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PURPOSE

The purpose of the International Aeronautical and Maritime Search and Rescue Manual for Mobile Facilities is to provide guidance to those who:

- operate aircraft, vessels or other craft, and who may be called upon to use the facility to support SAR operations
- may need to perform on-scene co-ordinator functions for multiple facilities in the vicinity of a distress situation
- experience actual or potential emergencies, and may require search and rescue (SAR) assistance.

IAMSAR MANUALS

IAMSAR, jointly published by IMO & ICAO, comes in three (3) volumes each written with specific SAR duties in mind.

Vol 1 – Organisation and Management Volume - discusses the global SAR system concept, establishment of national and regional sar systems and co-operation with neighbouring states to provide effective and economical SAR services.

VOL II – Mission Co-ordination Volume - assists personnel who plan and co-ordinate SAR operations

VOL III – Mobile Facilities - is intended to be carried aboard rescue units, aircraft, and vessels to help in performance of search, rescue or on-scene co-ordinator functions.

RESPONSIBILITIES AND OBLIGATIONS TO ASSIST

The responsibilities to render assistance to a distressed vessel or aircraft are based on humanitarian considerations and established international practice.

Ship masters are obligated to assist others in distress at sea whenever they can safely do so.

NATIONAL AND REGIONAL SAR SYSTEM ORGANIZATION

To carry out these responsibilities, States have established national SAR organizations, or joined one or more other States to form a regional SAR organization associated with an ocean area or continent.

A search and rescue region (SRR) is an area of defined dimensions associated with a rescue co-ordination centre (RCC) within which SAR services are provided.

- SRRs help to define who has primary responsibility for co-ordinating responses to distress situations in every area of the world, but they are not intended to restrict anyone from assisting persons in distress
- the International Civil Aviation Organization (ICAO) regional air navigation plans (RANPs) depict aeronautical SRRs
- the International Maritime Organization (IMO) Global SAR Plan depicts maritime SRRs

The SAR system has three levels of co-ordination:

1 - SAR Co-ordinators (SCs)

SCs are the top level SAR managers; each State normally will have one or more persons or agencies for whom this designation may be appropriate.

SCs have the overall responsibility for:

- establishing, staffing, equipping and managing the SAR system
- establishing RCCs and rescue sub-centres (RSCs)
- providing or arranging for SAR facilities
- co-ordinating SAR training
- developing SAR policies

2 – SAR Mission Co-ordinators (SMCs)

- Each SAR operation is carried out under the guidance of an SMC. This function exists only for the duration of a specific SAR incident and is normally performed by the RCC chief or a designee. The SMC may have assisting staff.
- The SMC guides a SAR operation until a rescue has been effected or it becomes apparent that further efforts would be of no avail.
- The SMC should be well trained in all SAR processes, be thoroughly familiar with the applicable SAR plans, and:
 - gather information about distress situations
 - develop accurate and workable SAR action plans
 - dispatch and co-ordinate the resources to carry out SAR missions.

3 – On Scene Co-ordinators (OSCs)

When two or more SAR facilities are working together on the same mission, one person on-scene may be needed to co-ordinate the activities of all participating facilities.

The SMC designates an OSC, who may be the person in charge of a:

- search and rescue unit (SRU), ship, or aircraft participating in a search, or
- nearby facility in a position to handle OSC duties
- The person in charge of the first facility to arrive at the scene will normally assume the OSC function until the SMC arranges for that person to be relieved.

Duties of SMC

- obtain and evaluate all data on the emergency
- ascertain the type of emergency equipment carried by the missing or distressed craft
- remain informed of prevailing environmental conditions
- if necessary, ascertain movements and locations of vessels and alert shipping in likely search areas for rescue, lookout and/or radio watch
- plot the areas to search and decide on methods and facilities to be used
- develop the search action plan and rescue action plan as appropriate
- co-ordinate the operation with adjacent RCCs when appropriate
- arrange briefing and debriefing of SAR personnel
- evaluate all reports and modify search action plan as necessary
- arrange for refuelling of aircraft and, for prolonged search, make arrangements for the accommodation of SAR personnel
- arrange for delivery of supplies to sustain survivors
- maintain in chronological order an accurate and up-to-date record
- issue progress reports
- recommend to the RCC chief the abandoning or suspending of the search
- release SAR facilities when assistance is no longer required
- notify accident investigation authorities
- if applicable, notify the State of registry of the aircraft
- prepare a final report.

