Chapter 15: Search and Rescue

Introduction

This chapter provides a general overview of the Search and Rescue (SAR) organization and basic skills and knowledge required to conduct SAR operations as a boat crewmember.

A successful rescue mission depends on correct search planning and execution. The dramatic image of a Division rescue vessel battling wind and waves on the Great Salt Lake in the dead of night to save a helpless mariner is only part of the story. The rest of the story involves collecting essential information, planning the correct response, assessing the risk, selecting the proper search and rescue unit, and exercising proper safety precautions.

In This Chapter

This chapter contains the following section:

Section A. Organization and Responsibility

Introduction

The boat responding to a SAR incident is an operational facility that is one part of the overall SAR system. To enable the boat to effectively perform its operation as a search and rescue unit (SRU), an organization and assignment of responsibilities have been established by the five counties Sheriffs that have jurisdiction on the lake as well as the Division and Hill AFB. This section presents SAR information in accordance with the Great Salt Lake Pre-Plan and the Great Salt Lake Action Plan.

A.1. SAR Responsibility

SAR coordination responsibility on the Great Salt Lake is divided between the five counties having jurisdiction (Box Elder, Davis, Salt Lake, Tooele, and Weber) as well as the Division. All SAR efforts or operations are the responsibility of the county sheriff's office with jurisdiction where the incident occurred.

Due to the location of the State Parks facilities and the availability of park personnel and equipment, the majority of rescue efforts will involve State Park's personnel and their volunteers. Due to their training, expertise and equipment, State Park's personnel and volunteers are a vital element of the Great Salt Lake search and rescue efforts. The Division will have the option of immediate response, if necessary.

Refer to the *Operational Preplan of the Great Salt Lake* for more in-depth information.

A.1.a. Division Application

The Division promotes safety on the water. Boat crewmembers are a vital part of safety education. The Division shall develop, maintain, train, and operate SAR facilities, and may render aid to distressed persons and protect and save property. The Division may also be called on to assist other federal and state entities.

A.1.b. Areas of Responsibilities

Great Salt Lake is divided into four major AORs:

- Gilbert Bay south half (south of a line drawn from Carrington Island to White Rock Bay) – known as Gilbert south.
- Gilbert Bay north half and Carrington Bay – known as Gilbert north and Carrington respectively.
- Farmington Bay
- Gunnison Bay (north half of Great Salt Lake)

The Primary Area of Operation (AOR) for the rescue team based at the Great Salt Lake Marina is Gilbert South but, because of the specialized equipment staged at that facility the team may well be called out to Gilbert North, Carrington or Gunnison.

The primary AOR of the team based at Antelope Island is Gilbert North, Carrington, and Farmington Bay but they may well be called on to assist in Gilbert South and Gunnison during Cat I and Cat II SARs.

A.1.c. Objectives

Two SAR program objectives are of direct importance to boat crews:

- To minimize loss of life or personal injury and property loss or damage in the maritime environment
- To minimize search duration and crew risk during SAR missions.

A.1.d. SAR Facts

The majority of SAR cases and vessel assists occur within eight miles of the Great Salt Lake Marina. About 90% of these cases do not require searching. A small percentage of cases involve minor searches (less than an hour) and an even smaller percent of these cases involve major searches lasting as much as 24 hours. Most occur in daylight.

A.2. Search & Rescue Coordination

The boat and its team is part of a unit. A unit is part of a larger emergency response headed up by an incident command. The structure of incident management is based on three key organizational constructs: the Incident Command System, Multiagency Coordination Systems, and Public Information

A.2.a. SAR Mission Coordination

Each SAR mission is carried out under the guidance of an Incident Commander. The highest ranking person on scene is the initial Incident Commander until relieved by someone higher on the chain of command. ON a typical SAR on Great Salt Lake the initial incident commander would be the Harbor Master or first responding ranger until relieved by the Division Lieutenant or by the county incident commander. The incident commander (IC), has several duties and responsibilities:

- Obtain and evaluate all data on the emergency
- Dispatch SRU's based on this information
- Develop search plans that include determining limits for the search area, selecting the search pattern, and designating the On-Scene Coordinator
- Control the SAR communication network for the assigned mission
- Monitor progress of the SAR mission and request additional SAR resources as necessary.

A.2.b. On-Scene Coordinator (OSC)

The OSC is designated by IC to coordinate the activities of all units when two or more SRUs are on scene for the same incident. The first unit on scene usually assumes OSC until the IC directs that person to be relieved. The OSC should be the most capable unit, considering SAR training, communications capabilities and the length of time that the unit can stay in the search area. As the subordinate of the IC, the OSC has several duties and responsibilities. These are:

- Inform the IC through period situation reports (SITREPs)
- Coordinate the efforts of all SRU's on scene
- Implement the search action plan from the IC
- Control all on-scene communications between SRU's
- Monitor the endurance of all SRU's and call for replacement units as needed
- Provide initial briefings and search instructions to arriving SRUs.

A.2.c. Search and Rescue Unit (SRU)

An SRU is a unit with trained personnel and provided with equipment for SAR operations. The SRU responsibilities include:

- Efficiently execute assigned SAR duties
- Establish and maintain communication with the OSC or IC, as appropriate, prior to arriving on scene and until released from the case

A.2.d. Communication

Communications and information flow is critical to good SAR planning and conducting of SAR operations. SRU's must continually keep the OSC, or if an OSC is not assigned, the SMC informed of any change on scene so that proper, timely, and accurate changes can be made to the search plan.

Section B. SAR Emergency Phases

Introduction
Upon receiving an initial report of a distress situation. The IC should evaluate all available information and, considering the degree of emergency, declare a SAR emergency phase. A boat underway may take these initial steps to respond as the IC begins work on a search action plan, if needed.

B.1 Emergency Phase
Three emergency phases have been established for classifying incidents and to help in determining the action to take. These are:

- Uncertainty Phase
- Alert Phase
- Distress Phase

Emergency phases are based on the level of concern for the safety of persons or craft that may be in danger. Each phase requires the collection of data that can assist in determining proper response actions. The emergency phase may be reclassified by the IC as the situation develops. Also, if sufficient information is received from initial or early reports, one or more phases may be skipped in determining the proper phase for a particular case. The ultimate action could be immediate dispatch of an SRU. Everything possible must be done to make certain that a unit sent on a SAR case is the proper response.

B.2. Uncertainty Phase
Uncertainty phase exists when there is knowledge of a situation that may need to be monitored, or have more information gathered, but does not require dispatching resources. When there is doubt about the safety of an aircraft, vessel or persons onboard, or it is overdue or failed to arrive at the stated time on a float plan, the situation should be investigated and information gathered. The key word is “doubt.” A preliminary search is normally conducted during an uncertainty phase. This preliminary search is conducted by contacting facilities or marinas in the area to either locate the vessel or determine if the vessel has been seen. This is particularly useful during Brine Shrimp season.

B.3. Alert Phase
An alert phase is assigned when an aircraft, vessel, or persons onboard are having difficulty and may need assistance, but are not in immediate danger. Apprehension is usually associated with the alert phase, but there is no known threat requiring immediate action. SRU’s may be dispatched to provide assistance if it is believed that conditions might get worse. For overdue craft, the alert phase is considered when there is a continued lack of information about its position or condition. The key word is “apprehension.” An extended communications search is normally conducted during the alert phase. This consists of extensive and repeated attempts to communicate with the missing vessel. SRU’s may conduct an extended communications search with the vessel or deploy to check out any leads.

B.3. Distress Phase
The distress phase is when there is reasonable certainty that an aircraft, vessel, or other persons onboard is in danger and requires immediate assistance. This includes a direct report of an emergency or the continued lack of knowledge about a vessel’s progress or position. The key word is “danger”. SRUs are normally dispatched when this phase is reached.

Section C. Legal Aspects and Division Policy

Introduction
Numerous legal issues affect SAR. This section briefly covers general Division policy guidance relating to SAR. These issues are covered in greater detail in DNR and DIVISION Policy manuals.

C.1 SAR Agreements
The Great Salt Lake is part of five counties in Utah: Box Elder, Davis, Salt Lake, Tooele, and Weber. All SAR efforts or operations on the Great Salt Lake are the responsibility of the county sheriff's office with jurisdiction where the incident occurred. It is recognized, due to the location of the State Parks facilities on the lake as well as Parks' personnel training, expertise and equipment, State Parks is a vital element of the Great Salt Lake search and rescue efforts. State Parks personnel will have the option of immediate response, if necessary.

