
UNIT 10 SEARCH, RESCUE AND EVACUATION

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10.0 LEARNING OUTCOME

After studying this Unit, you should be able to:

- Understand the concept of search, rescue and evacuation phases of SAR and various techniques for it; and
- Analyse the technical, organisational and behavioural requirements for SAR.

10.1 INTRODUCTION

Search, rescue and evacuation processes need to be carried out immediately after a disaster strikes a certain area or building. These are the most immediate critical operations that are usually performed by the local volunteers, voluntary organisations and the emergency agencies. *Light Search and Rescue* is a procedure carried out at primary stages, initially to find out persons with injuries in lightly damaged buildings, or even without any injuries and needing assistance, and to help them exit. If the condition worsens and the local groups are not able to control the situation, then the specialist groups within emergency agencies have to be called in for professional help, and at times even the Defence Forces including the Army, the Navy, the Air Force and the Coast Guard are called on for help.

Primarily, Search and Rescue Operations are undertaken to save the maximum possible number of victims who are trapped in an area affected by a disaster. The basic aim of all such operations is to ensure the survival of the maximum possible number of affected people. A plan is worked out with the help of local people through surveys and then appropriate steps are taken by the various teams involved to carry out the operations. Besides physical rescue, the aim is also a systematic and organised approach in a post-disaster situation riddled with chaos and confusion.

10.2 SIGNIFICANCE OF SEARCH AND RESCUE (SAR)

Search and rescue, often known by the acronym SAR, is the process of identifying the location of disaster victims who may be trapped or isolated, and bringing them to safety and providing them with medical attention after a disaster strikes.

Search and rescue generally involves the local people who are well versed with the local terrain and can be instrumental in searching and accessing the trapped victims. SAR teams rely on sniffer dogs that are specially trained to smell out human beings trapped under the rubble. Heavy machines such as cranes and earthmovers are used to remove heavy rubble; and special equipment to delicately remove fallen structural elements and reach out inside heaps of rubble with visual or sound equipment for locating survivors.

In case of floods and cyclones, boats and helicopters are used to carry out the search and rescue operations by forming teams and carrying out SAR operations in the entire area systematically, each team covering its assigned sectors.

After the search, rescue and evacuation, some important steps are required to be taken in order to provide relief to the evacuees.

Prime amongst these are:

- Medical Aid
- Water and food
- Shelter
- Temporary subsistence supplies
- Health and sanitation
- Information, and
- Security.

10.3 PHASES OF SAR

SAR is carried out for different categories of affected people depending on the complexities of the processes involved. This is illustrated as follows:

- 1) The immediate stage is searching and rescuing people with injuries among people trapped in the affected area that we see at first sight.
- 2) The second stage is the rescue of persons whom we are able to contact but are unable to reach. These are people who may be trapped under heaps of rubble from a collapsed building, or people stuck on trees or high-rise buildings, or trapped inside basements.
- 3) The third stage includes searching those areas where survivors are likely to be trapped generally. These are called *likely survival points*.
- 4) The fourth stage is the last stage in which debris leading to likely survival points is cleared.

10.4 LOGISTICS AND METHODS

Search and Rescue Kits

SAR kits should ideally be kept in central locations in areas of vulnerable buildings. Local trained personnel can make use of these kits should a disaster strike the area. A typical SAR kit will comprise the following items:

- Evacuation map of the building or area
- Hammer
- Screw driver (6" flat)
- Axe
- 24" Crow bar
- Spade
- Pickaxe
- 50-foot rope
- Torch
- Spare battery cells
- Hard shoes or Gum Boots
- Helmet
- Hand gloves
- Dust Mask

Simple Rescue Methods

Rescue can be carried out ideally by using rescue equipment but also by ordinary methods when equipment is not available.

For rescuing an affected individual, there are two types of methods: *Single Person Methods* and *Two Person Methods*.

A) Single Person Methods

- **Firemen's Lift**

This method is used when the affected person is unconscious and only one rescuer is available for carrying out rescue work. In this method, the rescuer first makes the affected person lie on his or her the abdomen. Then he uses both his hands to lift the affected person by his armpits. He holds the right hand of the affected person with his left hand and with his free hand he holds the affected person's right leg. Now the rescuer lifts the affected person with both his hands and positions him or her in such a manner that his or her waist lies just above the neck of rescuer.

