LS11 SAR OPERATIONS

SURF LIFE SAVING TASMANIA

TASMANIA

LS11.1 SEARCH AND RESCUE (SAR) RESPONSIBILITIES

PURPOSE

To outline the search and rescue responsibilities used by Surf Life Saving Tasmania (SLST) for lifesaving operations.

PROCEDURE

Definition

Search and Rescue (SAR) services are defined as the performance of distress monitoring, communication, coordination of search and rescue functions, provision of medical advice and initial medical assistance through the use of lifesaving resources.

Lifesaving resources include all SLS active members/ALS staff, approved lifesaving equipment, Surf Life Saving clubs /units and support operations in Tasmania.

Overview

There are three levels of management within the SAR system:

- Overall management of SAR responsibilities by SAR Authorities;
- Control of individual SAR incidents by an Incident Controller (IC); and
- Command of lifesaving services by an Incident Commander (usually Duty Officer/Patrol Captain).

This section outlines, in general terms, the management and coordination actions required when a decision is made to implement procedures in prosecuting a SAR.

Once it is decided to proceed with a search, plans should be enacted for the commencement of search activity with a minimum of delay.

SAR Authority

A SAR Authority shall ensure that a SAR operation can be promptly initiated and prosecuted with the efficient use of available SAR resources, until the rescue has been completed or until chance of success is no longer a reasonable possibility.

SAR Authorities have the overall responsibility for establishing, staffing, equipping and managing the SAR system, including providing appropriate legal and funding support, providing or arranging for SAR assets, coordinating SAR training and developing SAR policies.

Most commonly in Surf Life Saving operations, the SAR Authority shall be the Tasmanian Police – namely Marine Area Command.

Incident Control

Control of an incident relates to overall management of a SAR involving multiple agencies. A representative of the SAR Authority shall take the role of Incident Controller.

Most commonly in Surf Life Saving operations, the Incident Controller shall be a senior representative of the Tasmanian Police Service.

LS11.1 SEARCH AND RESCUE (SAR) RESPONSIBILITIES

Each SAR operation is carried out under an Incident Controller (IC) designated for the purpose by the appropriate SAR Authority. The role of the IC may vary between SAR Authorities depending on their command arrangements. They must understand the extent of their authority and responsibility and must be capable of taking immediate and adequate action basing their decisions on knowledge, logic and good judgement.

Incident Command (SLS)

Command of an incident relates to the management of an individual agency's resources and delivery of specific tasks/objectives/goals, as set generally by the Incident Controller.

For Surf Life Saving, the Incident Commander shall be the most senior lifesaving officer on-scene, usually the Patrol Captain/Senior Lifeguard or Duty Officer.

The Surf Life Saving Incident Commander shall have 'command' and coordinate all Surf Life Saving assets/resources/personnel involved in the SAR, not limited to Lifesavers/Lifeguards (SLST/ALS), IRBs, RWC, ORB, and JRB.

Co-responding lifesaving services from adjacent regions or states shall fall under the command of the specific SLS Incident Commander, unless otherwise delegated by the Incident Commander.

Note: The relevant operational responsibilities of the various lifesaving service vessels/skippers/pilots shall be maintained however, as per the procedures for the safe operation of those craft.

The Incident Commander may delegate roles/responsibilities/tasks (including establishment of forward command posts/and delegation of forward incident commanders) as required – but reporting to the Incident Commander.

SAR ROLES - OVERVIEW

State Duty Officer

The State Duty Officer is the sole emergency contact and dissemination point between emergency services and lifesaving services regarding a beach or aquatic (coastal/offshore/inland) incident in Tasmania and for 'disasters' as per the TAS DISPLAN and relevant Sub-Plans.

All communications from emergency services and SLS shall be directed to the State Duty Officer.

The State Duty Officer shall correlate and disseminate the relevant information to the relevant lifesaving services.

Responding lifesaving services shall provide the relevant SITREPS and communication to the State Duty Officer.

The State Duty Officer shall provide SITREPS and seek further information from emergency service communications centers and key departments, including but not limited to Police Radio Room, Marine Area Command, Tasmanian Ambulance, SES, Tasmanian Parks and Wildlife.

Responding lifesaving services shall establish contact with on-site emergency services and Incident Controllers.

Only State Duty Officers (SURFCOM if required) shall undertake a tasking/notification role for lifesaving services (unless otherwise delegated to by the State Duty Officer).

LS11.1 SEARCH AND RESCUE (SAR) RESPONSIBILITIES

Local Duty Officer

These roles deliver 3 key functions:

1. Local dissemination and coordination of services for emergency response (generally outside regular patrol times and/or to unpatrolled locations).
2. On-site liaison with Incident Controller (most commonly Tasmanian Police).
3. On-site 'command' of own services/assets/personnel.

Lifesaving services which shall fall under the operational 'command' of the Local Duty Officer if participating in a SAR incident in TAS include:

- SLSC patrols/callout teams.
- SLS RWCs.
- SLS ORB/JRBs.
- SLS services responding from adjacent regions.
- Other SLS services (i.e Volunteer Marine Rescue).

SurfCom

SurfCom provides the support function to a SAR, including the combination of the following:

- Initial dissemination of information and tasking of SLS service to an emergency;
- Coordination of emergency service support;
- Upward and downward SITREPs to SLS/ALS and emergency services;
- Monitoring service response/status/welfare; and
- Maintaining data/communications records.

Only SLST SurfCom and or State Duty Officers shall undertake a coordination/ communications support role for lifesaving services over the SLST radio network (unless otherwise delegated to by the State Duty Officer).

Note: SurfCom does not deliver a 'command' function for a SAR incident, rather communication/ coordination support.

The staff of a SurfCom perform duties in the prosecution of search and rescue events in addition they have responsibility for maintaining the operations in a continuous state of preparedness. The SurfCom staff shall consist of personnel who are experienced and or trained in SAR operations. When a period of heavy activity is anticipated or during major SAR incidents, the regular staff may be supplemented as required.

LS11.2 SEARCH AND RESCUE STAGES

PURPOSE

To outline Surf Life Saving Tasmania (SLST) search and rescue stages.

PROCEDURE

Introduction

When the SAR system first becomes aware of an actual or potential emergency, the information collected and the initial action taken are often critical to successful SAR operations. It must be assumed that in each incident there are survivors who will need assistance and whose chances of survival are reduced by the passage of time. The success of a SAR operation depends on the speed with which the operation is planned and carried out. Information must be gathered and evaluated to determine the nature of the distress, the appropriate emergency phase, and what action should be taken.

Prompt receipt of all available information by the Surfcom/Duty Officer is necessary for thorough evaluation, immediate decision on the best course of action and a timely activation of SAR assets to make it possible to:

1. Locate, support and rescue persons in distress in the shortest possible time; and
2. Use any contribution survivors may still be able to make towards their own rescue while they are still capable of doing so.

Experience has shown that the chances for survival of injured persons decrease by as much as 80% during the first 24 hours, and those for uninjured persons diminish rapidly after the first three days. Following an accident, even uninjured persons who are apparently able-bodied and capable of rational thought are often unable to accomplish simple tasks and are known to have hindered, delayed or even prevented their own rescue.

SAR Stages

The response to a SAR incident usually proceeds through a sequence of five stages. These stages are groups of activities typically performed by the SAR system in responding to a SAR incident from the time the system becomes aware of the incident until its response to the incident is concluded. The response to a particular SAR incident may not require the performance of every stage. For some incidents, the activities of one stage may overlap the activities of another stage such that the portions of two or more stages are being performed simultaneously.

The five SAR stages are:

1. Awareness – Knowledge by any person or agency in the SAR system that an emergency situation exists or may exist.
2. Initial Action – Preliminary action taken to alert SAR assets and obtain more information. The stage may include evaluation and classification of the information, alerting of SAR assets, communication checks and, in urgent situations, immediate performance of appropriate activities from other stages.
3. Planning – The development of operational plans including plans for search, rescue and final delivery of survivors to medical facilities or other places of safety as appropriate.
4. Operation – Dispatching SAR assets to the scene, conducting searches, rescuing survivors, assisting distressed craft providing necessary emergency care for survivors and delivering casualties to medical facilities.
5. Conclusion – Return of Search and Rescue Units (SRU)s to a location where they are debriefed, refuelled, replenished and prepared for other missions, return of SAR assets to their normal activities and completing of all required documentation.

LS11.3 RESPONSIBLE SAR AUTHORITY

PURPOSE

To outline the responsible search and rescue authority.

PURPOSE

There are two levels of SAR response in Australia:

1. The Commonwealth level through AusSAR and the ADF; and
2. The State/Territory level through the Police.

Volunteer organisations such as Surf Life Saving work in close liaison with State Police. The Police retain overall SAR control in their jurisdiction.

It is common for a number of agencies to contribute to one SAR operation. In such circumstances it is vital that one agency has overall 'control' and other agencies involved cooperate with this agency to produce the best response possible within available resources.

Determination of Responsible Authority

In practice, the first agency to become aware of a distress situation is obliged to respond until the appropriate SAR authority with overall coordination responsibility is in a position to assume that responsibility. It is imperative that the appropriate SAR Authority is notified as soon as possible.

From time to time SAR operations may be commenced independent of a SAR authority. Once a relevant SAR authority is alerted to the incident it is their responsibility to coordinate the activities of the responding assets in order that the integrity of the search is maintained.

For lifesaving services this is evident and common through regular patrol duties and in emergency response situations where it is a period of time before Tasmanian Police are on-scene.

Responsibility for SAR coordination and direction may be transferred between SAR authorities, whenever more accurate knowledge of the missing person or distressed craft's position or movements comes to hand, or when it becomes apparent that a SAR authority other than the one initiating the action is more favourably placed to assume responsibility. This may be due to better communications, closer proximity to the area of search or more readily available facilities.

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LS11.4 SAR RESOURCE CHARACTERISTICS

PURPOSE

To provide guidelines regarding the selection of Search and Rescue (SAR) resources.