All agencies involved in SAR activities on the lake have signed a Memorandum of Understanding called the Operational Preplan for the Great Salt Lake. The purpose of this Preplan is to have a comprehensive plan which outlines collaboration and responsibilities of the five counties surrounding and responding to the Great Salt Lake in the event of a water incident. The document covers, but is not limited to, emergency authority, first notice, investigation, priority of mission and resources, strategy, initial action, call out, preference for resource, and on scene organization.

C.2. Action Plan
The Division's response to SAR activities as well as training requirements is defined in a document called the Great Salt Lake Search & Rescue Action Plan. This document is reviewed and amended every three years. The purpose of the document is to coordinate the Division's search and rescue response on the Great Salt Lake for both Great Salt Lake Marina and Antelope Island Marina in accordance with the five county Great Salt Lake Operational Preplan, through the establishment of Division specific operational procedures. The objectives spelled out in the Action Plan are as follows:

- To establish of Division specific operational procedures in regards to search and rescue response on Great Salt Lake
- To establish vessel equipment requirements for all participating Division vessels.
- To establish a call out roster for search and rescue response to the Great Salt Lake for the Great Salt Lake Marina and Antelope Island Marina.
- To provide search and rescue training opportunities to Division required response teams and to coordinate the Great Salt Lake Operational Preplan multi-agency training opportunities.
- To increase the Division employee's knowledge of the Great Salt Lake Operational Preplan.
- To facilitate the training, cooperation, and coordination with the other agencies involved in the Great Salt Lake Operational Preplan.
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C.2.a. Action Plan – Gather Information
Information is a vital element of a search & rescue. Without proper and accurate information a search may not have the desired conclusion. The individual receiving the distress call should utilize the Notification of Boater in Distress form and gather as much information as possible.

C.2.b. Acton Plan – Determine the Response Category

What kind of response is appropriate for the situation? The Great Salt Lake Search & Rescue Action Plan defines the response level. Compare the information gathered with the search and rescue categories defined in the Action Plan to determine the level of response necessary.

C.2.c. Action Plan – Response Categories

The Great Salt Lake Search & Rescue Action Plan defines four categories of response based on the factors that exist for a given search.

- Category I is a single marina response to a vessel in close proximity to the marina that is not in a 'Pan Pan' or 'Mayday' state, and where the wind and seas are mild with no weather disturbance.
- Category II is typically a single marina response with notification to the county sheriff dispatch for monitoring as well as notifying the other marina to be on standby. This is usually in response to a 'Pan Pan' or conditions at night where the distressed vessel location may not be known. It also includes weather disturbances or rough sea and wind conditions.
- Category III is typically a 'Mayday' call or multiple vessels involved or multiple victims needing medical attention. The response would be to activate the Great Salt Lake Operational Preplan, the sheriff incident command system and would include a multiple marina response.
- Category IV responses are for commercial airplane crash, tour boat 'Mayday' or other large scale traumatic incident. The response is similar to a Category III with the addition of a response of personnel and vessels from the northern region of Parks.

Refer to the Great Salt Lake Search and Rescue Action Plan for more specific and updated information for information gathering, proper response and category definitions.

C.3. Distress Beacon Incidents

Distress beacons are one of the most important tools available to people in distress for assisting SAR authorities. The various types of distress beacons that may be used on Utah's waters are EPIRB's and GPS trackers. EPIRB activation by a vessel notifies the Coast Guard of a distress situation and transmits the location of the EPIRB. The Coast Guard will then call the local dispatch agency where the EPIRB is located. GPS trackers, once activated will email or text another party that a loved one or interested party is in distress. Loved ones will usually call 911 at that time which will then notify the proper responding agency.

C.4. Flare Incidents

Parks responds to many flare sightings. Red and orange flares are recognized around the world as marine and aviation emergency signals and must be treated as distress.

C.4.a Considerations

The nature of flare distress signaling makes planning and execution of searches difficult due to the wide variation of flare types, possible altitudes, skill and position of the reporting source/observer, weather, and many other factors. For this reason the accuracy of the information received from the reporting source and/or observer is critical. For example, a hand-held flare in a recreation boat seen on the horizon by a beach observer will be approximately 4 miles away while a parachute flare rising to 1200 feet and seen on the horizon by the same beach observer could be more than 30 miles away. As with all SAR cases, a prompt, thorough, and proper response, including a thorough debrief of the reporting source(s), yields the best chance for a successful rescue.

C.4.b. Reports of Flare Sightings
It is critical that a correct, descriptive, and accurate information be obtained from persons sighting a flare. This requires careful and thorough questioning of the reporting source. The data gathering process requires patience and good interpersonal skills, since reporting sources are rarely familiar with the terms or procedures used by the Division when investigating flare sightings. A flare reporting checklist should be used to ensure all the proper information is obtained.

C.5 Hoaxes and False Alarms
False alarms and hoaxes waste valuable operational resource time and dollars, frustrate both search controllers and those required to respond, and may adversely affect the Division's ability to respond to real distress calls. It is often very difficult to determine with certainty whether an incident is a false alarm, hoax, or real distress due to sketchy and/or contradictory information.

C.5.a. Hoax
A hoax is a case where information is reported with the intent to deceive.

C.5.b. False Alarm
A false alarm is when someone or something reported to be in distress is confirmed not to be in distress and is not in need of assistance. In a false alarm case, the reporting source either misjudged a situation or accidentally activated a distress signal or beacon resulting in an erroneous request for help, but did not deliberately act to deceive.

C.5.c. Division Response
Division units shall respond without delay in accordance with the Great Salt Lake Search & Rescue Action Plan to any notification of distress, even when a false alarm or hoax is suspected. Until proven differently, these cases should be treated as if they are real distress cases. A distress call that "sounds like a hoax" shall not be merely dismissed without further action. A distress shall be considered to exist until the case is closed, suspended, or downgraded by proper authority.

C.6. Maritime SAR Assistance Policy
The Division's primary concern is any SAR operation is that proper, timely and effective assistance be provided. A key issue is that it is always a Division priority to remove people from danger.

Immediate response, in accordance with the Great Salt Lake Search & Rescue Action Plan, will be initiated for any situation where a mariner is known to be in imminent danger. This response may be provided by Division, state or local entities; volunteers or good Samaritans.

C.7 General Salvage Policy (Other Than Towing)
Division units and resources are employed for SAR, not salvage operations. The brine shrimp or salvage industries such as Trestlewood or Cross Marine may be better choices for salvage operations. However, in cooperation with Division, county, state, or federal investigation efforts, it may be prudent to assist in salvaging efforts.

C.7.a. General Considerations
During a SAR operation, boat crew and SAR planners should be alert to determine if the situation is changing:

- Has the incident changed from a distress (e.g., people are rescued) to an effort that is now more a salvage operation?
- Will salvage by the Division reduce the threat of loss of life or the vessel becoming a hazard to navigation? What can be done to prevent a worsening condition or total loss of vessel?
- Is there a threat of injury to boat crewmembers or damage to the boat that would prevent the SRU from responding to another distress?

C.7.b. Commercial Salvage
When commercial salvers are on scene performing salvage, Division units may assist them if the salver requests, and the assistance is within the unit's capabilities. However, salvage operations shall be performed only at the discretion of the Park Manager. When no commercial salvage facilities are on scene, Division units may engage in salvage, other than towing, only when such limited salvage operations (e.g., refloating a grounded vessel, dewatering, damage control measures, etc.) can prevent a worsening situation or complete loss of the vessel. Division units and personnel shall not unduly hazard themselves at any time during performing salvage operations.

C.7.c. Small Craft
This guideline applies to small craft that require salvage other than towing. However, when no commercial salvage companies are available within a reasonable time or distance, the Park Manager may modify the guideline to provide for refloating a grounded boat which is not in peril of further damage or loss if:

- The Division units are capable of rendering the assistance.
- The owner requests the assistance and agrees to the specific effort to be made.
- Division units and personnel are not unduly hazarded by the operation.

C.7.d. Operator Insistence
Occasionally, an operator will insist the Division take action, such as pulling a vessel from a reef, which the Division personnel on scene consider unwise. The Division is under no obligation to agree to any such request or demand. If a decision to comply with such a request is made, it should be made clear to the operator that he is assuming the risk of the operation and the fact that the action is undertaken at his request against Division advice should be logged.

C.8. General Issues
Other general issues that crewmembers must deal with when performing a SAR mission include the following:

- Public relations
- Searching for bodies
- Trespassing

C.8.a. Public Relations
A SAR operation often creates great interest with the general public and news media. Responsibilities as a boat crewmember do not include providing information to the news media. To avoid wrong

information and misunderstandings for the public, all inquiries should be directed to the Public Information Officer (PIO) or Incident Command (IC). Relatives of missing persons may also seek information. Division personnel and volunteers should show proper concern for their stressful situation but also refer them to the PIO or IC for any information.

