

ANNEX 21H**SEARCH AND RESCUE (SAR) PROCEDURES****1. Command Considerations - Implementing Search and Rescue (SAR) Operations**

- a. If personnel are known, or suspected of being in a smoke logged area and there is a high possibility that they are overcome or trapped, the Command must decide on whether a SAR operation is practicable. Normally SAR should only be considered when all fires are under control or confirmed extinguished; as it is then that sufficient CBRNDC equipment and manpower will be available for dedicated SAR operations. Once the decision to conduct this type of operation is made, the saving of life becomes the priority.
- b. When the Command consider a SAR operation may be necessary, (eg Support Team overdue) direction should be given to muster all equipment and prepare the teams. Concurrent to this, all hands should be accounted for, so that the number of potential casualties can be determined prior to the SAR operation. If a SAR operation is carried out during aid to another ship, passenger lists and crew check-off lists should be used.
- c. When selecting personnel for SAR teams, it is beneficial to identify individuals with knowledge of the area or compartments to be searched, but this must be weighed against their knowledge and experience of SAR techniques.
- d. Additionally, consideration should be given to:
 - (1) Location of the area where personnel were last seen or known to be.
 - (2) Details/locations of casualties (if known).
 - (3) Dangerous areas (eg positions where guardrails, ladders or decks etc are missing in way of work or damage).
 - (4) Difficult search areas and trap points (under machinery and small compartments).
 - (5) Little used exit points such as emergency exits, escape hatches etc.

2. FCP and I/C SAR Team Considerations**a. Safety Precautions**

The safety of the SAR teams is as important as the efforts to rescue trapped personnel. The person in charge of the incident should be guided by the following:

- (1) Make sure teams are well briefed on how to search a compartment and laying a guideline, if necessary.
- (2) Make sure teams know how to use SAR equipment, especially breathing apparatus.

- (3) Have the area to be searched clearly defined utilising ships plans (if available).
- (4) Always work in teams of at least two.

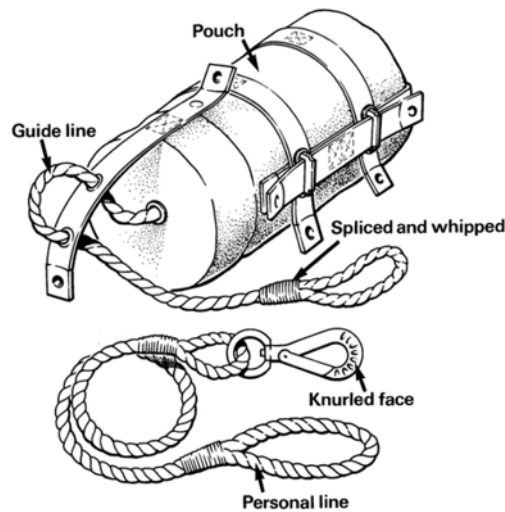
3. Equipment

The following equipment is available for SAR teams:

- a. A 40 m guideline in a pouch ([Fig 21H-1](#)) for searching compartments or for use on an unfamiliar vessel. The standing end is knotted to prevent it from being pulled out of the pouch. Four guidelines are supplied to each FRPP and UDRFPP. In addition, BA lockers that contain guidelines are to be identified by a tally '**GUIDELINE WITHIN**' applied beneath the EDBA tally or a white line around the top of the locker.
- b. A personal line with a knurled spring clip (8 per FRPP and UDRFPP). The spliced eye of the line is attached to the waistband of the EDBA harness. When the EDBA is not being used for SAR, the personal lines are to be stowed in FRPP lockers.
- c. Breathing Apparatus (EDBA).
- d. FFHBC for the search team and a hand-held radio for the I/C at the FCP.
- e. A 2 m BA extension hose and rescue mask. This is to be supplied to one member of each team (including pathfinders) committed to the search area in the event of a casualty is found. This is to be connected to the waist rectus coupling.
- f. A 15 m BA extension hose (2 x 15 m may be joined to give a 30 m hose - this is the maximum length that can be used). When connecting the extension hose to the EDBA, the shoulder rectus coupling must be used as the integrity of this connection has already been proven. It will require the removal of the EDBA facemask. This equipment must have a dedicated safety number to monitor air pressure when it is committed to the search area. A standby BA set must be readily available for use should the pressure on the 'in use' set diminish to the level of the warning whistle sounding.
- g. Lightweight stretcher.
- h. Thermal Imaging Camera (TIC) to be used in the grey scale (WH).
- i. Torches.
- j. **EEBD**. One belt worn EEBD per team for casualty use.