PROCEDURE

Introduction

Every endeavour should be made to obtain sufficient SAR assets to search the determined area in the shortest possible time. However certain factors, such as inclement weather or darkness, may impact services utilised and SAR planning.

Identification and deployment of SAR units shall commence at the time of the initial SAR response and a review of requirements shall continue through the action.

SAR Unit Selection and Characteristics

The selection of available SAR units to be used in SAR operations should take into account the following considerations:

a. The need to reach the distress scene quickly; and
b. Suitability for at least one of the following operations:
    I. Provision of assistance to prevent or lessen the severity of accidents;
    II. Conduct a search using air, marine or land units as required;
    III. Carriage of supplies to the scene of an accident and, if necessary, delivery of supplies; or
    IV. Execution of a rescue (air, marine, land units as required).

Aerial Assets

Aerial assets provide an enhanced SAR capacity and include:

a. Police Helicopters.
b. Volunteer/paid fixed-wing services (i.e Aerial shark patrol).

Maritime Assets

Search operations are generally best carried out by aircraft, while rescue operations are best carried out by helicopters, marine craft or land assets. However, it will sometimes be necessary to use marine craft or land assets for some search efforts, particularly when weather conditions prevent or hamper air search, when the location of the distress scene is known with reasonable accuracy, or the location is remote and non- aviation assets are best placed to render assistance.

In an emergency situation when gauging the speed of marine craft involved, it is usually their maximum speed possible under the prevailing sea conditions (can vary depending on conditions). Generally, small boats search at 15–40 knots and larger vessels search at 10 – 30 knots.

LS11.4 SAR RESOURCE CHARACTERISTICS

Rescue vessels can participate in operations at considerable distance from their base. Their main design requirements are good manoeuvrability, seaworthiness, long range, relatively high speed and sufficient size to accommodate survivors and equipment. Naval vessels, offshore lifeboats, seagoing tugs, customs and pilot launches and patrol boats are of particular value because of their special equipment, including communications equipment, and trained personnel.

Rescue boats such as Inflatable Rescue Boats (IRBs) and Rescue Water Craft (RWCs) are short-range vessels capable of operating a limited distance offshore (less than 1nm) in good sea conditions.

Large rescue boats, such as SLS Offshore Rescue Boats (ORBs), Jet Rescue Boats (JRBs) and SLS Rigid Hull Rescue Boats (RIBs) have a greater range and capacity (as per their specific 'vessel survey' parameters).

Other sources of maritime assistance may include:

a. Police vessels.
b. Naval vessels.
c. Tasmanian Maritime vessels.
d. Marine Rescue vessel.
e. Customs vessels.
f. Merchant vessels.
g. Fishing vessels.
h. Harbour craft, ferries, pilot launches and tugs.

Land Assets

A land-based response in conjunction with Aerial/Maritime resources (or stand-alone if conditions dictate such) is important to an effective SAR operation.

Land based assets include:

- Emergency operations centre (EOC).
- Incident command post.
- ATV/4WD vehicles.
- Foot based search parties.

LS11.5 EMERGENCY SIGNALLING DEVICES

PURPOSE

To provide guidelines regarding emergency signalling devices.

PROCEDURE

Introduction

People in a craft in distress may use any possible means of alerting others to their situation. These devices range from emergency radio beacons to mirrors.

Distress and Emergency Signals

There are many signals that can be used to indicate a distress or other emergency.

Personnel involved in lifesaving operations must be familiar with the types of signals they can expect to encounter in order to evaluate their meaning correctly and take appropriate action.

Most commonly for lifesaving services these emergency signals include:

- Flares
- Strobes (flashing lights)
- EPIRBs
- GPS/satellite Tracking
- Smoke
- V-sheets
- Flags
- Rescue Tubes
- Hand signals
- Marker Dye

Daylight Devices

Fluorescent sea dye marker, which stains the water a green or red colour, has been sighted as far away as 16 kilometres, with an average of 5 kilometres. However, sea dye is not visible when searching up-sun because of surface glare.

Orange smoke generating signals have been sighted as far away as 19 kilometres with an average of 12 kilometres. Smoke signals are most effective in calm wind conditions and open terrain. The effectiveness of smoke signals decreases rapidly with an increase of wind speed above 15 knots.

Pyrotechnic flares may be used in daylight; however their detectable range is only about 10 per cent of the night-time range.

Night-time Devices

Flashing strobe lights are an effective compact night signalling device available for individual survivors. Strobe lights have been sighted as far as 32 kilometres away with an average of 5.5 kilometres.

Incandescent lights that are used on some individual lifejackets have a much smaller detectable range than strobe lights, generally about 800 metres.

Flares, star shells and rockets have been detected as far away as 55 kilometres, with an average of 40 kilometres.

LS11.6 DISTRESS COMMUNICATIONS

PURPOSE

To provide guidelines regarding distress communications.

PROCEDURE

Distress traffic includes all messages relating to immediate assistance required by persons, aircraft, or marine craft in distress, including medical assistance. Distress traffic may also include SAR communications and on-scene communications. Distress calls take absolute priority over all other transmissions; anyone receiving a distress call must immediately cease any transmissions that may interfere with the call and listen on the frequency used for the call.

Distress and safety communications require the highest possible integrity and protection from harmful interference. Any interference that puts at risk the operation of safety services degrades obstructs or interrupts any radio communications, is harmful. Some frequencies are protected, in that they have no authorised uses other than for distress and safety.

Lifesaving services personnel should be particularly careful not to cause harmful interference, and should co-operate with authorities to report and stop incidents of interference.

The objective of lifesaving communications is to make possible the conduct of lifesaving operations. Communications must allow for:

1. Rapid transmission of distress messages from aircraft ships and small craft including for medical assistance;
2. Rapid communication of distress information to the authorities responsible for organising and effecting rescue;
3. Co-ordination of the operation of various SAR units; and
4. Liaison between controlling/coordinating authorities and response resources

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LS11.7 DISTRESS INCIDENT LOCATION

PURPOSE

To outline guidelines regarding estimating distress incident locations.

PROCEDURE

Estimating the Distress Incident Location

The first step in either marine or land search planning is to determine the limits of the area containing all possible survivor locations. This is usually done by determining the maximum distance the survivors could have travelled between the time of their Last Known Position (LKP) and the known or assumed time the distress incident and drawing a circle of that radius around the LKP.

Knowing the extreme limits of possible locations allows the search planner to determine where to seek further information related to the missing craft or persons and whether an incoming report might apply to the incident. However, systematic search of such a large area is normally not practical. Therefore, the next step is to develop one or more scenario/s or sets of known facts plus some carefully considered assumptions, describing what may have happened to the survivors since they were last known to be safe. Each scenario must be consistent with the known facts of the case, have a high likelihood of being true and allow the search planner to establish a corresponding geographic reference or datum for the survivors' most probable position (MPP).

Three possible situations may exist with respect to the location of a distress incident when it is reported.

Approximate Position Known

The incident may have been witnessed - reported as a navigational fix by another craft or the craft in distress; or computed by the Incident Controller as a dead reckoning position from a previously reported and reliable position of the craft in distress.

Approximate Track Known

The craft in distress may have filed a trip or voyage plan prior to departure that included the intended track or route but the crafts actual position along the track is unknown. A single line of position, such as a flare sighting, should be treated the same as a track known situation.

Approximate Area Known

When neither the position nor the intended tracks are known, at least an area that the craft in distress was probably within can usually be determined. The Incident Controller should try to reduce this area to an area of high probability that can be used as the initial search area or, if the area is small enough, use it.

LS11.8 URGENCY OF RESPONSE & TIME FACTORS

PURPOSE

To provide guidelines regarding time factors in relation to SAR emergency response.

PROCEDURE

Evaluating incidents to determine the urgency and the extent of required SAR response, or the terminating of a response is a function requiring information judgement and experience. In emergency situations requiring immediate assistance, the action taken must be accomplished quickly and positively. Where uncertainty exists, evaluation is usually more difficult and time consuming because of the many factors involved.

Perhaps the most difficult task the Incident Controller undertakes is the evaluation of these factors. They usually become apparent between the time the incident is reported and the execution of the search. This is a time when speed and reliability will be most important, however it is also a time when incident reports may be incomplete or confused.

The most serious limitation is time. When persons are injured or are subjected to adverse climatic or water conditions, the chances of survival decrease rapidly. Time limitation also may be dictated by the number of hours left for a daylight search, although the Incident Controller should not arbitrarily rule out night search, especially in unpopulated areas, over the ocean, and over flat terrain or deserts.

The facilities available to conduct a search may be limited by lack of available personnel and search assets. The Incident Controller must be aware of availability of SAR facilities within their region.

Terrain, weather and oceanographic conditions can affect all areas in SAR planning and operations. Search visibility, aircraft limitations, search effectiveness, safety of flight and time available to complete the search are some of the factors that will affect search capability.

Whenever practicable, pertinent data should be plotted on a chart to aid in evaluating related factors.

Normally the Incident Controller determines the urgency and extent of SAR services required for an incident. A rapid but systematic approach is essential since prompt response to emergency incidents is the essence of the SAR system.

General Time Factors

The probability of finding survivors and their chances of survival diminish with each minute after an incident occurs. Prompt positive action is required so that no life will be lost or jeopardized through wasted or misdirected effort. Individual incidents will vary with local conditions.

In the case of seriously injured persons or persons in a hostile environment, the reaction time of the SAR system must be measured in minutes. Critically injured persons of any accident usually die within the first 24 hours if not given emergency medical care.

Daylight Factor

For survivors not equipped with any type of detection aids, daylight visual search is usually the only search method available to the Incident Controller. If darkness were approaching this would be another limiting factor for the Incident Controller to consider.

Night Factor

If it is known or suspected that the survivors have detection aids such as pyrotechnic flares or other night signalling devices or can display other lights, night searches should always be conducted. Night searches, visual and electronic are particularly effective at sea, over sparsely populated areas, flat terrain and deserts.

Night aural and visual search should be considered. Modern electronic detection methods may be effective in locating targets. The capability of these devices should be discussed with the operators of the equipment.