C.8.b. Searches for Bodies
Fatalities as a result of a maritime incident on Great Salt Lake are considered an unattended death and therefore the jurisdiction of the county in which the death occurred. The urgency for evacuating fatalities is very low. Resource protection and safety to rescuers is paramount. Decedents will not be moved until permission to do so and other special instructions have been received from the Incident Commander. Every reasonable attempt should be made to photograph the scene [decedent(s) and immediate area] before any item is removed and re-photographed after decedent has been removed. Appropriate evidence collection and protection should be maintained. In cases of death, the procedures should follow the Utah Medical Examiners Act.

C.8.c. Trespassing
SAR personnel should obtain permission from the owner or occupant prior to entering private property. If this is not possible or practical, the Incident Commander must then grant permission before entering private property. Only when saving a person's life, can immediate action be taken.

Section D. SAR Incident Information

Introduction
Once aware of a distress, SAR units attempt to find out as much information about the incident as possible. Standard response procedures and report formats are very important.

Before SAR units are activated a number of facts about the case must be recorded. These facts fall into two broad categories:

- Initial SAR information
- Additional SAR information

Initial SAR information is very important for several reasons. One use of SAAR case information by SAR planners is to categorize the case to determine the most appropriate and effective response to provide. SAR planners use every available piece of information to plan the Division's response, including determining the type of SRU assigned, when it is dispatched, and what type of equipment is taken to the scene.

NOTE: For guidance and recommended response refer to the Great Salt Lake Search & Rescue Action Plan. The plan spells out four categories of incidents as well as the corresponding appropriate response.

D.1. Gathering SAR Information
Initial notification that an emergency exists may come from many sources, including:

- Relatives may report that a family member is overdue
- "MAYDAY" by radio
- Someone was witness to the distress

If the caller seems excited, follow the procedures below to help gather information about the case:

Step	Procedure
1	Calm the individual down enough to collect accurate, essential information
2	Be courteous and show concern for the caller and their situation
3	Be confident and professional, but not overbearing
4	Speaking calmly will help ease people's concerns and assure them that the situation is well in hand
5	Be prepared to write down information (have checklist and pen within reach).

D.1.a. Communication with Reporting Source

It is important to maintain communication with reporting sources, regardless of who they are or how the call was made. Also, keep callers advised of what actions are being taken to resolve the situation reported.

D.1.a.1. Radio Source

Most distress calls by radio come on Channel 16. This channel is the maritime VHF-FM international distress and calling frequency. To keep it open for other distresses, the caller is usually asked to move (shift) to a working channel once the initial information (found in D.1.b.) is obtained. Since shifting could result in losing communications with the reporting source, the caller is asked to shift back to channel 16 if no reply is heard in the working channel. The transmissions may be as follows:

Example: "Vessel in distress, this is Great Salt Lake Ranger Base. Shift and answer channel 12. If no reply is heard on channel 12, shift back to this frequency, channel 16, over"

Great Salt Lake uses two working channels as their preference. The first one is VHF channel 12. The other is VHF channel 22a (USA).

D.1.a.2. Telephone Source

If calls come in by telephone, the name and number of the person calling should be taken and written down immediately. In the event the call is disconnected, it will be possible to return the call and obtain the needed information. Also, it is important to identify how it may be possible to communicate with the person or vessel that is reported to be in distress. The reporting source should be asked if they know what types of communications equipment are on the vessel. Cellular telephone numbers, types of radio equipment and frequencies monitored might help establish communications with the distressed vessel or person.

D.1.b. Initial Information

Once stable and repeatable communications are established, the most vital information to immediately record is:

- Location of emergency
- Nature of distress
- Number of persons onboard (POB)
- Description of the craft

Response activity can be started once these items are known. Also, realize that this may be the only contact made with the distressed craft or reporting source (e.g., the radio broke, power was lost, or the boat sank).

D.1.c. Location of Emergency

The location of the emergency is the single most important piece of information to obtain. Without a location, it is impossible to send the search and rescue resource. Location can be provided in many different ways and often "local terminology" concerning position can be confusing. The exact location of the disabled vessel should be understood before continuing to gather information from the reporting source. Position can include any or all of the following:

- Position (latitude and longitude) of the incident
- Bearing and distance from the incident to any points of land or landmarks known or observed
- Last known position of the incident or distressed vessel.

Often a vessel operator will state he is just north of the smokestack (Kennecott stack). Although very little of Great Salt Lake is north of the smokestack, to most boaters the whole lake is north of the smokestack. This is also common on Utah Lake where a boater in distress may indicate he is west of the Y. Try to prompt for more precise information on location.

D.1.d. Nature of Emergency

The nature of distress must be clearly understood in order for responding units to be prepared to assist. The emergency may be any one (or combination of more than one) of the following, or it may be some other type of emergency:

- Grounding
- Sinking
- Collision
- Fire
- Disabled
- Overdue
- Medical

D.1.e. Number of Persons Onboard (POB)

The third most important piece of information to gather from the reporting source is the number of persons onboard. If for some reason the vessel in distress were to sink prior to the SRU's arrival, the number of survivors expected to be in the water would be a vital piece of information to have. Besides the number of POB, other information concerning their condition should be obtained:

- Medical condition of all POB.
- Survival equipment onboard.

D.1.f. Description of the Craft

A good description of the vessel in distress is important so that SAR assets will have an easier time locating the vessel. Information to obtain includes:

- Vessel name
- Vessel numbers
- Vessel type
- Vessel length

- Vessel color

When direct communication with the vessel in distress is not available (information about the distressed is being relayed by another source), the initial information about the relaying source should be gathered and recorded.

NOTE: In this section, the term "vessel" includes aircraft, person, or any other source of initial SAR case information. In these instances, ALL appropriate information should be obtained.

D.1.g. Additional Location Information
After then nature of the incident has been completely established, additional information about the location should be gathered:

- If the vessel is underway, find out its course, speed and intended destination
- If the vessel is disabled and drifting freely, ask for the direction they are being set and how fast they are moving
- If the vessel is anchored or aground, determine if the vessel's position is steady or if they are dragging anchor or being set further aground
- Always ask for updated position reports until the SRU arrives on scene

NOTE: It is important to have all people onboard ALL vessels don their PFD's as soon as possible.

D.2. Additional SAR Information
Besides recording the SAR information described above, certain additional information is extremely valuable. Information in this category includes:

- Medical data
- On-scene weather data
- Overdue data
- All radio frequencies the vessel can use or monitor, or cellular telephone number if used.

D.2.a. Medical Data
If medical assistance is required, as much of the following additional information should be collected and recorded as possible. Checklists containing complete lists of information to collect can be found in the Great Salt Lake Search & Rescue Action Plan and should be used to avoid missing key information.
Additional information includes:

- Patient's name, nationality, age, and sex
- Patient's symptoms and vital signs
- All medication given to patient
- All medication available aboard the vessel

D.2.b. On-Scene Weather
Additional weather information can be useful. Remember that some bodies of water in Utah are quite large. Great Salt Lake is a very large body of water that consists of 1500 to 1700 square miles. The weather on scene may differ from the weather at the dispatcher's location. On-scene weather information is important in determining:

- Type of SRU best suited to respond
- Datum (the probable location of the distressed vessel).

- SAR category

D.2.c. Overdues
Some reports received will involve people or vessels that are overdue at some location, but no distress will be evident at that time. Information collected at the time of the initial report may prove invaluable later if a search planning effort is begun.

D.2.d. Gathering Data
Gathering the following type of data will avoid possible delays if the person or vessel does not arrive at the destination and further action is required. Sometimes it becomes difficult to reestablish contact with the reporting source to gather additional information with that information is needed. Data collection includes:

- Period of time the vessel has been overdue
- Vessel's departure point and intended destination
- Places the vessel planned to stop during transit
- Navigation equipment aboard the vessel
- Survival equipment aboard the vessel
- Number of people aboard the vessel as well as their names, ages, sex and general health
- Personal habits of the people aboard the vessel (e.g., dependability, reliability, etc.).
- License plate number and description of the towing vehicle and trailer, if the boat was trailered to the departure point
- Communications equipment onboard including radio frequencies monitored
- Additional points of contact
- Pending commitments (work, appointments, etc.)

Section E. Search Planning

Introduction
Before SRU's are dispatched, careful planning is needed to accurately determine the area where the survivors are or will be located when the boat arrives on scene. Good SAR planning significantly increases the probability of successfully locating and rescuing those in distress. Planning the search involves calculating datum and then outlining the boundaries of the search area. Most search planning is done by the IC. This results in a search action plan. The boat crew then conducts SAR operations based on this search action plan. However, there may be times when the boat crew will have to do basic search planning. Search planning also includes risk management to determine what response, if any, is appropriate and which resources are the right ones to respond.