4. EDBA Extension Equipment in the SAR Role

- a. Carry out full pre-use and user checks on all equipment prior to entry. The 2 m extension hose and mask is connected to a search team members rescue mask connection, allowing provision of an air supply to a casualty.

Fig 21H-1. Guide Line (Indicator Route Line)

- b. Carry out a full face seal check on the EDBA, remove mask and connect the 2 m extension mask to rectus coupling. Carry out a face seal check on the rescue mask. Replace EDBA mask and carry out a face seal check.
- c. 15 m extension hoses, up to a maximum of 30 m can be connected to a BA set. The set is placed close to the entry point and is monitored by a BA Controller.

5. Precautions

SAR teams must utilise effective methods of personal protection when moving through vessels with reduced visibility, to ensure that any hazards, encountered are identified and avoided. It should be noted that SAR Team Leaders (TL) must identify the potential for penetrating too far into a vessel (particularly if the layout is unfamiliar eg a merchant ship). It can become increasingly difficult to maintain orientation and therefore safety, as well as the quality of any searching and the subsequent debrief, may be compromised. In addition, the SAR TL must remain mindful of any predetermined turn around cylinder pressure.

6. Air Management by the SAR Team

- a. It is the responsibility of the SAR TL to ensure that every BA wearer reports back to the FCP before their BA whistle sounds. This can only be achieved, and wearers will only obtain the maximum working duration of the BA set, if every wearer fully understands the importance of air management and regular gauge readings. The SAR TL should prompt other team members for regular gauge readings and ensure the FCP is updated. In turn, if the FCP does not receive regular gauge readings, the SAR TL must be prompted accordingly.
- b. During the SAR team briefing, the I/C FCP may wish to determine a Turn-Around Pressure in advance of deploying the SAR team. Each wearer will consume air at a different rate. The difference will be determined by a number of factors including; body mass, individual levels of fitness, work rate, environmental conditions and the wearer's reaction to the situation. It is for these reasons that each wearer must read their own gauge, make their own calculations, and take responsibility for informing the SAR TL of the pressure at which the team will need to start exiting the search area.

- c. Reaching easily identifiable locations eg a change of level or direction, doorways and large obstacles such as furniture and fittings can act as a prompt and waypoint. Checking gauge pressure at these waypoints on the return journey will guide the team as to the pace required in exiting the search area. By doing this at regular intervals, any unexpectedly high air consumption or loss should be identified.
- d. Air use must be monitored on the way out of the search area, and as previously mentioned, in all normal circumstances, wearers must be back at FCP before a low pressure warning whistle sounds.
- e. As indicated in [sub para f](#) if a team fully understands gauge reading and by making calculations, it is permissible to use some of the safety margin if a team needs to exit with a casualty. This extreme measure will only be employed in a highly calculated and controlled manner and the FCP must be advised of the decision made. In addition, the SAR team must remain in communication with the FCP, so that I/C FCP may introduce appropriate support and additional risk control measures.
- f. Where a SAR team has to exit with a casualty, it is essential that unless they are extremely close to an exit, a gauge reading is taken and a calculation is made on the air required to leave the incident. Having commenced the journey out, and on reaching the points where gauge readings were taken on the way in, they must take further gauge readings and by reference to their earlier calculations work out by how much their air consumption has increased. From this the team will be able to determine if they can leave the incident with the casualty or progress as far as possible before having to leave the casualty for another SAR team. Again, the SAR team must remain in communication with the FCP, so that appropriate support and additional risk control measures may be introduced where necessary.
- g. It is each wearer's responsibility to make the SAR TL aware of their gauge readings regularly so that work can be shared out evenly amongst the Team in order to maximise air remaining. Subject to the requirement for the SAR TL to maintain a leadership role and ensure awareness with the correct exit route, this might involve the wearers with the most air carrying the casualty, where possible. To facilitate this, the team should be rotated regularly to conserve air. However, it must be emphasised that this should **NOT** be attempted if doing so might compromise the safety of the SAR team.

7. SAR Control at the Entry Point

The I/C of the Main Group will normally control SAR teams and is to keep HQ1/SCC informed of progress. The I/C will also:

- a. Establish a casualty handling area.
- b. Ensure proper BA control.
- c. Arrange for a Rescue Team to stand-by, with BA pre-wear checks completed.
- d. Arrange for 30 m (2 x 15 m) BA extension equipment to be laid out and proved.