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LS11.9 FACTORS AFFECTING INITIAL SAR RESPONSE

PURPOSE

To provide guidelines regarding factors affecting initial SAR response.

PROCEDURE

There is a wide spectrum of factors that may influence the extent and manner of an initial SAR response.

To summarise some of the more important ones:

a. Extent and reliability of information about the location of the distressed craft/persons;
b. Availability of aircraft, marine craft and land parties for searching;
c. Actual and forecast weather conditions;
d. Times of daylight/darkness; and nature of terrain/location (within permitted response area i.e distance from shore).

Location of a Distressed Craft

Should a craft disappear without a distress call being received, the following assumptions are made:

a. That the craft is probably between the last reported position and its destination.
b. That the craft is most likely to be found on the section of the planned track between the last reported position and the position where the next report was due.
c. The possibility of a communications failure, and a subsequent diversion should not be overlooked. The operating agency should be questioned concerning policy as to diversion.
d. New intelligence information may cause the Incident Controller to re-evaluate the assumptions made during the initial planning phase. The possibility of these evolutionary changes to search strategy should not, however, dissuade an Incident Controller from basing initial search procedures on the above assumptions as long as there is, at that time, no indication of contrary tracking by the distressed craft.
e. When conducting an initial response, it is not necessary to draw up a probability area accurately based on the navigational history of the distressed craft's route, nor is it normally necessary to take water movement into account, unless the interval between the 'Last Known Position Time' and the estimated time of arrival of search units at the scene is longer than four hours. This will vary in high drift areas and the Incident Controller may make an arbitrary allowance in the first instance, which may be applied until an accurate probability area is calculated in readiness for a more intensive search.
f. The terms "Last Known Position" and "Last Known Position Time" are used when referring to last known position and associated times. For simplicity, they are used to describe both land and water positions.

LS11.10 RISK VS GAIN

PURPOSE

To provide guidelines regarding the process of evaluating risk versus gain in relation to SAR operations.

Surf Life Saving Tasmania (SLST) requires lifesaving personnel to evaluate SAR operations to determine the level of risk versus the likely gain before commencing activities to ensure the ongoing safety of personnel.

PROCEDURE

SAR facilities are responsible for taking whatever action they can to save life at any time and place where their facilities are available and can be effectively used. Nevertheless, there may be a point beyond which SAR services are not expected and cannot be justified.

Known and inherent and residual risk must be carefully weighed against the mission's chances for success and the gains to be realised.

SAR personnel and equipment shall not be placed at risk, nor the mission attempted, unless lives are known to be at stake and the chances for saving lives are within the capability of the personnel and equipment available.

All reasonable action shall be taken to locate distressed personnel, determine their status and bring about their rescue. Prolonged SAR operations after all probability of survival has been exhausted are uneconomical and not warranted. The decision to conduct such operations must be based on probability of detection.

Studies have shown that the period within 12 to 24 hours of a distress incident is the most critical for recovery of survivors. The best chance of successful recovery occurs during this time period. After 48 hours time the chance of successful recovery decreases rapidly.

LS11.11 SAR INFORMATION FACTORS

PURPOSE

To provide an overview of search and rescue information factors.

PROCEDURE

General Considerations for the Incident Controller

Incident Controller (IC) duties can be demanding, the gathering of information, evaluation of this information and initiation of action all require concentrated effort on many details. The IC will find the various forms, checklists, worksheets, tables and graphs provided in the appendices to be very helpful.

The following provides some general guidance for the early stages of a SAR operation, including information gathering and preparation for the possible need to plan searches. Several factors will influence the extent and manner of an initial SAR response. In general, these are:

a. Extent/reliability of information about the location of the distressed craft/occupants;
b. Availability of aircraft, marine craft and land parties for searching;
c. Actual and forecast weather conditions;
d. Times of daylight/darkness;
e. Nature of terrain;
f. Availability of survival supplies and supply dropping teams;
g. Sea currents; and
h. Time delay in notification.

Location Clues

Some of the clues that may indicate the survivors' location or situation include:

- Intentions;
- Last known position;
- Hazards;
- Condition and capabilities;
- Crew behaviour;
- On scene environmental conditions; and
- Results of previous searching.

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LS11.12 SAR INCIDENT INFORMATION

PURPOSE

To provide guidelines regarding the information that should be gathered in relation to a search and rescue incident.

PROCEDURE

The following information, or as much of it as is required to address an emergency situation, should be obtained from the craft or the individual reporting the actual or potential emergency situation or incident. As many of the items should be obtained as circumstances permit.

Maritime SAR Incident

A maritime SAR incident is considered imminent or actual when any of the following conditions exist:

1. A surface vessel or craft has requested assistance;
2. A surface vessel or craft has transmitted a distress signal;
3. It is apparent that a surface vessel or craft is in distress;
4. A surface vessel or craft is reported to be sinking or to have sunk;
5. The crew is reported to have abandoned ship or is about to do so;
6. Reports indicate that the operating efficiency of the craft is so impaired that the craft may sink or the crew may be forced to abandon;
7. The surface vessel or craft is overdue or unreported;
8. Persons are in the water and require assistance;
9. An EPIRB has been activated; or
10. A Medivac is required on medical advice.

Air, Marine or Land Incident information

1. Name, address, and telephone number or contact point of person reporting;
2. Distressed craft (name/type/call sign/registration) or identification;
3. Position of emergency (latitude/longitude or bearing/distance) from a known point or the last reported position and the next reporting position);
4. Nature of emergency (fire, collision, person overboard, disabled, overdue, crash or missing hiker etc.);
5. Date/time of emergency occurrence;
6. Date/time of notification;
7. For aircraft - altitude, attitude, heading, speed and endurance;
8. Craft description (size, type, markings, hull, colour of cabin, deck, rigging, fuselage colour, tail colour, wingtip colour, unusual features);
9. Details of persons on board, persons involved (POB) including number of people involved, ages, state of health, injuries, intentions;
10. Date, time and departure point, planned route, speed, ETA and destination;
11. Radio frequencies currently in use, monitored or scheduled;
12. Emergency radio equipment and frequencies, EPIRB, or flares;
13. Actual weather/sea conditions;

LS11.12 SAR INCIDENT INFORMATION

14. Local action being taken or assistance required;
15. Owner/agent of distressed craft and contact method;
16. Possible route deviations;
17. Navigation capabilities;
18. Survival equipment including quantity of food/water and signalling devices;
19. Other information sources, e.g. friends, relatives, associates, yacht clubs, and aero clubs; and
20. Mobile phone numbers of any person involved.

Person Overboard Incident Information

1. Name and call sign of ship with man overboard;
2. Position, course and speed of the ship;
3. Date, time and position when the person went overboard;
4. If time of person overboard unknown, when last seen;
5. Weather conditions (include water temperature);
6. Person's name, age and gender;
7. Person's height and weight to determine survivability;
8. Person's physical/mental condition and swimming ability;
9. Person's clothing (amount and colour);
10. Height of fall from ship to water;
11. Lifejacket (worn, missing);
12. Has the ship been completely searched;
13. Will the ship search for the person overboard and, if so, for how long;
14. Radio frequencies in use, monitored or scheduled;
15. Whether an urgency broadcast is requested;
16. Assistance desired;
17. Assistance being received;
18. Initial reporter (parent agency, radio station, name/call sign of ship); and
19. Other pertinent information.

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LS11.13 SAR BRIEFINGS

PURPOSE

To provide guidelines regarding SAR crew briefings.

PROCEDURE

Comprehensive briefing and de-briefing of search crews is a vital component of search planning. They are time consuming processes, and in the case of briefing, preparation must commence at an early stage and, whenever possible, in good time before departure. It must be appreciated that many personnel engaged for search operations are neither trained for, nor experienced in the search role. Field SAR personnel shall therefore be given every opportunity to familiarise with all relevant details of the distress. All instructions for the SAR operation shall be clearly and precisely presented.

The Briefing Officer appointed to the briefing task must be thoroughly familiar with the overall plan and individual search unit tasks.

Search Briefing

Comprehensive briefing of search units is vital to every search operation. The Incident Commander should be satisfied that the briefings are well prepared, and that where group briefings are to be conducted, the venue is suitable for the purpose.

Briefings for marine units will cover similar topics to those given to air and land units, but there may be less opportunity for face-to-face briefing contact. Appointed Briefing Officers (Patrol Captains/Duty Officers) should be aware of the difficulties inherent in briefing indirectly and the increased potential for misunderstanding.

Similar arrangements shall be made for debriefing SAR units.

Search Area Description

There are many ways of describing search patterns and the boundaries of search areas. In selecting the method to be used, Briefing Officers must consider the SAR knowledge of the recipients and the method to be used for the transmission of the information.

SMEAC

A standard sequence for issuing orders or instructions is used to convey the operational plan to all personnel. This sequence is known as SMEAC. Using the SMEAC system to sequence your delivery can enhance briefings.

Figure 11.13.1

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NAME OF ORGANISATION

SMEAC BRIEF

ITEM: **DESCRIPTION OF EVENT**

EFFFECTIVE: **DATE**

LOCATION: **LOCATION**

Advisory Target: **EXAMPLES**

SLS State Duty Officers

SLS Emergency Response Teams

Tasmanian Police

Ambulance Service of Tasmania

Helicopter Rescue Services

Marine Rescue Services

Issued By: **NAME OF ORGANISATION/PERSON**

Emergency Number: ### Non-Emergency: ###

EMAIL

SITUATION	What has happened (the big picture)
MISSION	The aim
EXECUTION	How the aim is to be accomplished (This may change as more information becomes available)
ADMINISTRATION	What support and coordination will be provided and how
COMMUNICATIONS	Who will be in control and how the communication system will work

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LS11.14 BASIC SEARCH PLANNING

PURPOSE

To provide guidelines on the process of basic search planning.

PROCEDURE

A search plan is required for every mission. It may be a very abbreviated plan for a single search unit, or it may be a complex plan involving a large number of units. In any case, a search plan should always be developed by the Incident Controller/Commander (IC), as many lives may depend upon the care with which the search is planned and conducted.