In This Section
This section contains the following information:

DATUM

E.1. Description
The term "datum" refers to the most probable location of the distressed vessel, corrected for drift over a given period of time. Depending on the information available and its accuracy, datum may be:

- A point
- A line
- An area

As the case develops, datum must be corrected to account for wind and current (Great Salt Lake has measurable current). Datum is established by the IC.

E.2. Datum Point
The datum point is defined as a point at the center of the area where it is estimated that the search object is most likely located.

E.3. Datum Line
If the location of the distressed boat cannot be pinpointed, its intended trackline or a line of bearing may be able to be determined. The datum line is the intended trackline or line of bearing plotted on the chart. Without more information, it is assumed that the distressed vessel may be anywhere along the length of the plot.

The Line could also be obtained by using electronic radio direction finding equipment. One direction finder will give one bearing or LOP. If multiple radio direction finders are used, Multiple LOPs can be obtained giving a more accurate position.

E.4. Datum Area
When either the exact position of the distress or a datum line cannot be determined, a datum area is developed based on many factors, but including as a minimum:

- Fuel endurance of the vessel in distress
- Vessel's maximum cruise range
- Wind and currents which affect the search object
- Operator's intentions

E.5. Forces Affecting Datum
As time progresses, datum must be corrected to compensate for the effects of wind, seas, and current. Some of the many natural forces that affect a search object are listed below.

E.5.a Leeway
Leeway is the movement of a search object through the water. Leeway is caused by local winds blowing against the exposed surface of the vessel.

E.5.b. Local Wind Driven Current
Wind blowing over the water's surface tends to push the water along in the same direction the wind is blowing. This wind current affects the movement of a search object in open waters. Wind-driven

current may not be a factor when searching in small lakes, rivers, or harbors because nearby landmasses may block or reduce the effect of the wind. But they should not be discounted on Great Salt Lake.

E.5.c. Sea Current
Sea current refers to the movement of water in the open sea. Great Salt Lake has four established currents; Jordan, Weber/Ogden, Bear, and Goggins

Search Area Description

E.6. Description
The search area is a geographic area determined by the IC as most likely to contain the search object. The amount of error inherent in drift calculations and navigational capabilities of both the distressed craft and the SRU are used to calculate a search radius.

E.7 Methods
Search areas may be described by many methods including the following.

E.7.a. Corner Point
In the corner point method, the latitude and longitude (or geographic features) of each corner of the search area are given (see **Figure 15-4**).

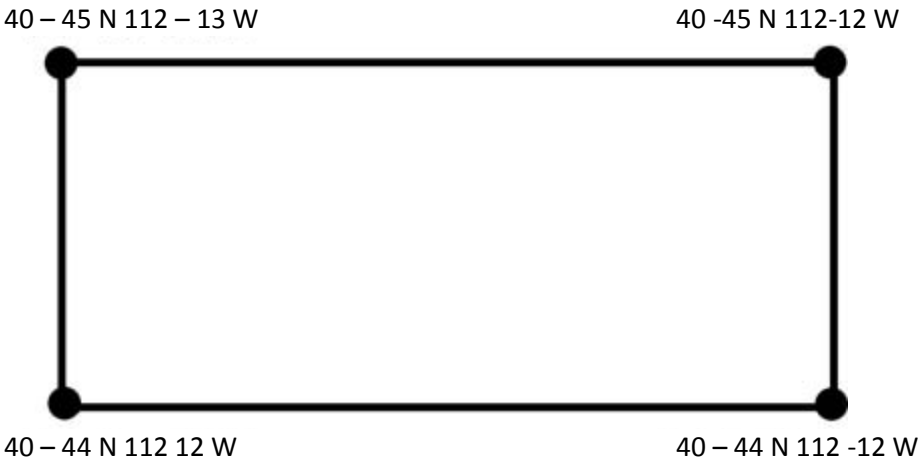


Figure 15-4
Corner Point

E.7.b. Trackline
In the trackline method, the latitude and longitude of the departure point, turn points, and destination point are given with a specific width along the track (see **Figure 15-5)**.

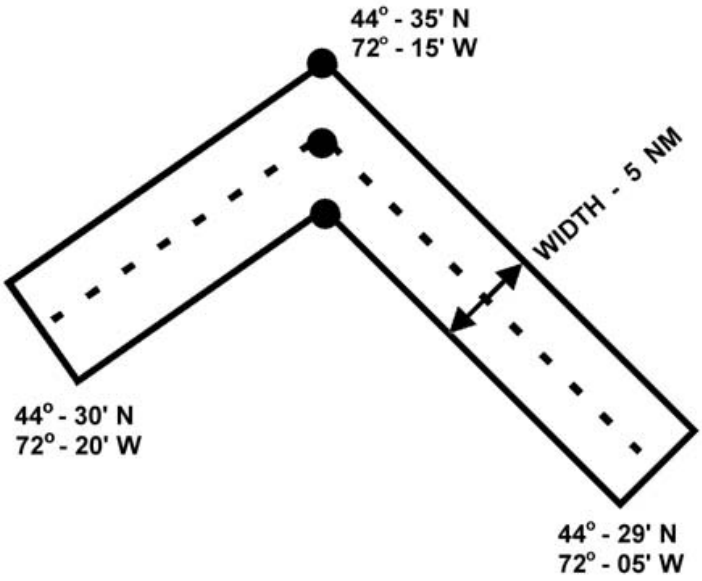


Figure 15-5
Trackline

E.7.c. Center Point (Circle)
In the center point (circle) method, the latitude and longitude of datum are given along with a radius around datum (see **Figure 15-6**).

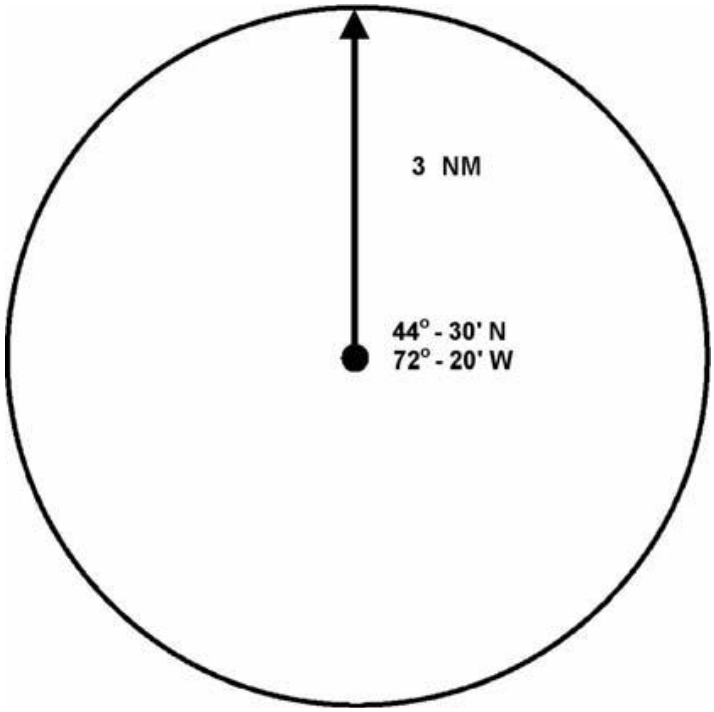


Figure 15-6
Center Point (circle)

E.7.d. Center Point (rectangle)
In the center point (rectangle) method, the latitude and longitude of datum are given with the direction of major (longer) axis plus the length and width of the area. (see **Figure 15-7**)

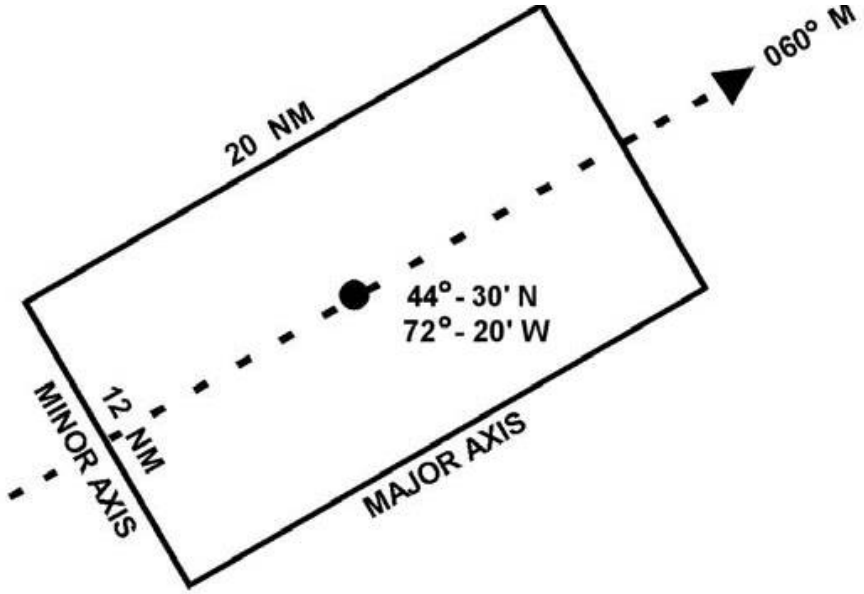


Figure 15-7
Center Point (Rectangle)

E.7.e. Center Point (landmark) (Rectangle, Bearing & Distance)
In the center point (landmark) method, the center point, or datum, may also be designated by a bearing and distance point from some geographic landmark. (See **Figure 15-8**).