8. SAR Compartment Search Procedures

a. **Left/Right Hand Orientation.** Search procedures will employ a left or right hand orientation, in that the SAR TL will use and follow the left or right hand bulkhead as their fixed reference point to ensure that the search is orientated and systematic. This left or right hand orientation applies at all times a SAR team is within the search area, after passing through the Forward Control Point (FCP) into the structure.

b. **SAR Technique**

(1) The search is to begin at the nearest point to the scene of the incident and then work away from it towards fresh air and safety. This ensures that if a casualty is found before the team reaches the limit of their endurance they are as near to fresh air as possible. To this end, priority is given to a 2 man Pathfinder team who can lay a guideline to the Scene Of The Incident (SOTI).

(2) Pathfinders enter the smoke boundary ensuring that the guideline is secured at the entry point, in fresh air, to a secure fitting. A 2 m BA extension hose is to be carried by one member of the team (ideally No 2). The guideline should be laid by the most direct route, if possible at waist height and always to secure fittings. This will allow search teams to follow with ease. Personal lines are to be attached to the guideline with the knurled edge of the clip facing the entry point. The guideline should, where possible, be laid above doorways to leave access for later search teams and indicate that the compartment has not yet been searched. When the Pathfinders arrive at the SOTI the guideline is to be secured to a fixed position.



Note. The guideline secured to a fixed position will indicate there is another guideline attached to continue further into the compartment. Guideline canvas bag on the deck indicates this is the SOTI.

(3) The fundamental principle of this procedure is that a SAR team will attempt to fully search each compartment they enter before moving on to the next compartment. On receiving and confirming their brief (which should include the use of ship's plans), the SAR team will move to the Point of Entry and enter the search area. The search may start at the point of entry or from a designated point, as per the brief given at the FCP. Within the search area the team will maintain a left or right hand orientation and use the corresponding wall as their fixed reference point at all times. At the point designated in the brief they will commence a Compartment Search procedure.



Note. Personal lines are to be attached so that on entry the line is across the front of the body therefore keeping the searcher close to the guideline on the way to the search area. At the pre-determined search start point the team is to turn 180° therefore allowing maximum extension of the personal line to aid compartment coverage. The knurled face of the personnel line hook is always to face the point of entry thus allowing the wearer to know the direction of travel to FCP if they become disorientated.

(4) When any team has been committed including pathfinders, an Emergency Rescue Team (ERT) should always be ready, standing by, with all pre-wear checks completed. Once the guideline has been laid, SAR teams can be committed after being given a full brief on what areas they are to search, and search technique (boundary, quarter, diagonal). The SAR teams must clip onto the guideline in fresh air, at the entry point, with the knurled side of the personal line spring clip pointing towards the entry/exit point.

(5) When the pathfinders have completed their task, they debrief the I/C SAR and the search teams. Once briefed the Search Team must attach their Personal Line to the guideline ensuring the knurled edge is towards the exit point. The team then proceed to the SOTI (the point where the guideline is tied off); this is where the search begins, a cylinder pressure check must be made before the team work back towards the FCP.

(6) The search team should always follow the guideline to the SOTI. . When proceeding along the guideline and through the search area continually test the area ahead by moving a hand ahead with the palm toward the face ensuring you tread gently and cautiously before committing weight to the lead foot.

(7) On entry into the first (primary) compartment to be searched, the perimeter and in the case of all compartments, the centre of the compartment, are searched at the same time. At no time should all members of the team unhook themselves from the guideline. If a lightweight stretcher is to be used, a 4 man team should be considered. First aid should be given only when it is safe to do so.