Duties of OSC

- Co-ordinate operations of all SAR facilities on-scene.
- Receive the search action plan or rescue plan from the SMC or plan the search or rescue operation, if no plan is otherwise available. (See Planning and Conducting the Search in this section.)
- Modify the search action or rescue action plan as the situation onscene dictates, keeping the SMC advised (do in consultation with the SMC when practicable).
- Co-ordinate on-scene communications.
- Monitor the performance of other participating facilities.
- Ensure operations are conducted safely, paying particular attention to maintaining safe separations among all facilities, both surface and air.
- Make periodic situation reports (SITREPs) to the SMC. The standard SITREP format may be found in appendix D. SITREPs should include but not be limited to:
 - weather and sea conditions
 - the results of search to date
 - any actions taken

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- any future plans or recommendations.
 - maintain a detailed record of the operation:
 - on-scene arrival and departure times of SAR facilities, other vessels and aircraft engaged in the operation
 - areas searched
 - track spacing used
 - sightings and leads reported
 - actions taken
 - results obtained.
- Advise the SMC to release facilities no longer required.
 - Report the number and names of survivors to the SMC.
 - Provide the SMC with the names and designations of facilities with survivors aboard.
 - Report which survivors are in each facility.
 - Request additional SMC assistance when necessary (for example, medical evacuation of seriously injured survivors).

Rendering Assistance

Initial Action by Assisting Craft

Vessels Assisting

- Methods of Distress Notification
- An alarm signal or a distress call from another vessel at sea, either directly or by relay.
- A distress call or message from aircraft. This usually occurs by relay from a CRS.
- Alert sent from a vessel's alerting equipment and then relayed shore to - ship.
- Visual signals or sound signals from a nearby distressed craft

Immediate Action

The following immediate action should be taken by any ship receiving a distress message:

- acknowledge receipt of message.
- gather the following information from the craft in distress if possible:
 - - position of distressed craft
 - - distressed craft's identity, call sign, and name
 - - number of POBs
 - - nature of the distress or casualty
 - - type of assistance required
 - - number of victims, if any
 - - distressed craft's course and speed
 - - type of craft, and cargo carried
 - - any other pertinent information that might facilitate the rescue
 - - maintain a continuous watch on the following international frequencies, if equipped to do so:
 - 500 kHz (radiotelegraphy)
 - 2182 kHz (radiotelephony)
 - 1 56.8 MHz FM (Channel 16, radiotelephony) for vessel distress
 - 121.5 MHz AM (radiotelephony) for aircraft distress

The following information should be communicated to the distressed craft:

- own vessel's identity, call sign, and name
- own vessel's position

- own vessel's speed and estimated time of arrival (ETA) to distressed craft site
- distressed craft's true bearing and distance from ship.
- Use all available means to remain aware of the location of distressed craft (such as radar plotting, chart plots, Global Positioning System).
- When in close proximity, post extra look-outs to keep distressed craft in sight.
- The ship or CRS co-ordinating distress traffic should establish contact with the SMC and pass on all available information, updating as necessary.

Proceeding to the Area of Distress

- Establish a traffic co-ordinating system among vessels proceeding to the same area of distress.
- Maintain active radar plots on vessels in the general vicinity.
- Estimate the ETAs to the distress site of other assisting vessels.
- Assess-the distress situation to prepare for operations on-scene.

On-Board Preparation

- A vessel en route to assist a distressed craft should have the following equipment ready for possible use:

Life-saving and rescue equipment:

- lifeboat
- inflatable liferaft
- lifejackets
- survival suits for the crew
- lifebuoys
- breeches buoys
- portable VHF radios for communication with the ship and boats deployed
- line-throwing apparatus
- buoyant lifelines
- hauling lines
- non-sparking boat hooks or grappling hooks
- hatchets
- rescue baskets
- litters
- pilot ladders
- scrambling nets
- copies of the *International Code of Signals*

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- radio equipment operating on MF/HF and/or VHF/UHF and capable of communicating with the SMC and rescue facilities, and with a facility for direction finding (DF)
- supplies and survival equipment, as required
- fire-fighting equipment
- portable ejector pumps
- binoculars
- cameras
- bailers and oars.