- **Human Crutch**

This method is used when affected person has an injury in one of his/her leg. In this

method, the rescuer first ties the injured leg of the affected person with his opposite leg with a handkerchief. If the affected person's left leg is hurt, the rescuer will tie this leg with his own right leg. The rescuer holds the affected person's waist with his hand and then they both can walk slowly with the rescuer supporting the affected person's injured leg with his own leg.

- **Pick a back**

This method is used when the affected person has an injury in his or her leg and is not able to walk long distances, but can support himself or herself with his or her hand. In this method, the rescuer first gets down on one knee and allows the affected person to saddle on his back. The rescuer then holds the affected person at the thighs and the affected person encircles the rescuer's neck for support.

- **Staircase drag**

This method is used when one has to rescue an unconscious person from a floor higher than the ground floor. In this method, the affected person is laid down on his back and his hands and feet are tied with a handkerchief. The rescuer holds the casualty's armpits and slowly drags him or her down the stairs head, first.

- **Firemen's Crawl**

This method is used when the affected person is trapped inside a smoke filled area and is unconscious. The rescuer first ties the hands of the casualty and then goes astride the casualty. The rescuer inserts his head in the loop made by the casualty's hands. Then by pushing his hand and foot against the ground, he can drag the casualty to a safer place.

- **Tow Drag**

This method is used when the affected person is lying in such an area where there is very little space to carry out the rescue. The affected person may or may not be unconscious. In this rescue method, the rescuer inserts his feet into the casualty's armpits and then pulls the casualty out of the confinement area. After taking the casualty out, the rescuer can lift the casualty with any appropriate method.

B) Two Person Methods

- **Fore and Aft**

This method is used when the affected person is having an abdominal injury. For carrying out this method, two rescuers are required. In this method, the affected person is laid down flat on his/her back. One of the rescuers holds the casualty from the armpits while the second rescuer holds the legs. Then they both lift the casualty and in this way they can shift the casualty to a safer place.

- **Two Hand Seat**

This method is used when the affected person is injured in one leg. For carrying out this method two rescuers face each other on either side of the affected person. They both bend and place their inside arms under the casualty's back just below the shoulders, raise him and put their outside arms under his thighs, holding each other's hands with a hook grip. The affected person can place his/her hands around rescuers' necks.

- **Three Hand Seat Method**

This method is used when the rescuers need one hand free to support the affected person's injured leg. In this method, if the affected person's left leg is injured, the rescuer on the right grasps his own left wrist with his right hand & the other rescuer's left wrist with his left hand. The second rescuer will hold the right wrist of first rescuer keeping his left hand free to support the casualty's injured leg or any other medical equipment.

- **Four Hand Seat Method**

This method is used for an affected person who is heavy and who can support her/ his self with his/ her hand. In this case, each of the two rescuers grasps his left wrist with his right hand, grasping the other rescuer's right wrist with his left hand.

- **Carry Chair**

This method is useful to lift a handicapped or a very old person. The person to be lifted is placed on a chair, and then, the chair can be carried to a safer area.

- **Knots and Lines**

A rope is an important part of SAR operations. It can act as a guideline during searching; it can be used to lift equipment during rescue work or while carrying out fire fighting, and it can be used for rescuing people. Various knots and lines are used, which are mentioned below:

- **Over hand knot or thumb knot**

It is used as a stopper knot. Sometimes it is also known as first aid knot because it is used to tie the bandage.

- **Figure of Eight**

It is used to stop a line running through a sheave or a pulley.

- **Reep Knot**

It is used to join two ropes of the same diameter or thickness.

- **Chair Knot**

It is used to lower an unconscious casualty.

- **Half Hitch**

It is used to hoist round object.

- **Claw Hitch**

It is used to secure a line to a round object.

- **Timber Hitch**

It is a simple knot with several loops on it, which is used to hoist any odd heavy object.

- **Black Wall Hitch**

It is used to secure a line to the shank of a hook.

– **Draw Hitch**

It is used as temporary fastening when we require the knot to be released immediately.

– **Single Sheet Bend**

It is used to join two ropes of different thickness.

– **Double Sheet Bend**

It is similar to single sheet bend but with a double hitch round.

– **Carrick Bend**

It is used to join two lines without the knots forming an obstruction to pass round an object.

– **Sheep Shank**

It is used to shorten the length of a line or to avoid any damaged part of the line.

– **Single Bowline**

It is used for various miscellaneous purposes.