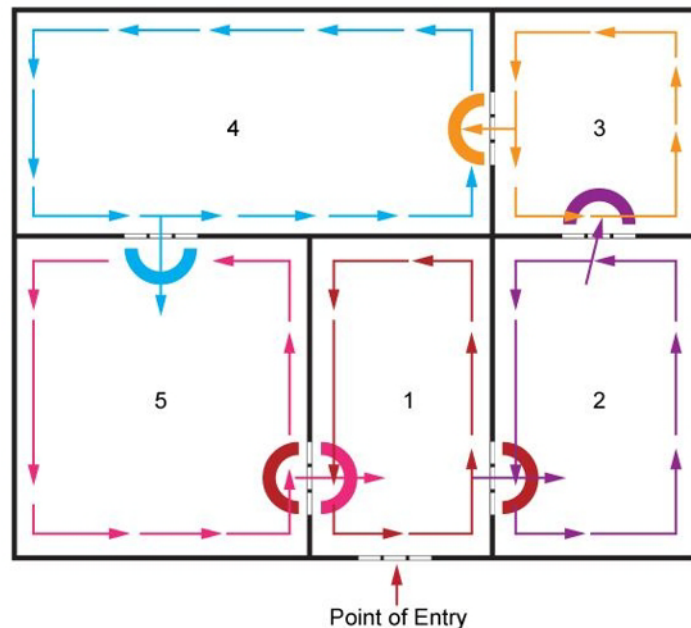
(8) At the SOTI, one member of the team detailed by the TL remains on the guideline at all times to act as a datum for the search. The remaining members of the team search out into the centre of the compartment ensuring there are attached to each other by use of their personal lines. As the team progress through the compartment, they should carry out a sweep around any doors encountered and then continue around the compartment. If open doors are encountered during this phase of the search the compartment (secondary compartment) should be entered informing I/C SAR of the action, leaving a further Team member as a datum at the entrance point, the remaining team members enter and search the secondary compartment. If proved clear, the door is to be closed and marked (by placing a cyalume on the door or the guideline across it) informing I/C SAR. The original compartment search is then to be completed.

(9) If open hatches are encountered the TL is to inform I/C SAR but is not to proceed through the hatch until the original compartment search is complete unless ordered to do so by I/C SAR. When searching through a hatch a team member is left at the bottom of the ladder as a datum, the team then search that compartment, once complete the hatch is to be closed to preserve watertight integrity and a cyalume is placed on the hatch.

(10) Once the original compartment search is completed the Search Team are to progress to the next compartment by maintaining a left or right hand bulkhead search pattern, as briefed at the I/C SAR. The same procedure will then be repeated for that and any subsequent compartments.

(11) On completion of the search, or at the pre-planned turn-around pressure, or at any point during the search as the SAR TL determines, the SAR TL must ensure that orientation with the bulkhead is maintained, albeit the direction of travel reversed in order that the team may exit the structure.

Fig 21H-2. Diagrammatic Representation of the Principles of Compartment Search Procedure (Example shown - Right Hand Orientation in a 5 Compartment Structure)



Note. This illustrates the basic principle of the procedure. It does not cover all possible compartment configurations and is not to any specific scale.

9. Precautions when Searching

a. When negotiating a hatch and ladder:

- (1) Ensure that the hatch retaining clip is secure.
- (2) Test rungs/treads before committing full weight.
- (3) Feel below for the next rung/tread. Never assume that deck level has been reached. SAR TL to inform rest of team the number of rungs/treads to expect during transit.
- (4) Never jump from a ladder to a deck.
- (5) One searcher at a time on a ladder, the other stood clear.
- (6) Use the 'ladder clear' drill.

b. When passing through a doorway or access:

- (1) Enter cautiously, as the door could lead to a ladder, a trunk or shaft, or an unsafe/damaged deck.
- (2) If the access is restricted, do not remove BA.
- (3) Ensure that there is sufficient room to turn around.

c. When moving through the ship:

- (1) Tread gently and cautiously before committing weight to the lead foot, (shuffle, rather than walk).
- (2) Never put weight on guardrails.
- (3) Avoid touching metal items with bare hands as they may be hot from fire or electrically live.
- (4) Continually test the area ahead by moving a hand ahead, with the palm towards the face.

10. Locating Missing Personnel

a. Personnel trapped by smoke or fire often retreat into unexpected places to protect themselves, so all areas of compartments must be methodically searched. Possible hiding places are:

- (1) In or behind bunks.
- (2) In or behind lockers.
- (3) Under tables or chairs.
- (4) Adjacent to compartment exits.
- (5) In bilges or under deck plates.

b. Casualties who are conscious will probably be suffering from shock and may present a danger to the search team. Teams must be prepared to restrain casualties and keep their own air supplies out of reach.

11. Actions on Locating Casualties

a. Upon locating a casualty the SAR Team Leader should relay this information to the FCP as soon as possible. The other members of the team should carry out a proximity search around the casualty to ensure there are no further casualties close by.

b. At this stage the SAR team members must take a gauge check to ensure effective air management is maintained.