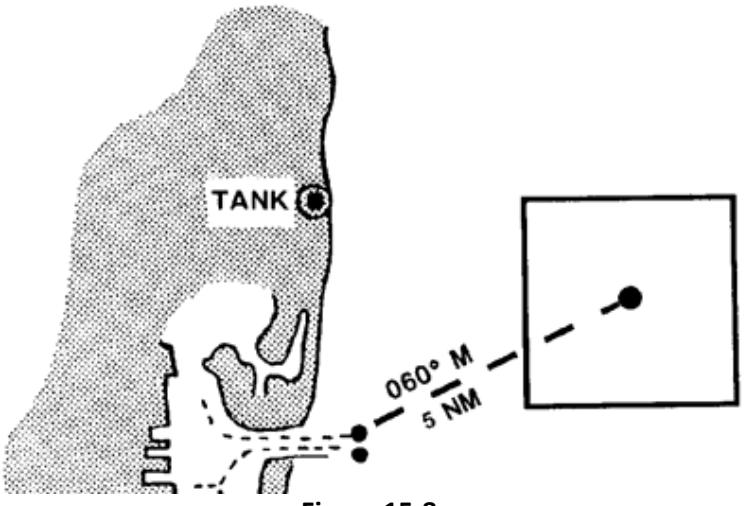


Figure 15-8
Center Point (landmark) (Rectangle, Bearing & Distance)

E.7.f. Landmark Boundaries
Two or more landmarks are given as boundaries of the search area along a shoreline (see **Figure 15-9**)

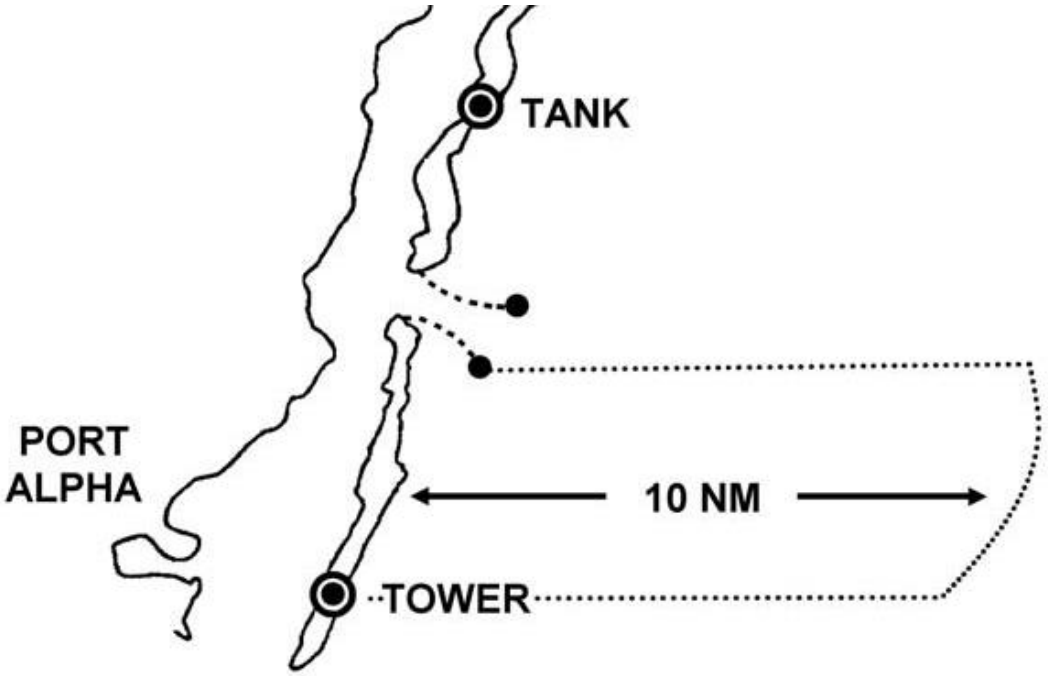


Figure 15-9
Landmark Boundaries

Search Area Coverage

E.8. Description
Search area coverage considers the area to be searched and the SRUs available to search. Once the search area has been determined and the search patterns selected, the next step is to have SRU's conduct the search. Based on the sweep width, an SRU will be assigned its own part of the overall areas of search. Essentially, the boat will start at an assigned commence search point (CSP), steer the track (search leg), and search (sweep down) on both sides of the boat.

E.9. Sweep Width
Sweep width is a distance measured on both sides of an SRU. A sweep width of one mile means ½ mile on starboard and ½ mile on port for a total "width" of one mile. Sweep width is determined by:

- Search object type, size, and construction.
- Environmental conditions.
- Sensor (e.g., visual or radar)

E.10. Track Spacing (S)
Track spacing is the distance between adjacent parallel legs within a search area. These tracks may be the result of successive sweeps conducted by a single SRU or conducted simultaneously by multiple units separated by fixed intervals. Most of the search patterns described in this chapter consist of equally spaced, parallel search legs (tracks). The distance between adjacent search legs is called the track spacing (S). The best track spacing is a distance that permits maximum expectations of search object detection in the shortest period of time.

E.11. Commence Search Point (CSP)
The CSP is a point normally specified by the IC for an SRU to begin its search pattern.

Search Patterns

E.12. Description
Once a search area has been determined, a systematic search for the object must be planned. Which is the best search pattern to use?

E.13 Considerations
The following should be considered to determine which search pattern to use:

- Weather conditions.
- Size of search area.
- Size of search object.
- Number of search units involved.
- Search area location.
- Time limitations.

E.14. Search Pattern Designation
Search patterns are designated by letters. The first letter indicates the general pattern group:

- T = Trackline
- C = Creeping Line
- P = Parallel (commonly used on Great Salt Lake)
- V = Sector
- S = Square (commonly used on Great Salt Lake

The second letter indicates the number of search units:

- S = Single-unit search
- M = Multi-unit search

The third letter indicates specialized SRU patterns or instructions, for example:

- R = Return
- N = Non-return

E.15 Types of Search Patterns

The most common types of search patterns are discussed below. More detailed descriptions can be found in the ***Great Salt Lake Search & Rescue Manual.***

E.15.a. Square (S) Pattern

The Square Search (S) pattern is used when the last known position of a search object has a high degree of accuracy, the search area is small, and a concentrated search is desirable. Square patterns are good for man overboard (MOB) searches. The Square Search Pattern is one of the most common patterns used on Great Salt Lake.

- Square Single-Unit (SS): In the SS pattern for boats, the first leg is normally in the direction of the search object's drift and all turns are made 90° to starboard. (see **Figure 15-10**)
- Square Multi-Unit (SM): The SM pattern is used when two units are available. The second unit begins on a course 45° to the right of the first unit's course (see **Figure 15-11**)

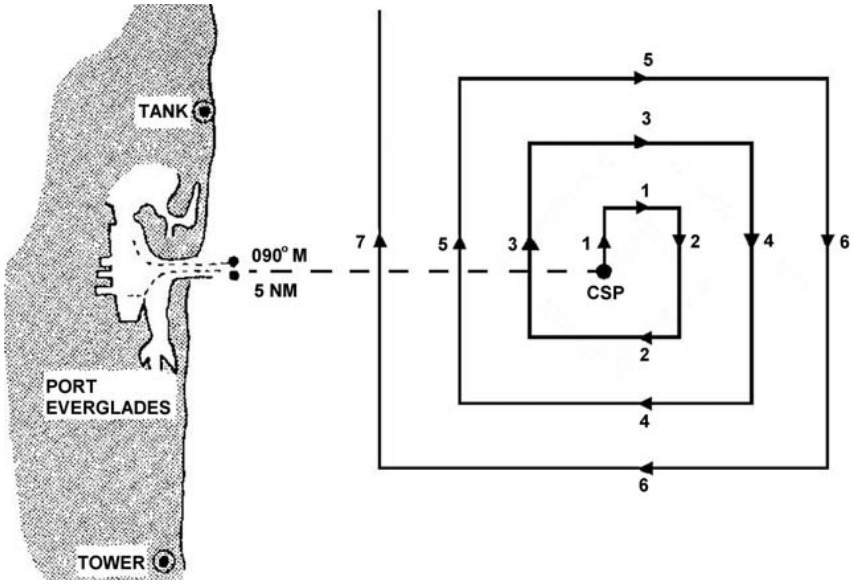


Figure 15-10
Square Single-Unit (SS)