Signalling equipment:

- signalling lamps
- searchlights
- torches
- flare pistol with colour-coded signal flares
- buoyant VHF/UHF marker beacons
- floating lights
- smoke generators
- flame and smoke floats
- dye markers
- loud hailer

Preparations for medical assistance, including:

- stretchers
- blankets
- medical supplies and medicines
- clothing
- food
- shelter

Miscellaneous equipment:

- If fitted, a gantry crane for hoisting on each side of ship with a cargo net for recovery of survivors.
- Line running from bow to stern at the water's edge on both sides for boats and craft to secure alongside.
- On the lowest weather deck, pilot ladders and manropes to assist survivors boarding the vessel.
- Vessel's lifeboats ready for use as a boarding station.
- Line-throwing apparatus ready for making connection with either ship in distress or survival craft.
- Floodlights set in appropriate locations, if recovery at night.

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- Life-saving and rescue equipment
- Signaling equipment
- Preparations for medical assistance

Vessels Not Assisting

The master deciding not to proceed to the scene of a distress due to sailing time involved and in the knowledge that a rescue operation is under way should:

- Make an appropriate entry in the ships's log-book.
- If the master had previously acknowledged and responded to the alert, report the decision not to proceed to the SAR service concerned.
- Consider reports unnecessary if no contact has been made with the SAR service.
- Reconsider the decision not to proceed nor report to the SAR service when vessel in distress is far from land or in an area where density of shipping is low.

Search Patterns

Each search pattern has a specific use. Some are better suited for small, confined areas, while others are better suited to larger areas.

Regardless of the type of search pattern selected, as a coxswain, you are expected to understand the SMC's SAP and be able to complete the assigned search. Once the SMC determines the search area, a systematic search for the object must be planned.

The SMC will consider weather, search area size, search object size, numbers of SRU's available, search area location, and time limitations in deciding which pattern to use.

Search patterns are designated by letters. The first letter indicates the general pattern group:

T = Trackline P = Parallel C = Creeping Line V = Sector S = Square

The second letter indicates the number of SRU's assigned to that pattern:

S = Single Unit M = Multi-unit

The third letter indicates specialized patterns or instructions; the three most commonly used are:

R = Return N = Non-return C = Co-ordinated

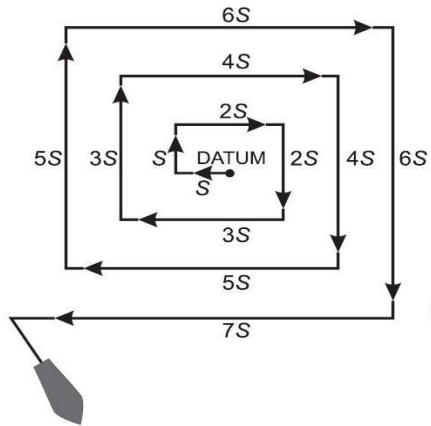
Track Spacing (S)

The distance between adjacent tracks in a search pattern of a rescuing ship is called track spacing. The distance 'S' between tracks is found out from the table given in IAMSAR based on object of search and the visibility. An appropriate weather correction factor is applied depending on prevailing wind force.

Radius is normally taken as 10 NM if search is to be commenced immediately otherwise it is calculated.

IAMSAR SEARCH PATTERNS

Expanding Square Search (SS)



Used when

- The search area is small
- The location of the search object is known within relatively close limits, but some doubt exists about the distress position, and
- A concentrated search is desired
- Not too many vessels/crafts can take part due to small area involved