Confirmation of this information with the TL should take place and where possible, the FCP notified of SAR team members' air supplies and the rescue and withdrawal decisions of the SAR Team Leader, accordingly.

c. **On discovering a conscious casualty:**

- (1) Open the by-pass valve on the extension mask and offer the mask to the casualty at arms length.
- (2) Close the by-pass valve once the casualty is breathing comfortably.
- (3) If the casualty is able, escort to the entry point immediately.
- (4) If the casualty cannot be safely moved, provide an EEBD. Inform OIC who will arrange for a relief team member with extension equipment (30 m maximum) to provide a more permanent air supply.

d. **On discovering an unconscious casualty:**

- (1) Open the by-pass valve on the extension mask, place on the casualty and purge the mask.
- (2) Leave the by-pass valve open.
- (3) Remove casualty to the point of entry immediately.
- (4) If the casualty cannot be safely moved or is trapped. Inform OIC who will arrange for a relief team member with extension equipment (30 m maximum) to provide a more permanent air supply.



Note. As soon as 2 people are breathing from the same set, endurance is significantly reduced therefore cannot be positively controlled.

12. Entrapped Procedure

- a. When BA wearers cannot retrace their exit route they should consider going into entrapped procedure. No provision exists for conserving the air supply in compressed air BA other than by the wearer moderating demand by exerting the least possible energy. By conscious effort and self-control, the wearer can reduce demand considerably.
- b. When a BA Wearer becomes aware that it is not possible to escape the search area the following actions should be taken:
 - (1) Contact the FCP by radio (if possible).
 - (2) Operate the BA distress alarm.
 - (3) Relax as much as possible in the circumstances by assuming a reclined or seated posture.

(4) Breathe calmly and gently to minimise air usage.

c. The cylinder valve should not be adjusted, other than to check that it is fully open. Once the safety margin has been reached the low pressure warning device will operate. In the case of an air-operated low pressure warning whistle device, the air consumed is minimal.

13. Deployment of an Emergency Rescue Team (ERT)

The I/C FCP is responsible for the instigation of emergency procedures and/or the deployment of an ERT. The I/C FCP is also responsible for all other elements of ERT deployment, including briefing and debriefing ERT/s and maintaining a suitable record of all relevant operational and risk information, decisions made, tasks given to ERTs and any other relevant information. Following the deployment of any Rescue Team, arrangements must be immediately made for the provision of replacement Rescue Team.

14. Actions of a BA Wearer in Distress

a. BA wearers should indicate that they are in distress by operating the BA distress alarm (horn). Such action should be taken if there is a risk to life or severe injury to any BA wearers in the SAR team, or if the SAR team feel they cannot evacuate safely from the incident by their own unaided efforts, or if they are unable to trace their route to their exit point. In the unlikely event of a BA distress alarm failing to operate, the warning device of another team member should be operated. In such circumstances, the BA wearer, or their SAR TL or colleague, should consider the following actions:

(1) Inform the FCP immediately.

(2) Operate the BA distress alarm of any persons affected (in the unlikely event that a BA distress alarm fails to operate, the alarm of another member should be operated).

(3) Establish communications with the FCP and inform them of the situation, current location and intentions.

(4) Carry out gauge checks and inform FCP of cylinder pressures.

(5) Carry out a dynamic risk assessment and decide whether appropriate to remain at current location or to locate a safe waiting area.

(6) Where possible, retrace steps to the FCP.

(7) If unable to retrace steps to the exit, locate an alternative exit eg hatch/door, in immediate vicinity and attempt to attract attention.

(8) Where appropriate, adopt 'entrapped procedures' to conserve air whilst awaiting rescue.

b. Actions of SAR Team/s in a search area on hearing a BA distress alarm:

(1) Contact should be made with the FCP to inform them that a BA distress alarm is audible.

- (2) On hearing the BA distress alarm from another team within a search area, SAR TL should instigate a gauge check to determine if sufficient air reserves exist within the team to investigate the source and render assistance.
 - (3) Rendering assistance to a SAR team in distress should take precedence over existing tasks, unless it is determined that their activities are risk critical and if uncompleted may compromise the safety of other BA wearers within the search area.
 - (4) FCP should be informed of the intentions of the SAR Team.
 - (5) The SAR team must not take unnecessary risks, such as entering large or complex areas without the means to retrace their steps.
- c. Actions of an ERT on locating distressed BA Wearer/s:
- (1) Cease operation of the BA distress alarm to improve communications.
 - (2) Obtain verbal confirmation from distressed wearer/s into the nature of the emergency (if possible).
 - (3) Inform FCP that the distressed wearer/s have been located and request further ERTs for assistance as required.
 - (4) Take gauge readings of distressed wearer/s.
 - (5) Take gauge readings of ERT.
 - (6) Render any on scene emergency assistance as required.
 - (7) Following an assessment of risk, determine and implement a safe action plan to remove distressed wearer/s from the search area.