– **Round Turn and Two Half Hitch**

It is used to secure a line to round objects.

– **Cats Paw**

It can be used to hoist a hose or a similar object.

– **Running Bowline**

It consists of a bowline, with the standing line passing through the bight of the line, to form a running noose.

– **Bowline on Bight**

It is used to lower a stretcher or an unconscious person.

● **Rescue Using Chair Knot**

The following safety precautions need to be taken while lowering a casualty with a line:

- Always use a guideline to prevent the casualty from striking with building wall;
- The line should pass hand to hand, and not through hands;
- The line should run over a wooden block or some sack under the point of contact of line and building;
- Check the area for required space;
- Insert the shorter loop into casualty's armpits and longer loop into the casualty's knees;
- While lowering the casualty assign someone on watch below the casualty.

Search and Rescue Checklist

Finally, the following checklist, as per the *Source book on District Disaster Management, Ministry of Agriculture, Government of India, and National Academy of Administration, Mussourie* can help assess the level of preparedness of search and rescue operation plans.

- What rescue tasks may need to be performed?
- Who is responsible, who coordinates?
- Are there procedures for detecting and marking danger areas?
- How are search and rescue activities integrated with other emergency functions, particularly in health?

10.5 BEHAVIOURAL REQUIREMENTS

Qualities of a Good Rescuer

A good rescuer needs to be physically fit and trained/experienced to be able to effectively carry out rescue work. Incapable rescuers usually hinder the work on site, and often also cause more harm by aggravating the situation and causing further injuries to the persons to be rescued. The following key features are seen when selecting rescuers for a mission:

- Technical ability
- Common sense
- Directional sense
- Effective improvisation
- Proper judgment
- Physical and mental fitness

General Precautions while carrying out Search and Rescue

SAR is a process with high level of risk to the rescuers as well. It is important for the rescuers to take adequate precautions to keep themselves safe. The following actions are advised:

- Wearing necessary personal protective equipment
- Always working in pairs
- Before starting SAR, one should always note down alternative means of escape for oneself
- Using guidelines such as directions for rope use when you enter a confined place, smoke filled room or a dark place
- Carrying out thorough searches in toilets, storerooms, under tables, in lifts, etc.

Evacuation

Evacuation implies removing all people from a threatened area to a safer place, before, during or after an emergency. It has been observed that in most disaster events, like earthquakes, cyclones and fires, a large percentage of total deaths occur due to wrong evacuation practices or stampede. It is necessary to evacuate using short and safe exits. Generally, those areas should be avoided that make occupants more vulnerable.

Evacuation in Slow and Rapid Onset Disasters

Mass evacuations are carried out to move people out of impact areas in case of cyclones or floods, once the warnings have been received. People from expected areas of impact are moved to cyclone shelters or schools or other public buildings in nearby places that are designated, emergency shelters. Public vehicles are often organised to make such evacuation possible. The general public is warned of the coming disaster, and advised to evacuate themselves or take the help of the government or NGOs working in the area to move out.

Evacuation is more difficult in very rapid onset disasters such as earthquakes, fires or accidents. Mass evacuation is not possible in such cases since there is very little or no warning time available. In such cases people caught in the event can just follow preplanned evacuation systems and use exit signs, exit routes, meeting points etc. *Pre-planning* for evacuation is most critical for such situations. *Such planning is discussed in the following sections:*

Evacuation Planning

An Evacuation Plan is a plan that shows the shortest and safest exit routes and the location of first aid, fire fighting equipment and SAR equipment in a building or area. The evacuation plan should be prepared in non-disaster times, and should be kept updated. It should also be used in mock drills.

To check the level of preparedness provided for in evacuation planning, Evacuation Checklist has been provided in the *Source Book on Disaster Management, Ministry of Agriculture, and Lal Bahadur Shastri National Academy of Administration, Mussourie.*

Evacuation Checklist

- Does any person or organisation have the authority to evacuate people?
- Are there designated locations to which evacuees should travel?
- How many people may need to be evacuated?
- In what circumstances should they be evacuated?
- Who will tell people, that it will be safe to return? Who will trigger this?
- Are staging areas and pick -up points identified for evacuation?
- Are evacuees to be provided with information or where they are going and how they will be cared for?
- Is there security for evacuated areas?
- How are prisoners to be evacuated?
- How are the cultural and religious requirements of evacuees to be catered for?

- Who is responsible for traffic control during evacuation?
- How are evacuees to be registered?