When a search mission is required, four factors are of immediate importance to the search unit for conducting their search:

1. An adequate description of the search target;
2. The search area, including weather conditions and any possible risks or dangers;
3. The best search pattern; and
4. The appropriate track spacing.

The IC will most likely provide much more detailed information to the first search unit to be dispatched to the search area, but the above four items comprise a minimum. The IC develops the original or optimum search plan on the assumption that sufficient and suitable search units will be available for conducting the operation. Once the optimum plan is developed, the IC must make every effort to obtain the services of the search units he/she needs.

Additional search planning involves:

1. Evaluating the situation, including the results of any previous searching;
2. Estimating the distress incident location and probable error of that location;
3. Estimating the survivors' post-distress movements and probable error of that estimate;
4. Using these results to estimate the most probable location (datum) of survivors and the uncertainty (probable error of position) about that location;
5. Determining the best way to use the available search assets so the chances of finding the survivors are maximized (optimal search effort allocation);
6. Defining search sub-areas and search patterns for assignment to specific search assets;
7. Providing a search plan that includes a current description of the situation, search object description(s), specific search responsibilities to search facilities, on-scene coordination instructions and search asset reporting requirements.

LS11.14 BASIC SEARCH PLANNING

Controlling Factors

When developing a search plan, the IC must carefully weigh the limitations of time, terrain, weather, navigational aids, search target detect ability, suitability of available search units, search area size, distance between search area and SAR unit staging bases, and the particular Probability of Detection (POD) desired under the circumstances.

As the ability to survive after an emergency is limited, time is of paramount importance and any delay or misdirected effort will greatly diminish the chances of locating survivors. While thorough mission planning and good conditions for search are desirable, positive and immediate action is also required. The IC should exercise best judgement and initiate search with a minimum of information and few SAR units while additional data are obtained and more extensive search operations are planned.

Of all the factors involved in search planning, one or more may prove so important in a particular situation that the others can generally be regarded as secondary or even disregarded entirely. These important factors are referred to as the controlling factors, and are the ones given the most consideration when developing the attainable search plan. For example, when only a limited number of SAR units are available, the following relationships might exist between datum, search area, time available and POD:

1. Inaccurate datum requires a larger search area at the expense of time or POD;
2. Limited time available for the search requires a rapid search rate at the expense of the POD; and
3. High POD requires close track spacing at the expense of area searched or time.

The preceding paragraph illustrates a few of the factors where the particular circumstances may dictate controlling factors. In any of the above circumstances additional SAR units would alleviate the situation, but (apart from SAR unit's availability) there is a practical limit to the number of search units that can be safely used within a given area. With the realisation that emphasis on any factor will usually be at the expense of others, the IC must decide which factors are the most important. Once this is decided, the search effort is planned to meet the requirements of the controlling factors, while at the same time satisfying the other factors as much as possible.

A controlling factor peculiar to most maritime areas is the drift rate. In situations where a high drift rate is encountered the IC must allow for sufficient extension of the search area in the direction of drift in order to prevent the target from slipping out of the area during the search.

Search legs must be planned so that the target cannot slip out of the search craft's track spacing during successive sweeps. The simplest and most effective way of accomplishing the latter is to orientate the search legs with the drift direction.

If the search leg must be oriented across the drift direction, then the search craft should take no longer than 30 minutes to complete each search leg.

To ascertain if the drift rate presents a problem, compare the targets drift rate to the rate of creep of the search aircraft. If the targets drift rate exceeds the aircraft's rate of creep, remedial action is necessary. This may take the form of a barrier search at the end of the search area.

LS11.15 ENVIRONMENTAL FACTORS

PURPOSE

To provide guidelines regarding the affect of environmental factors on SAR operations.

PROCEDURE

Weather/Oceanographic Factors

Adverse weather prevailing in or approaching an area where survivors are located may also limit the time available to conduct a SAR operation. Not only are survivors of a distressed craft more difficult to detect under adverse weather conditions, but also SAR units themselves operate at lower efficiency due to the added turbulence, rough seas and higher stresses on both the search personnel and their craft.

Accurate knowledge of weather conditions and the prudent judgment based on it will enhance the likelihood of a successful mission. Knowledge of the prevailing weather conditions will also play an important role in the safety of the search units.

If weather will not allow for a search operation to be mounted without endangering additional lives, the search effort should be deferred. If weather is currently good but forecast to deteriorate in a short time, more rapid action is required and detailed planning may suffer due to the time available. If weather is good and forecast to remain so, more extensive planning may be accomplished.

Wind, visibility and cloud cover influences the search track spacing. Therefore, the better the weather information the more realistic will be the derived track spacing. Maintaining accurate search patterns is difficult in adverse weather. Aerial units are particularly vulnerable. For this reason the patterns selected should allow for more precise navigational accuracy.

Safety may sometimes be prejudiced by actual weather conditions which must therefore be monitored continuously by the IC. Low cloud base and restricted visibility are particularly hazardous during searches that cover large areas where many aircraft are employed. Should an air search be conducted under adverse weather conditions that deteriorate below the required flight conditions then air search may have to be suspended.

In situations where survivors are adrift in regions of high velocity water current, searches should be mounted without delay. The probability of locations survivors is high during the early stages of survival craft drift as the drift factor allowed for in search calculations will be of reasonable accuracy over a short time period.

When missions involve overdue craft, the weather situation should be evaluated to determine what effect it may have had upon the craft's operating capabilities and/or the actions of the craft's operator prior to SAR system activation.

LS11.15 ENVIRONMENTAL FACTORS

To obtain an overall weather picture an attempt should be made to complete the following questionnaire:

1. What was the weather at the departure point, destination and along the planned track at the time the overdue craft should have been in those areas? If no established weather facilities are available, the information should be obtained from local reliable sources in the areas concerned, such as Police or marine volunteers, if possible.
2. What was the en-route and forecast weather briefing given to the crew of the missing craft, and what was the operator's reaction to the weather briefing?
3. What was the weather in the area where the missing craft is presumed to be and if the time of emergency is known, what were the actual weather conditions at the craft's estimated position?
4. Were there any marked changes in wind or sea currents that might have resulted in navigation errors?
5. Were there any areas of low ceiling, poor visibility, precipitation, thunderstorms, frontal activity, turbulence, icing, that may have caused the craft to attempt circumnavigation, or that could have exceeded either the crafts or operator's capability?
6. Were there any areas of marked pressure changes that may have caused aircraft altimeter errors?

Weather Reports by Survivors

Occasionally missions will occur during which radio contact can be established with survivors who do not know their exact position. If survivors can report sufficient weather information, the IC and meteorological personnel may be able to develop an approximation of the survivor's position by fitting the survivor's weather into the current synoptic picture.

The following weather information should be requested immediately, and on a scheduled basis thereafter, if possible:

1. Percentage of cloud cover;
2. Estimated height of clouds;
3. Type of description of cloud;
4. Estimated surface wind velocity;
5. Winds aloft direction, if discernible by cloud movement;
6. Prevailing weather phenomena such as snow, rain, fog, sea state, etc;
7. The times of sudden changes in wind or weather such as rapid clearing, quick deterioration, sudden changes in wind direction, noticeable change in temperature, blowing dust or any other condition that might indicate frontal passage;
8. Outside air temperature; and
9. Observed times of sunset and/or sunrise.

LS11.16 SURVIVAL ENVIRONMENTAL FACTORS

PURPOSE

To provide guidelines regarding survival environmental factors.

PROCEDURE

The environment in which the survivor is exposed is another factor that limits the time available to complete their rescue. In some cases, environment will be the most time critical of all. Climatic atlases are useful to evaluate probable climatic conditions in regions where few or no weather reporting facilities are available.

The relation of survival time to water temperature, air temperature, humidity and wind velocity is not a simple one. These and other factors often exist in combination to complicate the problem of estimating life expectancy of survivors. Individuals will vary in their reaction to cold and heat stresses.

Additional factors which will vary a survivor's life expectancy include the type of clothing worn, the clothing's wetness, the survivor's activity during their exposure, initial body temperature, physical conditions, thirst, exhaustion, hunger, and various psychological stresses such as isolation, loneliness and remoteness, and the all-important individual will to live.

The following graphs are provided to assist the IC in determining the urgency required to remove survivors from the environment, and to assist in evaluating the practicality of terminating a search. These graphs are based upon case histories, field tests, laboratory experiments and analysis of all known data. However, the IC must understand that some individuals will exceed the life expectancy or tolerance times indicated in these figures, and therefore should consider these figures as helpful guidelines rather than absolute controlling factors.

Hypothermia

Hypothermia is the abnormal lowering of internal body temperature (heat loss) and results from exposure to the chilling effects of cold air, wind or water. Death from hypothermia may occur in both land survival and water survival situations. Hypothermia is the leading cause of death for survivors of maritime disasters.

Internal body temperature is the critical factor in hypothermia. If the body temperature is depressed to only 35°C, most persons will survive. If the body temperature is depressed to approximately 33°C, most persons will return to useful activity. At about 32°C, the level of consciousness becomes clouded and unconsciousness occurs at 30°C. Only 30 percent would be expected to survive these temperatures. At body temperature depressions of 26°C and below, the average individual will die and ventricular fibrillation (heart attack) will usually occur as the final event. In some cases individuals have survived with body temperatures as low as 17°C.

Water Hypothermia

The body will cool when immersed in water having a temperature of less than 33°C. The warmest temperature that ocean water can be at any time of year is 29°C. Approximately one-third of the earth's oceans have water temperatures of 19°C or above.

The rate of body heat loss increases as the temperature of air and water decreases. If a survivor is immersed in water, hypothermia will occur very rapidly due to the decreased insulating quality of wet clothing and the fact that water will displace the layer of still air that normally surrounds the body. Water allows a rate of heat exchange approximately twenty five times greater than that of air at the same temperature.

In water temperatures above 21°C survival time depends solely upon the fatigue factor of the individual, some individuals having survived in excess of 80 hours at these temperatures. Staying afloat and fighting off sharks are the major problems at these temperatures.