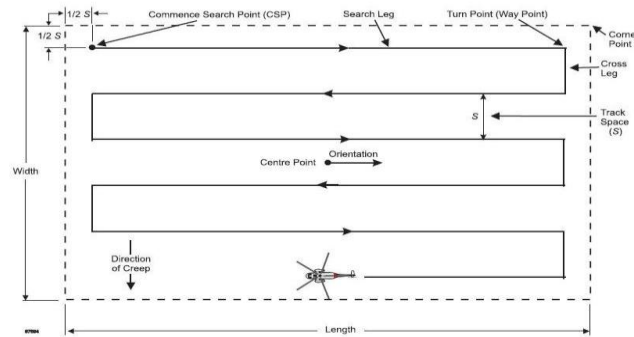
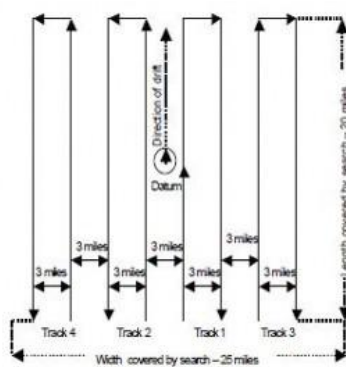
Description:

The SRU goes to the best known location of the search object. This becomes the center (datum) of the search area. Datum should be marked with a buoy, life ring, strobe light, etc. The first leg will begin from datum in the direction of drift for one track space (S). If there is no drift, the first leg will be true north.

Search leg length is increased by one track space on every other leg.

A second search is performed by rotating the search pattern 45° to the right.

Parallel Sweep Search (PS)



Parallel sweep search (PS)

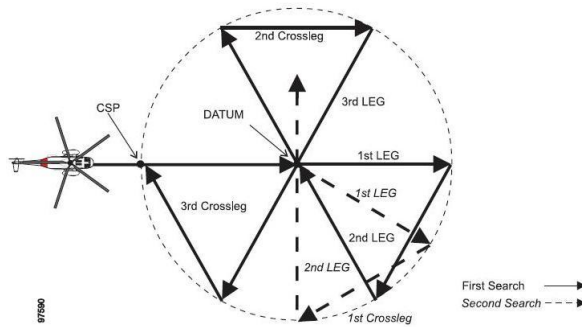
Used when

- The search area is large, location uncertain
- Area to be subdivided for assignment to other SRUs
- Multiple vessels can be used
- Search commences from one end of the sub-area and search legs are parallel

Description:

The SRU searches parallel to the long side (major axis) of the search area, moving over one track on the return. This process continues until the entire search area has been searched or the search object is located. The Commence Search Point (CSP) is located $\frac{1}{2}$ track space (S) inside the search area in the specified corner.

Sector Search (VS)



Used when

- The search area is small and location is known
- Must not be used by multiple aircraft/vessels
- An aircraft and a vessel may be used together to perform independent sector searches of the same area.

Description:

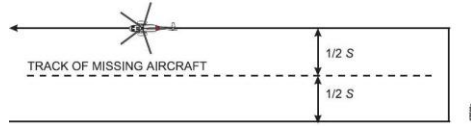
The SRU goes to the best known location of the search object. This becomes the center (datum) of the search area. Datum should be marked with a buoy, life ring, strobe light, etc.

The first leg will begin from datum in the direction of drift for one track space (S). If there is no drift, the first leg will be true north, 000°T, the second leg is 120°T, the next is 240°T and so on.

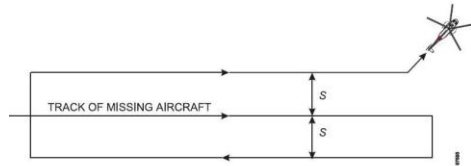
All course changes are 120° to the right and the length of all legs are equal to one track space (S).

A second search (with the same SRU – VS) is performed by rotating the search pattern 30° to the right beginning at datum. A second search (with a second SRU – VM) is performed by rotating the search pattern 90° to the left beginning at datum.

Trackline Search, Return (TSR/TSN)



Track line search, return (TSR)



Track line search, non-return (TSN)