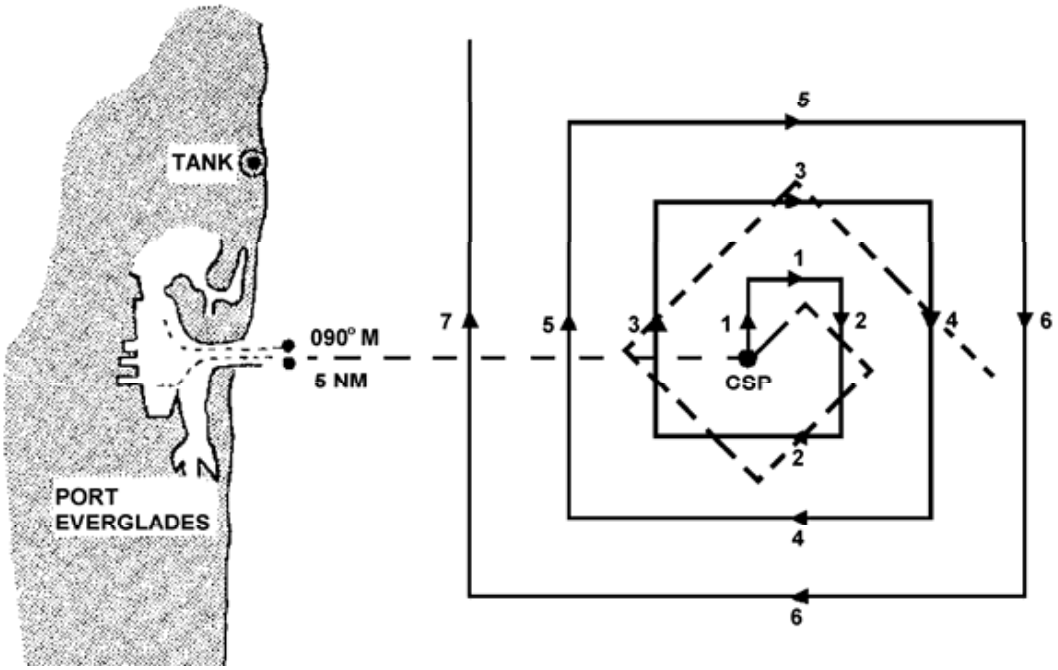


Figure 15-11
Square Multi-Unit (SM)

E.15.b. Sector (V) Patterns

Although rarely used on Utah's waters, a discussion on Sector searches may be useful. Sector search patterns are used when datum is established with a high degree of confidence but the search object is difficult to detect, such as a person-in-the-water. The search unit passes through datum several times, each time increasing the chance of finding the search object. The pattern resembles the spokes of a wheel with the center of the wheel at datum. Datum should be marked by the first SRU on scene with a Data Marker Buoy (DMB) or other floating object. By marking the center of the search pattern, the VO has a navigation check each time the boat passes near the center of the search area (datum). This pattern consists of nine legs. There are two types of sector search patterns.

- Sector Single-Unit (VS): The VS pattern is used by a single boat. The first leg begins in the same direction that the search object is drifting toward. All legs and cross legs of this pattern are of equal length. After running the first leg, the first turn will be 120° to starboard to begin the first cross leg. All subsequent turns will be 120° to starboard to a course determined by adding 120° to the previous course. Every third leg (3rd, 6th, 9th) will start out 120° to the right of your cross leg, but once sighted, you will steer on the DMB. Once you reach the DMB, return to the original course you steered when you started your third leg.

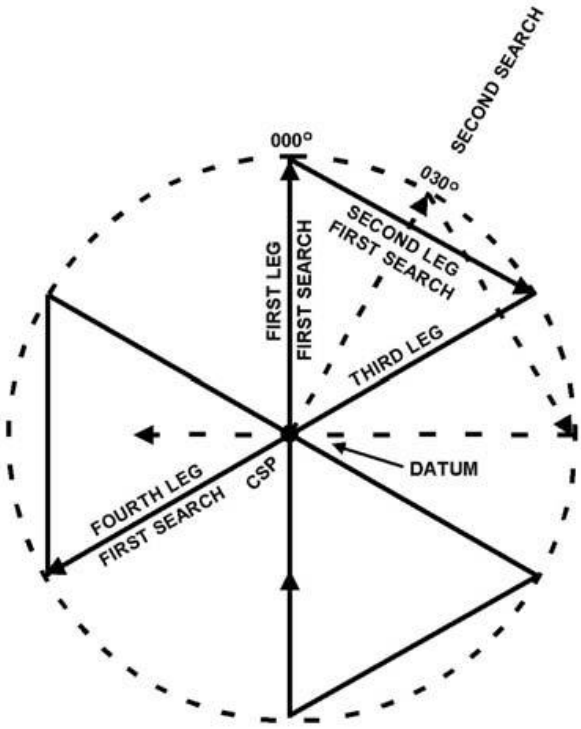


Figure 15-12
Sector Single Unit (VS)

- Sector Multi-Unit (VM): The VM pattern is used when a second boat is available. The second boat starts at the same datum, but begins the first leg on a course 90° to the left of the first boat. The search is then the same as a VS pattern. The second boat should start the search at a slower speed than the first boat, if both boats start at the same time. When the first boat is one leg ahead of the second boat, the second boat accelerates to search speed. This slow start by the second boat will keep both boats from arriving at the center of the search pattern at the same time. (see **Figure 15-13**)

NOTE: Course and leg identifiers should be carried in each SRU to calculate course and times for each expanding square and sector search pattern leg. The course and leg identifiers can be easily obtained through the federal stock system, Stock Number SN 7530-01-GF2-9010 (see **Figure 15-14** and **Figure 15-15**)

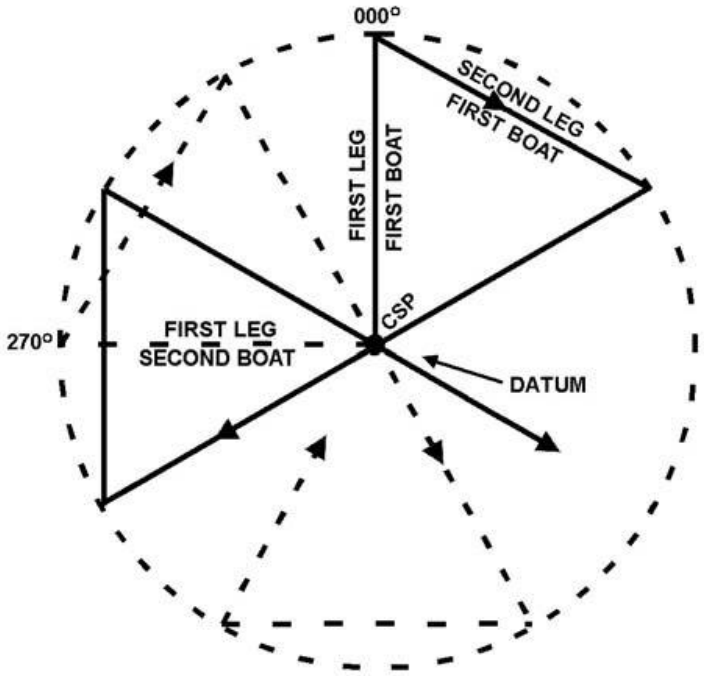


Figure 15-13
Sector Multi-Unit (VM)

E.15.c.1. Parallel Track Single-Unit
The Parallel Track Single-Unit (PS) pattern is conducted by a single SRU. The legs of the search are run parallel to the long side (major axis) of the search area. This is a common search pattern used by Division SAR units, especially when searching away from a shoreline or upwind from an empty vessel looking for a MOB target. (See **Figure 15-16**)