LS11.16 SURVIVAL ENVIRONMENTAL FACTORS

Between 15°C and 21°C an individual can survive up to 12 hours. At 15°C skin temperatures will decrease to near water temperature within 10 minutes of entry and shivering and discomfort is experienced immediately upon immersion. Dunking and submersion difficulties become increasingly distressful to the survivor.

From 10°C to 15°C the survivor has a reasonably good chance if rescue is completed within 6 hours. Faintness and disorientation occur at water temperatures of 10°C and below. Violent shivering and muscle cramps will be present almost from the time of entering the water and intense pain will be experienced in the hands and feet. This very painful experience will continue until numbness sets in.

All skin temperatures decrease to that of the surrounding water temperature in about 10 minutes. In the temperature range from 4°C to 10°C, only about 50 per cent of a group can be expected to survive longer than 1 hour. In water temperatures of 2°C and below the survivor suffers a severe shock and intenese pain on entering the water. This shock in some instances may be fatal owing to loss of consciousness and subsequent drowning.

Water survivors who die within 10 to 15 minutes after entry into frigid water apparently do not succumb because of reduced body temperature, but rather from the shock of rapid entry into cold water. Fifteen minutes is too short a time for the internal body temperature to fall to a fatal level, even though the outer skin temperatures are at the same temperature as the water. In addition, the temperatures of the hands and feet fall so rapidly that such immersions are frequently less painful than those in 4°C to 10°C water.

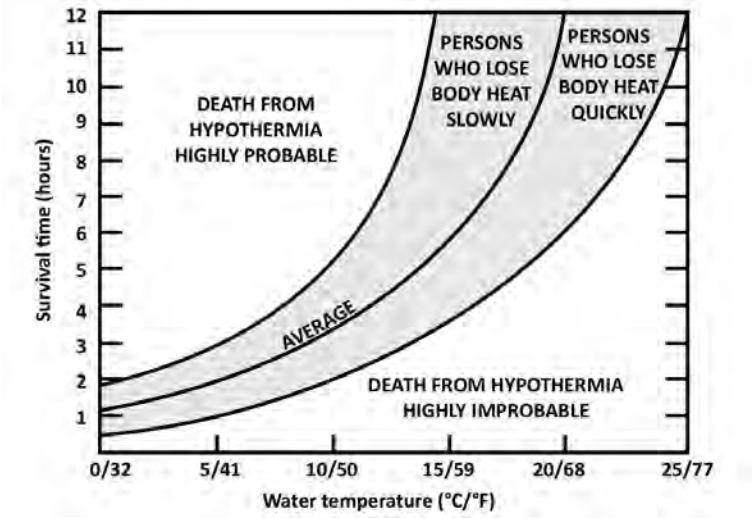

Figure 11.16.1

The graph above displays predicted calm-water survival time, the time required to cool a lightly clothed, non-exercising human to 30°C in cold water. This graph shows a line for the average expectancy and a broad zone that indicates the large amount of individual variability associated with different body size, build, fatness, physical fitness, and state of health. The zone would include approximately 95% of the variation expected for adult and teenage humans under the conditions specified. Factors that slow the loss of body heat are: high body weight, heavy clothing, survival clothing, or the use of a huddling or other protective behaviour.

Factors that make a person lose body heat faster are: low body weight, light clothing, or exercising (such as the situation where survivors without lifejackets must swim to stay afloat). Specialised insulated protective clothing, such as immersion suits or wet suits, is capable of increasing survival time from 2 to 10 times the basic duration shown on the figure.

Wind Hypothermia

Although the body will lose heat approximately twenty-five times slower in calm air than when immersed in water, the body heat loss will be accelerated with increasing wind velocities. This is an additional factor to consider for exposed survivors.

The table below depicts the effects of various wind speed and air temperature combinations. The straight-line relationship between air temperature and the logarithm of D wind speed allows simple interpolation of the intermediate temperatures. The shaded areas represent wind speed and temperature combinations that would cause freezing of any exposed skin.

Estimated wind speed (knots)	Actual air temperature (˚C/F)					
	10/50	0/32	-12/10	-23/-9	-35/31	-45/-48
0	Little danger for properly dressed persons					
10				Increased danger of freezing exposed flesh		
20						
30					Great danger of freezing exposed flesh	
40 or more						

Figure 11.16.2

Hyperthermia, Heat Stress and Dehydration

Hyperthermia, heat stress and dehydration are dangers in hot climates, particularly in desert areas. The most severe form of heat stress is heatstroke, during which the body temperature rises due to the collapse of the temperature control mechanism of the body. If the body temperature rises above 42°C, the average person will die. Milder forms of heat stress are heat cramps and heat exhaustion. Another limiting factor both in hot climates and in survival situations at sea is dehydration. A person totally without water can die in a few days, although some have survived for a week or more.

LS11.17 PARALLEL LINE SEARCH PATTERN

PURPOSE

To provide guidelines regarding parallel line search patterns.

PROCEDURE

Parallel line search patterns are used when the area of probability is large and the location of craft or person in distress is not well established. The search legs used are parallel to the major axis of the search area. This search pattern can be carried out by single or multiple vessels.

The parallel line search pattern is best used in rectangular or square areas. It is a very suitable pattern for a search conducted over water. The search vessel/s proceeds from one corner of the search area maintaining parallel tracks. Successive tracks are maintained parallel to each other and one track spacing apart.

This type of search may be carried out by one aircraft or by several aircraft following parallel tracks or each searching smaller rectangular areas separately.

This search pattern provides uniform coverage and should be utilised only when operating in the open ocean. Search and rescue crews should follow the following steps when utilizing this search pattern for single vessels:

1. The search pattern shall begin at the one corner of the search area.
2. Crews shall take a visual reference or drop a buoy and anchor as a surface marker. This will then provide a continuous reference point during the search.
3. The search pattern should begin so that there is a continuous overlap of vision throughout the search.
4. Crews shall ensure that successive tracks are maintained parallel to each other and are one track space apart.

Parallel line searches utilising more than one vessel should follow the same steps as one vessel operations but include the following considerations:

1. When operating within a relatively small area of probability (e.g. a beach 500 metres or less in length) each craft shall be designated a specific starting point in the search area in line with each vessel and shall be one track spacing apart.
2. When operating within a relatively large area of probability (e.g. a beach greater than 500 metres in length) each craft shall be designated a specific section of the search area based on distance with a specific overlap distance incorporated e.g. each vessel is designated a starting point 300 metres apart with an overlapping distance of 50 metres.

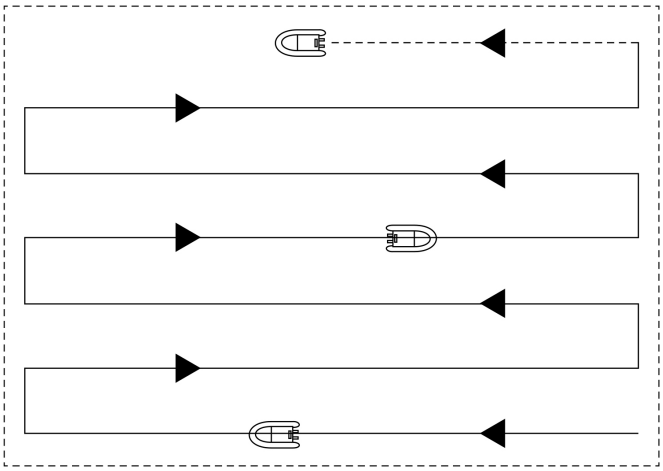

Figure 11.17.1 - Single Vessel Parallel Line Search

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LS11.18 CREEPING LINE SEARCH PATTERN

PURPOSE

To provide guidelines regarding creeping line search patterns.

PROCEDURE

A creeping line search pattern would be used when there is a stronger probability of the craft or person in distress is closer to one end of the search area.

There are two different types of creeping line search patterns, these are:

a. Rip to Open Ocean
b. Open Ocean

Rip to Ocean

A rip to ocean creeping line search is to be utilised in inshore conditions when the last known position of the patient/s were in a rip current and the current direction is known. This search pattern should also be utilised when undertaking search and rescue operations in river and creek mouths and bars.

When undertaking a rip to ocean creeping line search the following steps should be utilised:

1. The search pattern shall begin at the last known position.
2. Crews shall take a visual reference or drop a buoy and anchor as a surface marker. This will then provide a continuous reference point during the search.
3. The search pattern should follow the direction of the current. The search lines taken should be close enough so that there is a continuous overlap of vision throughout the search.
4. Crews shall work from the last known position, down current, observing the change from rip current to ocean current. Crews shall alter the heading of the search accordingly with the current.

Open Ocean

An open ocean creeping line search is to be utilised in open ocean or flat water conditions. This search pattern is to be utilised when the direction of the current or wind is known.

When undertaking an open ocean creeping line search the following steps should be utilised:

1. The search pattern shall begin at the last known position.
2. Crews shall take a visual reference or drop a buoy and anchor as a surface marker. This will then provide a continuous reference point during the search.
3. The search pattern should begin following the direction of the current or wind. The line taken should be close enough so that there is a continuous overlap of vision throughout the search.
4. Crews shall work from the last known position, and move along search lines that are equally spaced.