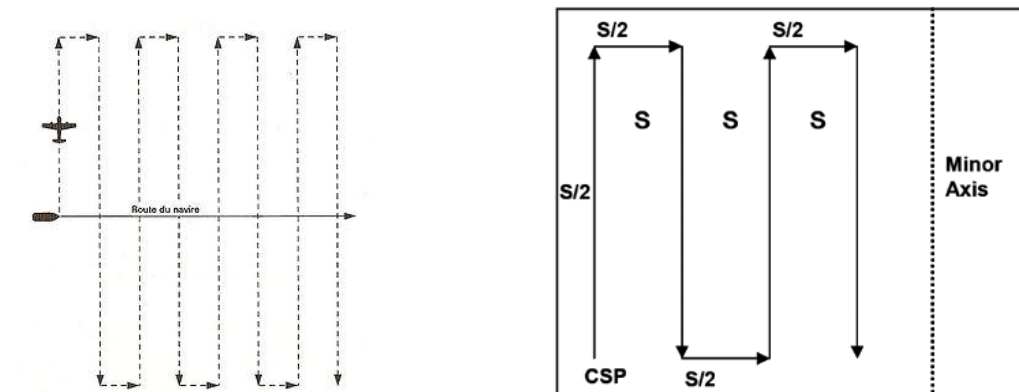
Used when

- An aircraft or vessel has disappeared without a trace along a known route
- Often aircrafts used as initial search effort due to ease of planning and implementation.
- A rapid and reasonably thorough coverage of the missing air craft's/vessel's intended track

Description:

Usually the first search effort in an overdue case since it's assumed that the search object is near track and either it will be easily seen or the survivors will signal. The SRU searches out $1/2$ track space (S) in the direction of the intended track from the origin to the destination and ends $1/2 S$ on the other side of the origin.

Creeping Line Search (CS)



Used when

- The search area is large
- Creeping line search, co-ordinated is often used.
- The aircraft does most of the searching, while the ship steams along a course at a speed as directed by the OSC so that the aircraft can use it as a navigational checkpoint.

Description:

The SRU searches parallel to the short side (minor axis) of the search area, moving over one track on the return. This process continues until the entire search area has been searched or the search object is located. The Commence Search Point (CSP) is located $\frac{1}{2}$ track space (S) inside the search area in the specified corner.

Sightings and Identification

While searching, you may encounter objects that need to be investigated.

If you need to divert and leave the search pattern, do so only after recording or marking the position and progress in the search pattern to which you are assigned.

Once sighting identification is complete, and the results are negative, return to the position recorded and continue the search.

Notify SMC how much time is spent evaluating sightings

Completing the Mission

The SAR System is deactivated or shut down under one of the following situations:

- Case Closed – The distressed person or craft is located and necessary assistance is rendered
- False Alarm – The person or craft reported to be in distress has been determined not to be in distress and does not need further assistance; and
- Active Search Suspended (ACTSUS) – Suspending the search after exhausting all possible hope for locating survivors with the information known

Person Overboard

Three Situations

- *Immediate action*

The person overboard is noticed from the bridge and action is taken immediately.

- *Delayed action*

The person is reported to the bridge by an eyewitness and action is initiated with some delay.

- *Person-missing action*

The person is reported to the bridge as missing.

Ship Manoeuvres

- When the possibility exists that a person has fallen overboard, the crew must attempt to recover the individual as soon as possible.
- Some factors that will affect the speed of recovery include:
 - ship's manoeuvring characteristics
 - wind direction and sea state
 - crew's experience and level of training
 - capability of the engine plant
 - location of the incident
 - visibility level
 - recovery technique
 - possibility of having other vessels assist.

- ***Initial Action***

- Throw a life-ring over the side as close to the person as possible.
- Sound three prolonged blast of ship's whistle, hail "Person Overboard".
- Commence recovery manoeuvre as indicated below.
- Note position, wind speed & direction, time.
- Inform master of vessel and engine-room.
- Post look-outs to keep the person in sight.
- Set off dye marker or smoke flare.
- Inform radio operator, keep updated on position.
- Stand by the engines.
- Prepare lifeboat for possible launching.
- Distribute portable VHP radios for communication between bridge, deck, and lifeboat.
- Rig pilot ladder to assist in recovery.