The process of making an evacuation plan is as follows:

- First take the building or area plan as Base Map
- Make separate floor plans
- Remove the unnecessary text or dimension from the map
- Show the Exit Route by arrow signs from each room to the assembly point or points in easily accessible open spaces. Try to provide maximum number of exits.
- Put 'Emergency Exit' labels at the functional exits
- Show the locations of fire extinguishers
- Locate and highlight the site for SAR and First-Aid Equipment
- Mark safe open areas as assembly points
- Locate 'Danger Areas' and mark them with red signs with skeleton symbols
- Separately draw room exit plans and display them in individual rooms
- There should be a provision for at least two exits for each room. Locate room exits in opposite direction to the extent possible.

Importance of Exit Signs

Exit signs help in getting out of a building during an emergency. As we know, during emergencies people panic and some times forget the exit routes. During such times, exit signs help people get oriented and exit the danger areas. Getting out is not enough in itself; getting out safely is important. Often people get injured and stampedes are caused while getting out. Prominently visible exit signs help people out even when it is dark.

Pre-Planning for Evacuation

An order to evacuate could come at any moment. By planning ahead, individuals can evacuate quickly and safely without sacrificing life, limb and property. The goal should be to spend as little time as possible following an evacuation order.

Evacuation Activities

- Lock door and windows and turn off utilities like water taps, cooking gas and electricity.
- Shut off systems that draw outside air, such as fireplaces and air conditioners.
- If you can provide transportation for a neighbor who has none, do so. Try to help the aged, disabled and other people around you who may need special attention, such as women and children.
- In case of fire or earthquake, evacuate immediately. In case of cyclone or any other evacuation where there is a little time, carry essential items, such as:

- Medical supplies (prescriptions, first aid)
- Money (cash, credit cards, important documents)
- Personal hygiene items (washing, shaving, dental, eye-care, sanitary)
- Clothing, bedding
- Baby needs (food, diapers, favorite toys)
- Portable radio and batteries
- Miscellaneous useful items (matches, flashlights, plastic bags)
- Keep your radio tuned to a local station for emergency news updates.

10.6 CONCLUSION

Casualties happen in disasters because people are caught at the wrong place at the wrong time. Earthquakes kill when people get stuck inside weak buildings that get damaged or collapse, burying people beneath piles of debris. Cyclones kill people in their direct path, even if they are inside buildings if these buildings happen to be weak. Floods kill people in high inundation areas. It is therefore critical to evacuate people whenever there is the possibility of a high damage disaster in that area. Mass evacuations are possible before cyclones and floods, since there is ample warning. Evacuations are more difficult from buildings before fires and earthquakes, since the warning time is very short. Rapid evacuation methods have to be used in such cases.

Search and rescue has to be resorted to when there has already been some damage and people are trapped in affected buildings or areas. Trained search and rescue teams need to move around to find such people, and then help or carry them out to safety. If such persons are injured they also require immediate medical attention.

10.7 KEY CONCEPTS

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|--------------------------------|---|
| Emergency Agencies | : The army, police, fire, medical health professionals and the local municipality are the crucial emergency personnel/agencies in the immediate aftermath of disasters. Presently, there is certain ambiguity regarding the role of police in disaster management, in that, whether it should restrict itself to law and order or undertake more relief tasks required during response. |
| Evacuation Plan | : Simply explained, evacuation plan comprises rapid and safe way to move every person out of danger to a place of safety. Evacuation has to be preplanned on the basis of hazard maps. Evacuation Plan should clearly delineate the routes prepared through satellite imagery to know the routes which could be used, mode of transport required, strength of population, etc. |
| Light Search and Rescue | : Light search and rescue also requires preplanning. The team has to be updated regarding the strength of |

population in the neighbourhood, number of elderly, disabled, children etc. Secondary rescue follows, which involves use of heavy equipment to remove rubble and deployment of sniffer dogs to trace the dead and struggling in the debris.

Rescue Method : Rescue method depends on the kind of injury sustained by the victim, that is whether CPR is needed, what physical posture is best for the victim, what the first aid requirements are, etc.

10.8 REFERENCES AND FURTHER READING

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10.9 ACTIVITIES

- 1) Find out which disaster can strike your area. Prepare family and office evacuation plans.
- 2) List agencies that are responsible for search, rescue and evacuation during disasters in your area. Meet one of the agencies and prepare a report on how they carry out operations during emergencies.