LS11.18 CREEPING LINE SEARCH PATTERN

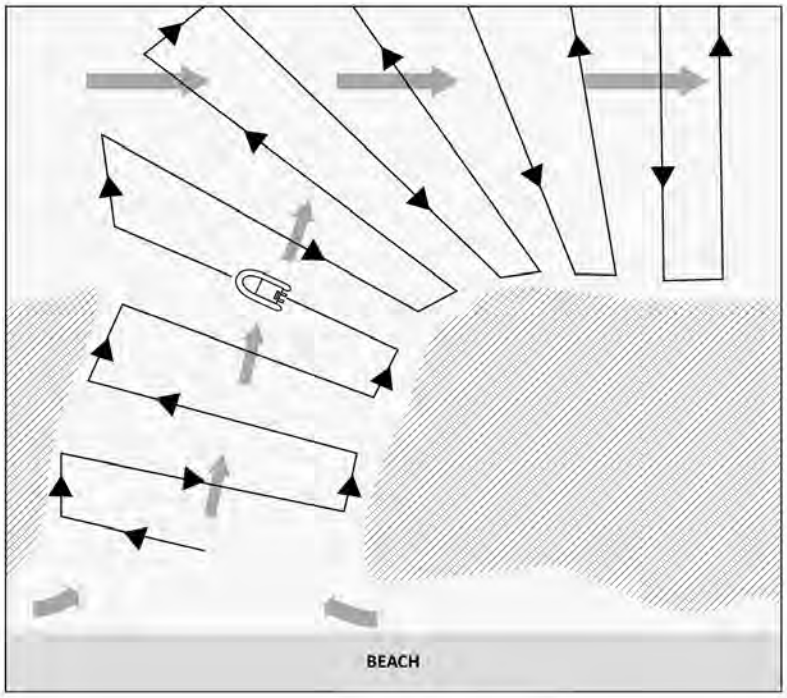

Figure 11.18.1 - Creeping Line Search Pattern

(Rip to Open Ocean)

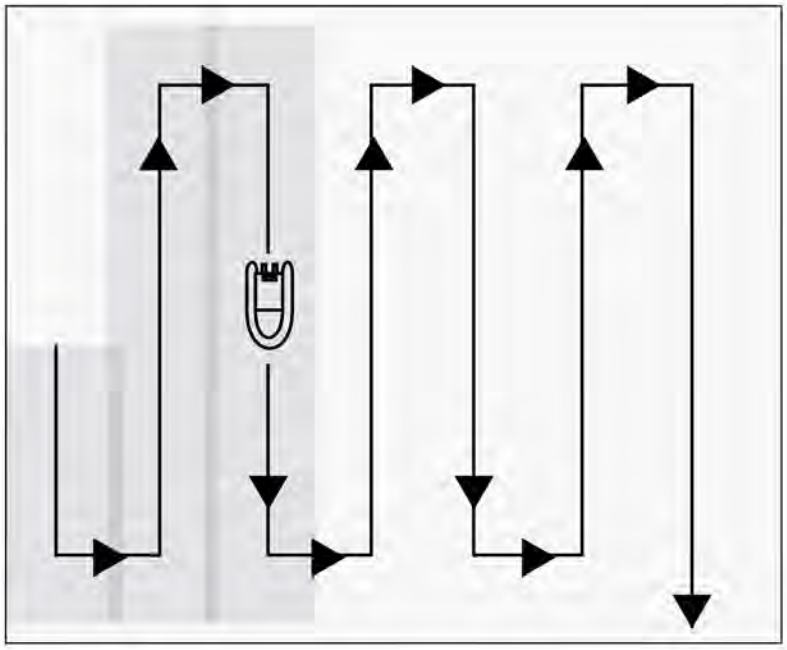

Figure 11.18.2 - Creeping Line Search Pattern

(Open Ocean)

LS11.19 EXPANDING SQUARE SEARCH PATTERN

PURPOSE

To provide guidelines regarding expanding square search patterns.

PROCEDURE

This procedure is referred to as an expanding square search as it begins at the reported position or most probable location and expands outwards in concentric squares. It is a very precise pattern and requires accurate navigation.

The square search pattern is used when the target is known to be in a relatively small area and the current direction is unknown. This search pattern provides uniform coverage and should be utilised only when operating in the open ocean.

Search and rescue crews should follow the following steps when utilising this search pattern:

1. The search pattern shall begin at the last known position.
2. Crews shall take a visual reference or drop a buoy and anchor as a surface marker. This will then provide a continuous reference point during the search.
3. The search pattern should begin so that there is a continuous overlap of vision throughout the search.
4. The first two legs are held to a distance equal to the track spacing and every succeeding two legs are increased by a further track space. Turns may be to the left or right at a 90 degree angle, depending upon the observer positions.
5. To ensure that each two legs are as accurate as possible the following methods may be used:
    i. Distance – Each two legs are of equal length.
    ii. Time and Speed – Each two legs are to occur over the same amount of time and at the same speed.

Expanding square search patterns utilising more than one vessel should follow the same steps as one vessel operations but include the following considerations:

1. The second vessel is to commence the same pattern but orientated 45°.
2. If the same speed is used for both vessels, the first vessel must be allowed to complete at least 3 search legs before the second commences to avoid risk of collision.

LS11.19 EXPANDING SQUARE SEARCH PATTERN

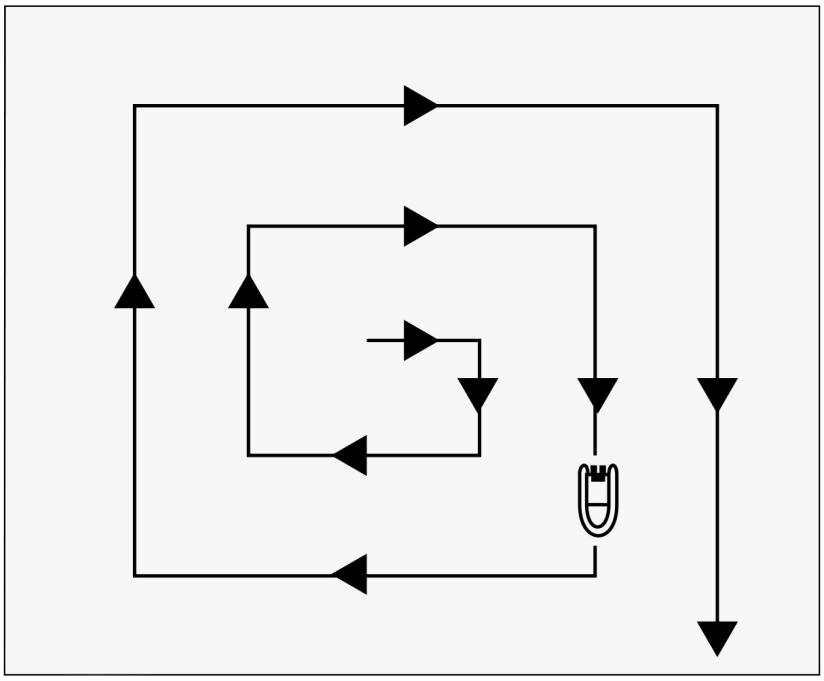

Figure 11.19.1 - Expanding Square Search Pattern

(Open Ocean)

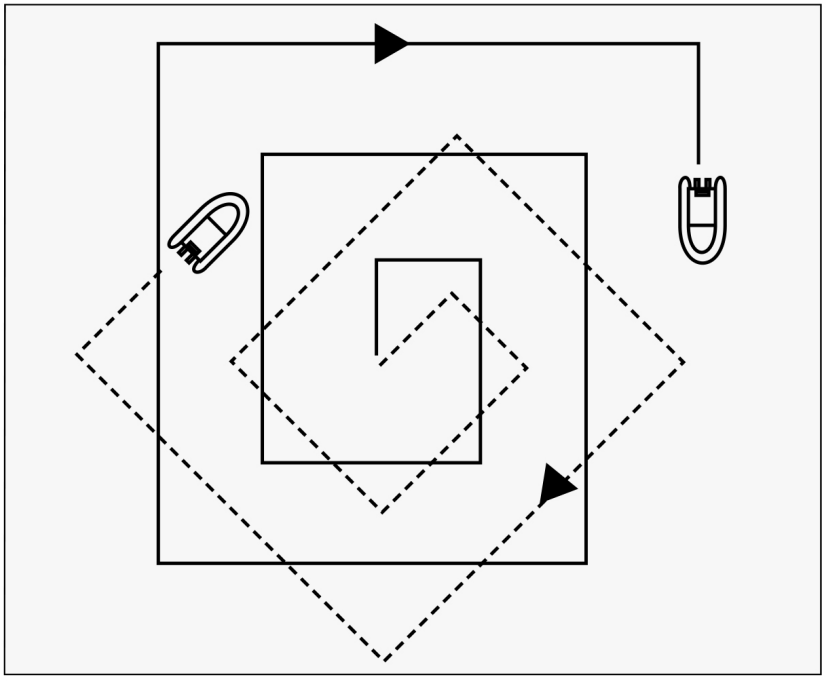

Figure 11.19.2 - Expanding Square Search Pattern

2 Vessels (Open Ocean)

LS11.20 UNDERWATER SEARCH & RESCUE

PURPOSE

To outline the correct procedure when undertaking an underwater SAR.

PROCEDURE

Underwater search and rescue activities may be conducted by lifesaving services in the initial phase of a SAR where the objective is to save a patient's life. When a search becomes a definite 'body recovery' operation, lifesaving services shall not undertake underwater SAR activities.

The use of SCUBA equipment is not to be used by lifesaving personnel at anytime. Lifesaving services may not tow lifesaving or emergency service personnel with SCUBA equipment.

Known and inherent risk must be carefully weighted against a mission's chance for success and the gains to be realised. All reasonable effort should be taken to locate those in trouble, determine their status, and affect the rescue.

The decision to prolong an operation after all probability of success has been exhausted should not be undertaken, unless at the direction of the Police.

The first consideration is the safety of the snorkelers, the crew, and the boat. When the time has elapsed, such that the search is basically for a body, the crew should not place themselves in a situation of risk. Where there is a chance that a life may be saved, the risks must be evaluated by the snorkelers and the skipper.

All participants must be qualified and proficient Surf Life Savers or Lifeguards. The snorkeler on scene initially must assess the situation faced, to ensure the safety of the team and the supporting crews. The snorkeler is expected to exercise judgement based on training and experience, in relation to the safety of the mission. If a snorkeler considers the risk too great, other personnel must accept the snorkeler's decision as final.

Only IRBs and ORCs are to be utilised when towing snorkelers (RWCs and JRBs are not to be used at anytime).

Snorkeler Equipment

Snorkelers should carry the following equipment at all times:

- Snorkel and Mask;
- Swim Fins;
- Wetsuit; and
- Dive Flag (displayed).

Initial Search

Firstly, establish where and when the victim was last seen. Determine this by dissecting two sets of landmarks and marking with anchor line and marker buoy.