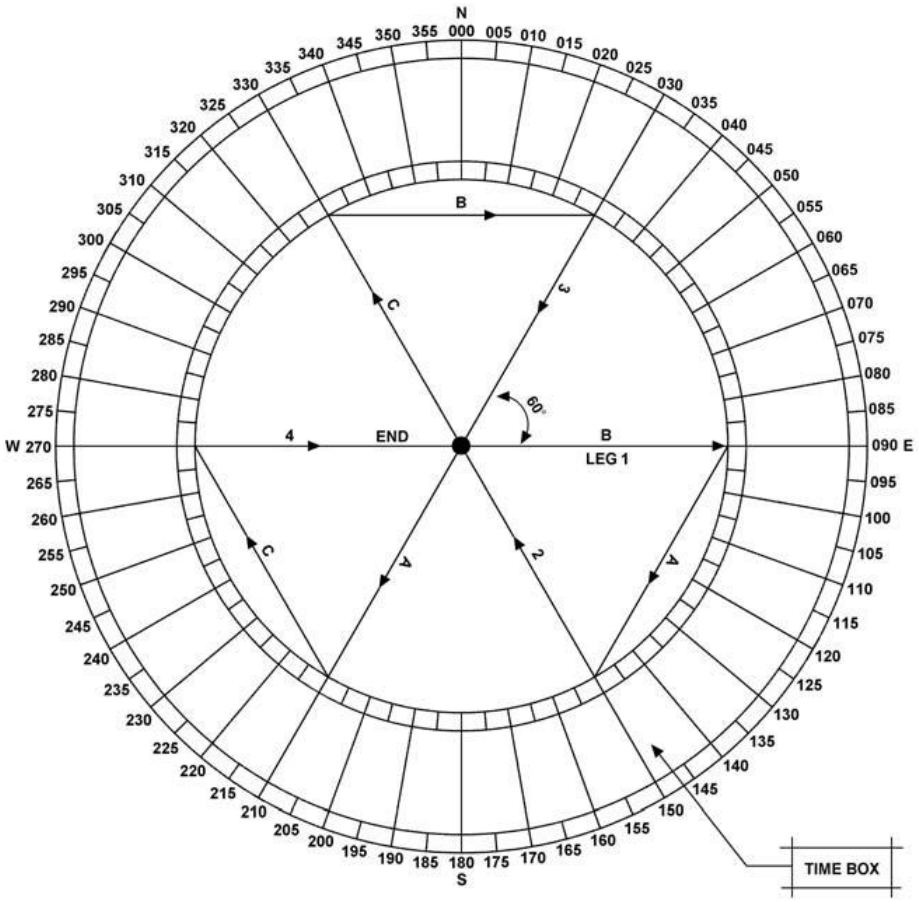
E.15.c.2. Parallel Track Multi-Unit (PM)
The Parallel Track Multi-Unit (PM) pattern is used under the same circumstances as the (PS) but with more than one SRU. (See **Figure 15-7**) The SRUs are separated by a single-track spacing. They search parallel to the long side of the search area. After completing the first search leg, the move over a distance equal to the track spacing times the number of SRUs, and then search back on the reciprocal heading of the first leg.

E.15.d. Creeping Line Single-Unit
The Creeping Line Single-Unit (CS) pattern is used when the probable location of the search object has been determined to be more likely at one end of the search area than at the other end. Creeping line search patterns are the same as parallel patterns with the exception that the legs are run parallel to the short sided (minor axis) of the search area. This pattern's CSP and search legs are also located ½-track spacing inside the search area. (see **Figure 15-18**)

E.15.e. Trackline Single-Unit No Return (TSN) and Trackline Single Unit Return (TSR)
The trackline search patterns are used when the only information available on the missing vessel is the intended track. The Trackline Single-Unit No Return (TSN) search follows directly along the intended

track of the missing vessel whine the Trackline Single-Unit Return (TSR) search course is laid out one-half track space to both sides of the intended track of the missing vessel. (See **Figure 15-19**)

NOTE: In darkness or extremely low visibility, surface search vessels should periodically stop their engines at selected points in the search area and conduct a listening search for a short period of time, then return to covering their assigned search area.



COURSE AND LEG IDENTIFIER FOR SECTOR SEARCH PATTERNS - (VS) - 60° CENTRAL ANGLES

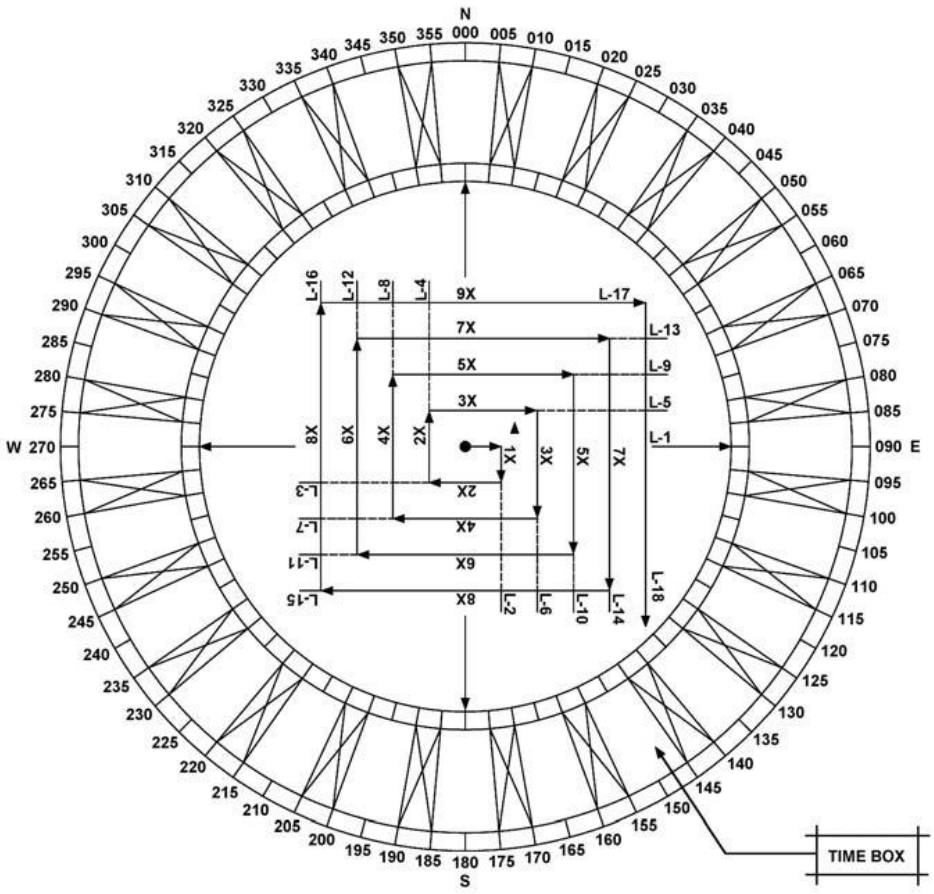
TIME AND DISTANCE TABLE

NAUTICAL MILES	SPEED 5Kts	8Kts	10Kts	12Kts	15Kts	18Kts	20Kts
	M:S	M:S	M:S	M:S	M:S	M:S	M:S
.5	6:00	3:45	3:00	2:30	2:00	1:40	1:30
1	12:00	7:30	6:00	5:00	4:00	3:20	3:00
1.5	18:00	11:15	9:00	7:30	6:00	5:00	4:30
2	24:00	15:00	12:00	10:00	8:00	6:40	6:00
2.5	30:00	18:45	15:00	12:30	10:00	8:20	7:30
3	36:00	22:30	18:00	15:00	12:00	10:00	9:00
3.5	42:00	26:15	21:00	17:30	14:00	11:40	10:30
4	48:00	30:00	24:00	20:00	16:00	13:20	12:00
4.5	54:00	33:45	27:00	22:30	18:00	15:00	13:30
5	60:00	37:30	30:00	25:00	20:00	16:40	15:00
5.5		41:15	33:00	27:30	22:00	18:20	16:30
6		45:00	36:00	30:00	24:00	20:00	18:00
6.5		48:45	39:00	32:30	26:00	21:40	19:30
7		52:30	42:00	35:00	28:00	23:20	21:00
7.5		56:15	45:00	37:30	30:00	25:00	22:30
8			48:00	40:00	32:00	26:40	24:00
	M:S	M:S	M:S	M:S	M:S	M:S	M:S

M - MINUTES
S - SECONDS

1. PLACE LEG NUMBER 1 INDEX ON HEADINGS OF FIRST SEARCH LEG.
2. THE LETTERS ON THE CROSS LEGS INDICATE THE NUMBERS PARALLEL RADIAL LEG FOR DETERMINING EACH CROSS LEG HEADING.