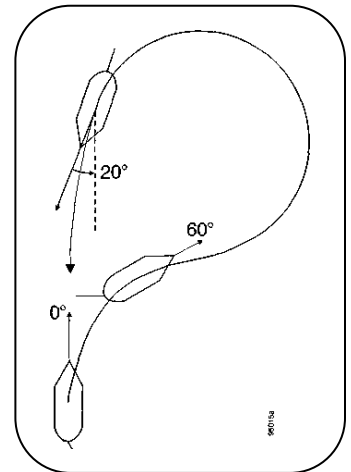
Standard Methods of Recovery

Williamson turn

- makes good original track line
- good in reduced visibility
- simple
- takes the ship farther away from the scene of the incident
- slow procedure

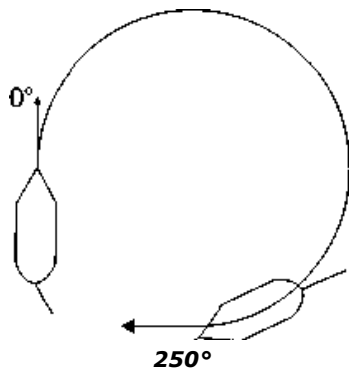
Williamson turn

- Rudder hard over (in an "immediate action" situation, only to the side of the casualty).
- After deviation from the original course by 60° , rudder hard over to the opposite side.
- When heading 20° short of opposite course, rudder to midship position and ship to be turned to opposite course.



One turn ("Single turn, Anderson turn")

- fastest recovery method
- good for ships with tight turning characteristics
- used most by ships with considerable power
- very difficult for a single-screw vessel
- difficult because approach to person is not straight

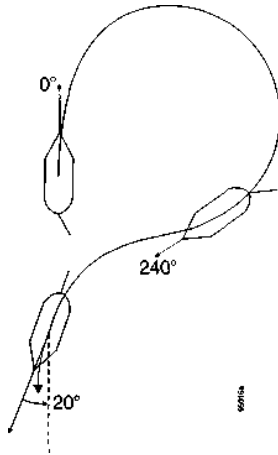


Anderson (Single) turn (270° manoeuvre)

- Rudder hard over (in an "immediate action" situation, only to the side of the casualty).
- After deviation from the original course by 250°, rudder to midship position and stopping manoeuvre to be initiated.

Scharnov turn

- will take vessel back into her wake
- less distance is covered, saving time
- cannot be carried out effectively unless the time elapsed between occurrence of the incident and the commencement of the manoeuvre is known



Scharnov turn

(Not to be used in an "immediate action" situation.)

- Rudder hard over.
- After deviation from the original course by 240°, rudder hard over to the opposite side.
- When heading 20° short of opposite course, rudder to midship position so that ship will turn to opposite course.

(Note: The underlined part indicates the disadvantages of this type of turn.)

Appendix A - Regulation V/33 of the International Convention for the Safety of Life at Sea, 1974, as amended Distress messages: obligations and procedures

1. The master of a ship at sea which is in a position to be able to provide assistance, on receiving a signal from any source that persons are in distress at sea, is bound to proceed with all speed to their assistance, if possible informing them or the search and rescue service that the ship is doing so. If the ship receiving the distress alert is unable or, in the special circumstances of the case, considers it unreasonable or unnecessary to proceed to their assistance, the master must enter in the log-book the reason for failing to proceed to the assistance of the persons in distress, taking into account the recommendation of the Organization to inform the appropriate search and rescue service accordingly.

2. The master of a ship in distress or the search and rescue service concerned, after consultation, so far as may be possible, with the masters of ships which answer the distress alert, has the right to requisition one or more of those ships as the master of the ship in distress or the search and rescue service considers best able to render assistance, and it shall be the duty of the master or masters of the ship or ships requisitioned to comply with the requisition by continuing to proceed with all speed to the assistance of persons in distress.

3. Masters of ships shall be released from the obligation imposed by paragraph 1 on learning that their ships have not been requisitioned and that one or more other ships have been requisitioned and are complying with the requisition. This decision shall, if possible, be communicated to the other requisitioned ships and to the search and rescue service.

4. The master of a ship shall be released from the obligation imposed by paragraph 1 and, if his ship has been requisitioned, from the obligation imposed by paragraph 1 on being informed by the persons in distress or by the search and rescue service or by the master of another ship which has reached such persons that assistance is no longer necessary.

5. The provisions of this regulation do not prejudice the Convention for the Unification of Certain Rules of Law Relating to Assistance and Salvage at Sea, signed at Brussels on 23 September 1910, particularly the obligation to render assistance imposed by article 11 of that Convention.