During underwater SAR extreme care should be taken to avoid running the snorkeler over. Dive flags must be on or displayed at all times.

Underwater Currents

In many instances due to tide and underwater currents the body will have drifted from the position last seen. To determine the underwater current use marker dye and drop it into the sea at the position where the victim was last seen and observe the direction and rate of drift.

LS11.20 UNDERWATER SEARCH & RESCUE

Search Pattern

In consultation with the snorkeler, determine the area to be searched, the search pattern to be adopted and the width between each search run. This is determined by clarity and depth of water. Before commencing the search the size of the initial search area should be established and co-ordinates noted from various objects on the land so the search area can be accurately determined. If the search is unsuccessful then a new area should be defined unless timeframes dictate that the likelihood of survival has been exhausted.

Snorkeler Towing

In good visibility and sea conditions the IRB/ORC can tow the snorkeler behind the boat. The search pattern best used when towing the snorkeler is a creeping line search utilising landmarks to ensure that the area is being covered accurately. As a rule of thumb the boat will idle ahead with motor/s when towing a snorkeler. At no time should the snorkeler be towed at a speed greater than 4 knots. The snorkeler's height above the seabed depends on visibility. Successful sweeps require a 50% overlap.

Figure 11.20.1 - Recommended Speeds When Towing Snorkelers Underwater.

VISIBILITY (METRES)	SPEED (KNOTS)	SPEED (METRES/SECOND)
3	1.0	0.5
6	1.5	0.75
9	2.0	1.0
12	2.5	1.25
15	3.0	1.5
18	3.5	1.75

Recovery of a Search Object

When located, the snorkeler should let go of the tow rope and attempt to recover the patient if able or maintain a visual. The snorkeler should signal to their support boat to gain their attention.

Crews Duties

- Assist snorkeler to don equipment.
- Monitor the snorkeler's safety as they deploy and use "OK" dive signal to check their condition once they are in the water.
- Observe position of snorkeler at all times and report any hazards to driver/skipper.
- For tow searches in ORBs, deploy the snorkeler tow bar. Place rope around bollard with one turn and hold onto rope so to receive or send any required signals. Relay any messages to driver/skipper.
- Assist snorkeler back onto boat.

Drivers Duties

For a stationary search, anchor vessel then assist crew with preparations:

- Ensure motors are in neutral when snorkelers are entering or leaving water.
- For tow searches, slowly take up slack on line then maintain appropriate speed for tow (motor/s idling).
- Steer appropriate bearings as indicated by skipper/crew, as accurately as possible.
- Listen to directions from crew as dictated by messages from snorkeler.
- At no time during towing should the vessel reverse.

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LS11.21 PROBABLE ERRORS OF POSITION

PURPOSE

To outline factors that may cause probable errors of position when planning and undertaking a SAR activity.

PROCEDURE

Drift Error for Waterborne Targets

Over land, the datum is the last known position; however when survivors are known or thought to be in or on the water an allowance must be made for movement of the water resulting from the effects of wind and current. The degree of displacement of the datum from the last known position assumes increasing importance with the passing of time, and MUST be allowed for in search planning. Survival Craft Drift, as the displacement is called, is a function of:

1. The average sea current;
2. The average wind current; and
3. Leeway.

Sources of information include data held by the SurfCom, vessels passing through the search area, and individuals with local knowledge.

The direction and speed of these factors is referred to as 'SET'. Contrary to the convention of expressing wind velocity, the direction component indicates the direction of movement. The speed component is usually quoted in knots. Care must be taken to ensure that the speed unit is both stated and interpreted correctly.

Sea Current

Tidal and local geographic features may affect sea currents near the coast. When areas near the coast are to be searched, the water movement for the area should be discussed more fully with local experts.

Tidal Streams

Tides are caused by the gravitational pull of the moon and sun, modified by the depth and shape of the sea basin along the coastal areas. Currents in coastal waters are usually affected by tides, changing in predictable velocity as the state of the tide changes. In some locations tidal streams are of the reversing type, abruptly changing direction 180 degrees at about the time of high and low water. In other places the direction will change in small increments so as to create a constant rotary movement. Variations of these tidal effects may also be found.

The exact effect of the tide on currents in any specific area may be found by consulting tide tables or local charts. Local knowledge is again of great value in dealing with movements of tidal streams. While the changes in direction of tidal streams have a tendency to nullify the cumulative effect, they must nevertheless be considered in computing drift for the following reasons:

1. Often, with reversing streams, the effect in one direction is greater than in the other so that, over a period of time, the resultant effect is more in one direction than in the other.
2. Even over short periods of time the flow of tidal streams will cause significant changes in the probable position of a search object.

Since most areas affected by tidal streams will be close to landmasses, wind current will usually not be a factor in determining drift. Because of this, drift occurring in in-shore waters over short periods will be more greatly affected by tidal streams than current or leeway. However, if the cumulative effect of tidal streams and coastal currents thrusts the target into areas where sea current takes effect then drift considerations will need to be revised.

River Current

River current will affect SAR incidents that occur in offshore areas near river mouths. Tidal streams affect the river current speeds near the mouths of the rivers. In large rivers this affect may be noticed several kilometres upstream from the mouth. Published current tables often give values which are combinations of tidal and river flow effects. These are among areas where reversing streams will be greater in one direction that the other.

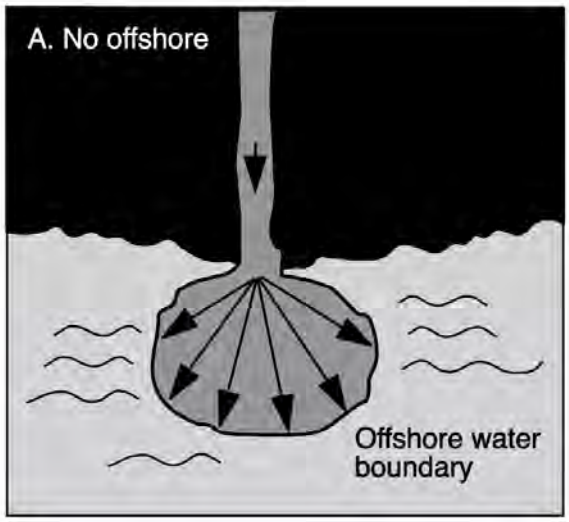

Figure 11.21.1

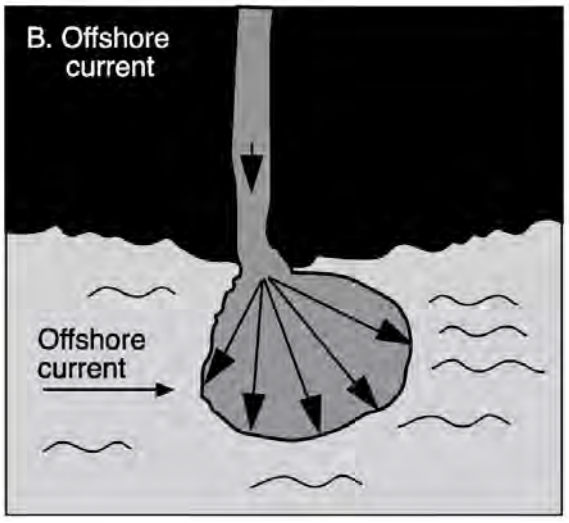

Figure 11.21.2

On the other hand, river current affects both total current and sea current at its mouth. Some major rivers extend their influence quite significantly off shore. Seasonal variations in water volume and velocity should be considered.

When estimating river current in the discharge area an assumption that the current direction is a straight line from the river mouth to the discharge boundary and the river current speed decreases linearly from the river mouth to the discharge boundary should be made. The river current speed at the mouth can usually be obtained from local knowledge or by direct observation.

If any type of offshore current is present, the IC should expect that the river discharge will not fan out symmetrically, but will be displaced in the direction of the offshore current.

Long Shore Current

Long shore currents are caused by incoming swells striking the shore at an angle. Long shore current information must be obtained from direct observation or local knowledge.

Swell/Wave Current

In calm conditions, swells and waves may affect rafts and other small marine search targets. The effect is similar to leeway in that the raft is being moved through the water. However swell/wave current speed is so small, under 0.1 knots, that the drift force is usually ignored in determining general search areas. It is useful however for determining probable direction of target movement in some cases.

LS11.21 PROBABLE ERRORS OF POSITION

Surf Current

Surf current is only considered for incidents occurring in coastal surf areas. It is more of a rescue or salvage factor than a search planning factor. Surf currents will move a drifting object after it enters the surf zone. If no longshore current is present, the surf current will move the object towards the shore perpendicular to the line of breakers. If a long shore current is present, the object will be displaced in the direction of the long shore current.

Rip Current

Rip current is a special type of surf current. It is a narrow band of current flowing seaward through the surf line as a result of the long shore current building up a large volume of water along the beach line and then bursting through the incoming surf on its way back to sea. Rip currents are only a few metres wide through the surf line, but they fan out and slow down when in smoother water. Rip currents occur when longshore currents are present and in places where some form of bottom trough, bottom rise or shoreline feature assists in deflecting the long shore current build up in a seaward direction.

Local Wind Current

Local wind current is the current generated by wind acting on the surface of the water. The current changes with variations of the wind pattern. Near the coast, wind current can be affected by various factors and consideration should be given to omitting the wind current vector from search areas close to the coast. Offshore, consideration should also be given to omitting the wind current vector, if it is considered to be an area of consistent winds. The velocity of a wind current is calculated from:

1. Wind data for the 48 hours preceding splash time;
2. Actual and forecast winds between splash time and Datum time; and
3. The application of coefficients taken from tables held by SurfCom.

Wind current is calculated for 6-hour periods, the periods being coincident with the meteorological synoptic periods. The current for any given synoptic period is the cumulative effect of the wind in the area for the 48 hours prior to the end of the synoptic period being considered. The direction and speed coefficients obtained from the tables allow for the effect of coriolis, and the reversal of wind direction, to express the result as 'SET'.

Leeway

Leeway is the movement of a search object caused by it being pushed through the water by local winds blowing against its exposed surfaces. A boat, raft or any other type of marine craft has a certain proportion of its hull and superstructure exposed above the surface of the water at all times. This exposed area is blown against by local winds, which in turn have the effect of pushing the marine craft through the water. The more surface area the wind has to blow against, the greater will be the wind's effect on drift. If the silhouette of a boat were projected onto a flat plane, which was perpendicular to the wind direction, the area enclosed by the silhouette would be called the exposed flat-plane area. As the boat's heading changes relative to the wind, its flat-plane area also changes, usually becoming least when the boat is heading directly into the wind or downwind.

The pushing force of the wind is countered by the water drag on the underwater hull. The drag varies with the volume, shape, depth and orientation of the underwater hull. When a marine craft is parallel to the wind direction the least amount of underwater drag will exist since the craft will be pushed through the water in the direction its hull is designed to move. Almost the same conditions exist when the boat is pointed directly into the wind and is being pushed backwards through the water longitudinally. When the boat's heading is perpendicular to the local wind, however, the greatest amount of underwater drag will exist since the boat must now be pushed sideways through the water. Between these extremes the amount of underwater drag will varies depending on the heading of the boat.

LS11.21 PROBABLE ERRORS OF POSITION

Divergence

When a search object first begins to drift, the wind will push the object in a downwind direction. As the search object continues to drift, the wind will cause the search object to deflect (or diverge) to either the left or to the right of the downwind direction. The amount of divergence is dependent upon the shape of the "sail" area of the search object. Divergence is caused by the lack of symmetry of the drift object.

Modification of the Probability Area

Modification of a calculated probability area may be suggested from an assessment of intelligence information received in the SurfCom, limitations imposed by search unit availability or for other reasons.

It should always be understood that SAR calculations are intended to be a guide to search planning, and may be modified to suit any particular situation as suggested by the accumulated SAR experience within the SurfCom.

Any member of the SurfCom team who considers that a modification would be to advantage shall make the IC aware of the suggestion. When offering such suggestions, every attempt should be made to present viable alternatives, together with a summary of the advantages, and disadvantages of each. The authority to make any such modification rests solely with the IC.

Modification Suggested by Intelligence Information

During the course of a SAR action, reports and information may be received from a variety of sources claiming that the missing craft had been seen or heard. Detailed analysis of these reports, and comparison with known data, may lead the IC to delineate a modified, or totally different, search area.

Modification Resulting From a Shortage of Vessels

When it is not possible to search the whole of the probability area due to a shortage of vessels, a number of factors may be changed to facilitate modification of the area. For example: track spacing, vessel speed and size of the probability area. After consideration of these factors, the IC will make a decision which section of a probability area should be searched first.

LS11.22 INFORMATION EXCHANGE IN TRANSFER OF COORDINATION

PURPOSE

To provide guidelines regarding information exchange in the transfer of coordination of search and rescue operations.

PROCEDURE

Information Exchange in Support of Transfer of Coordination

Where the Incident Controller or Incident Commander needs another agency or Incident Controller/ Commander to take responsibility for a SAR event or a specific activity in the SAR event:

a. The incoming agency/Controller/Commander must be provided with:
   i. Clear objectives, scope and scale of the delegated responsibility and service required;
   ii. Full briefing on the SAR event to the extent that it will affect the service to be provided;
   iii. Conditions and constraints on use of assets;
   iv. Time requirements and constraints; and
   v. Tactical intelligence, information and data as it becomes available that may affect the progress of the support service provided.

b. The incoming agency/Controller/Commander must:
   i. Accept, or reject the proposed delegation. If the action is other than to accept the delegation, then the coordinating authority must be informed of the operational reasons;
   ii. Operate within the terms of reference for the supporting service;
   iii. Inform the coordinating authority of any circumstances, if they arise where the specified service cannot be provided or needs to be varied, together with reasons;
   iv. Exchange with the coordinating authority, tactical intelligence, information and data as it becomes available that may affect the progress of the SAR event; and
   v. Report progress of the support activity to the coordinating authority.

LS11.23 CONCLUSION OF SAR OPERATIONS

PURPOSE

To provide guidelines regarding concluding a SAR operation.

PROCEDURE

General

SAR operations enter the conclusion stage when:

a. The target is located and the survivors are rescued;
b. Information is received that the target is no longer in distress;
c. All known persons on board are accounted for;
d. The SAR authority determines that further searching has no significant chance of succeeding and either suspend or terminate the search;
e. The Lifesaving Incident Commander (Duty Officer/Lifeguard Supervisor) deems conditions too dangerous for personnel;
f. There are not sufficient lifesaving services available to safely continue operations

The authority to end a search rests with different levels within the SAR organisation, depending on the circumstances. In particular, the SAR Authority is responsible for deciding when to suspend or terminate an unsuccessful search where lives were known to be at risk.

Suspension of a Search when the Target is Not Found

When it is determined that further search would be of no avail, the Incident Controller shall consider recommending the suspension or termination of the SAR operation. However, search action shall not be suspended or terminated nor the distress phase cancelled without the specific concurrence of the SAR authority.

The decision to suspend a search shall not be made until a thorough review of the search is conducted. The review will focus on the probability of there being survivors from the initial incident, the probability of survival after the incident, the probability that the survivors were in the search area, and the effectiveness of the search.

The review should:

a. Examine search decisions to ensure that proper assumptions were made and that planning scenarios were reasonable;
b. Reconfirm the certainty of initial position and any drift factors used in determining the search area;
c. Re-evaluate any significant clues and leads;
d. Examine datum computations and data calculations;
e. Confirm that all reasonable means of obtaining information about the target have been exhausted;
f. Review all intelligence material to ensure no information had been overlooked;
g. Examine the search plan to ensure that:
    i. assigned areas were searched;
    ii. the probability of detection was as high as desired; and
    iii. compensation was made for search degradation caused by weather, navigational, mechanical or other difficulties; and
h. Consider the survivability of the survivor/s taking into account:
    i. time elapsed since the incident;
    ii. environmental conditions;
    iii. age, experience and physical condition of (potential) survivors;

iv. survival equipment available;
v. studies or information relating to survival in similar circumstances; and

i. Consider the rescue plan to ensure that:
   i. best use was made of available resources;
   ii. contingency plans were sufficient to cater with unexpected developments; and
   iii. coordination with other agencies was effective in ensuring best treatment of survivors.

Before an unsuccessful search is suspended or terminated, the SAR authority shall make arrangements to ensure that the next of kin are fully briefed on the complete search effort, including condition in the search area, other salient operation factors and the reasons for proposing the suspension or termination of the search.

Consideration may be given to notifying the decision to suspend or terminate search effort at least one day prior to suspension of operations allowing next of kin at least one more day of hope while giving them time to accept that the search cannot continue indefinitely.

When a lifesaving service SAR response is discontinued or a search is suspended, the Incident Commander (Duty Officer) shall inform the Incident Controller and all authorities, units and facilities that have been activated and/or alerted.

On occasions, after the suspension of a search, it may be necessary for the Police to continue to search for bodies and/or aircraft/vessel wreckage. In such cases the SAR authority that had responsibility for the coordination of the search and rescue operation may, where possible:

a. Provide briefings on the path of the aircraft/vessel prior to disappearance, last known position, area searched and related intelligence;
b. Review intelligence to assist search;
c. Source aircraft for transport or search purposes; and/or
d. Provide drift information.

Should any other organisation wish to continue with or initiate an independent search, the SAR authority that had responsibility for the coordination of the search and rescue operation should ascertain whether there is any new intelligence that provides grounds to resume or continue the search. Under the circumstances where there is new intelligence, it should be evaluated and if considered valid the search should be continued or resumed. Where there is no new intelligence, then the SAR authority may assist the requesting organisation by:

a. Briefing the aircraft/vessel's path prior to disappearance, splash/crash point, area searched and related intelligence;
b. Advising the possible location of suitable search aircraft; and/or
c. Providing drift information.

Reopening a Suspended Search

If significant new information or clues are developed reopening of a suspended case should be considered. Reopening without good reason may lead to unwarranted use of resources, risk of injury to searchers, possible inability to respond to other emergencies, and false hopes among relatives.

LS11.23 CONCLUSION OF SAR OPERATIONS

Records and Reports

Records relating to search and rescue operations, including air searches on behalf of other organisations, shall be retained for periods as required under the relevant legislation and regulation.

When a search has been terminated without locating a missing aircraft or its occupants, all records, charts etc. shall be retained and be accessible to SAR staff to allow easy resumption of search activity should further intelligence be received.

Reports on SAR actions shall be generated as required for Coroners inquiries, management purposes and for training requirements.

Incident Debriefs

Following an incident the conduct of a debrief of agencies and groups involved should be considered. The purpose of incident debriefs is to establish opportunities for improvement in the operation of the national SAR system.

Incidents worthy of debrief may include those where:

a. Lives have been lost unexpectedly;
b. Large and complex searches have been conducted;
c. Multi agency involvement occurred; or
d. Where coordination, communication or response challenges were experienced during the incident.

This list is not exhaustive and the conduct of a post incident, multi-agency debrief is at the discretion of the SAR authority in overall coordination of the incident with mutual agreement of other SAR authorities and agencies involved.

Post incident debriefs should be used to:

a. Establish opportunities for improvement in the operation of the National SAR System; and
b. Ensure current policies and procedures are appropriate.

The SAR authority with overall coordination is to:

a. Decide the need for a debrief in consultation with other SAR participants;
b. Organize and host the debrief unless otherwise agreed by the participants;
c. Establish a venue that maximizes opportunity for participation in, and learning from, the debrief; and
d. Capture and share the opportunities for improvement arising.

Participation at debriefs may be restricted to participants SAR authorities and agencies depending on the issues that are likely to arise and would be a decision for the SAR authority with overall coordination for the incident.

SAR authorities that participate in the debrief will meet their own attendance costs, unless otherwise agreed by the participants.

The debrief should include the opportunity for all significant parties involved in the incident to contribute and learn from it.

REFERENCE

Critical Incident Debriefing

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