FIGURE 15-14
Course and Leg Identifier for Sector Search Patterns



COURSE AND LEG IDENTIFIER FOR EXPANDING SQUARE PATTERN - (SS)

TIME AND DISTANCE TABLE

NAUTICAL MILES	SPEED 5Kts M:S	8Kts M:S	10Kts M:S	12Kts M:S	15Kts M:S	18Kts M:S	20Kts M:S
.5	6:00	3:45	3:00	2:30	2:00	1:40	1:30
1	12:00	7:30	6:00	5:00	4:00	3:20	3:00
1.5	18:00	11:15	9:00	7:30	6:00	5:00	4:30
2	24:00	15:00	12:00	10:00	8:00	6:40	6:00
2.5	30:00	18:45	15:00	12:30	10:00	8:20	7:30
3	36:00	22:30	18:00	15:00	12:00	10:00	9:00
3.5	42:00	26:15	21:00	17:30	14:00	11:40	10:30
4	48:00	30:00	24:00	20:00	16:00	13:20	12:00
4.5	54:00	33:45	27:00	22:30	18:00	15:00	13:30
5	60:00	37:30	30:00	25:00	20:00	16:40	15:00
5.5		41:15	33:00	27:30	22:00	18:20	16:30
6		45:00	36:00	30:00	24:00	20:00	18:00
6.5		48:45	39:00	32:30	26:00	21:40	19:30
7		52:30	42:00	35:00	28:00	23:20	21:00
7.5		56:15	45:00	37:30	30:00	25:00	22:30
8			48:00	40:00	32:00	26:40	24:00
	M:S	M:S	M:S	M:S	M:S	M:S	M:S

M - MINUTES
S - SECONDS

1. PLACE INDEX (ARROW NUMBER 1) ON HEADING OF FIRST SEARCH LEG. HEADINGS OF ALL LEGS ARE SHOWN BY THE CORRESPONDING PARALLEL INDEX ARROWS.
2. RECORD TIME TO TURN IN THE TIME BOX FOR EACH LEG. LEG NUMBERS ARE SHOWN ON LEG EXTENSION LINES.

Figure 15-15

Course and Leg Identifier for Expanding Square Pattern

Figure 15-16
Parallel Track Single-Unit (PS)

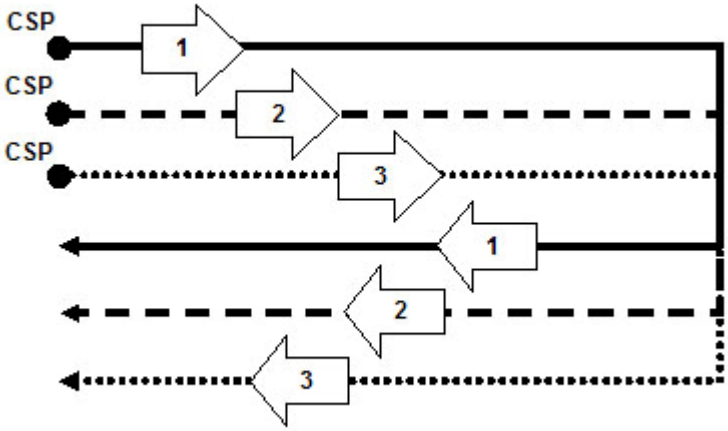


Figure 15-17
Parallel Track Multi-Unit (PM)

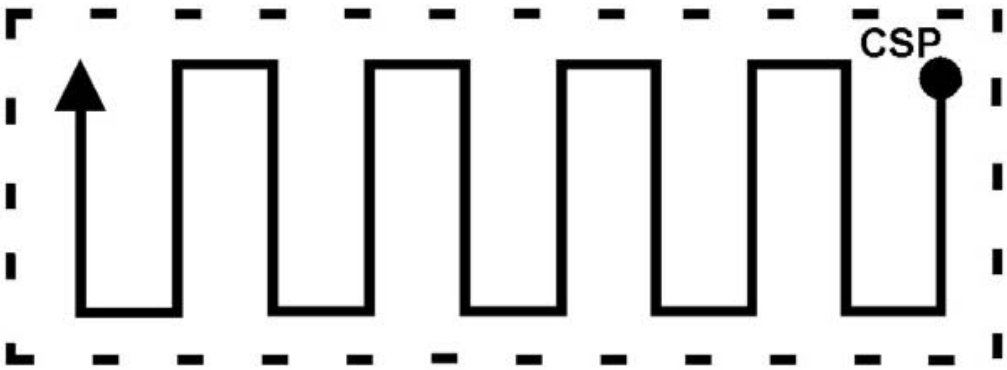


Figure 15-18
Creeping Line Single-Unit (CS)

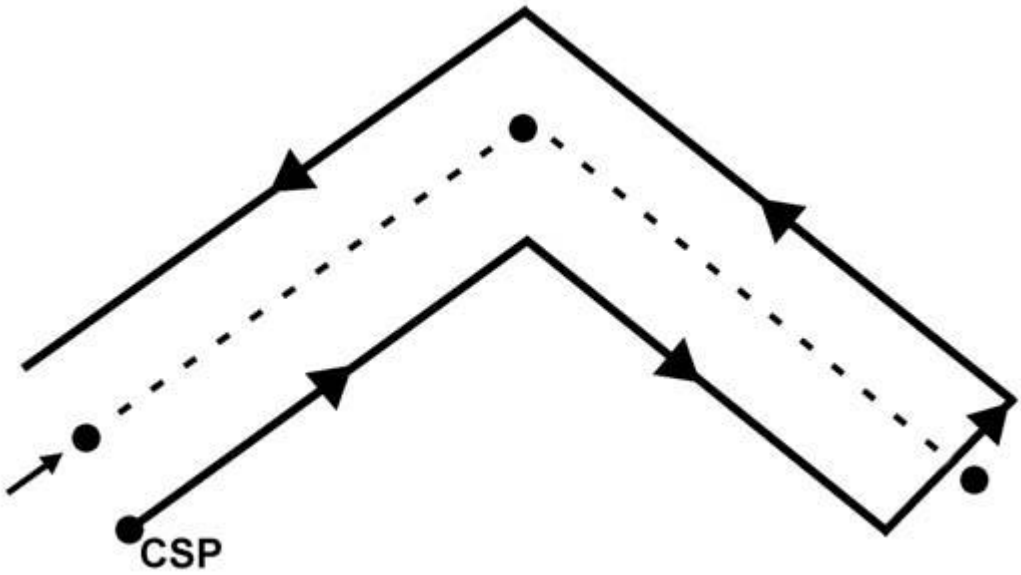


Figure 15-19
Trackline Single-Unit Return (TSR)

E.15.f. Barrier

Although rarely used on Utah's waters, the barrier pattern is used in areas with strong current, such as a river. The search lies along the path of the current. The boat moves back and forth over the same track. This can be done by steering on an object on each side of the riverbank. The boat moves from one side of the search area to the other while the current carries the water and objects past the search barrier.

Since river currents can vary across the width of a river, a more effective barrier might be established by forming a line abreast. This is done by placing observers on each bank and a boat in the area of swiftest current station keeping between the observers onshore. Additional boats, if available, could be added to the line abreast to reduce the effective track spacing and increase the effective coverage. This technique produces a more effective and predicable barrier.

Initial Response

E.16. Search Patterns and Actions to be Taken

The simplified patterns and initial search actions are to be used when an SRU arrives on scene and the object of the SAR incident is not initially seen or located. The following patterns and initial search actions are to be used until a complete search plan has been developed by the Incident Commander.

E.17. SRU Actions

Whenever a case occurs which has an SRU on scene and the object of the distress is not immediately seen or located, report the situation to the Incident Command by the quickest means possible. The IC will immediately start planning and then develop a search action plan of the SRU. In the meantime, the SRU should be conducting either an expanding square or sector search using a search radius of 6 nautical miles in accordance with the guidelines spelled out in the Great Salt Lake Search & Rescue Action Plan.

E.18. Initial Response Search Area

If the search object is not located upon arriving on scene, the SRU is to assume it is adrift if the distressed boat did not indicate it was at anchor.

Step	Procedure
1	Draw a circle with a 6 NM radius cantered at the last known position (LKP). If drift is considered to be significant, the SRU should estimate the drift based on local knowledge/on-scene conditions, and center the 6 NM circle on the drifted LKP.
2	Communicate and confirm the new datum with the IC. Remember that the time of datum must take into consideration the underway transit times for the SRU
3	Next draw the search pattern within the tangent of the circle. Datum for the search is the CSP. Refer to E.20.c of this section for information regarding track spacing
4	Orient the search area in the same direction of drift, that is, in the same direction as the total drift vector. (see **Figure 15-20** and **Figure 15-20**)

If the reported position of the distressed craft is in shallow water, it could be at anchor, and a search down he drift line may be appropriate.

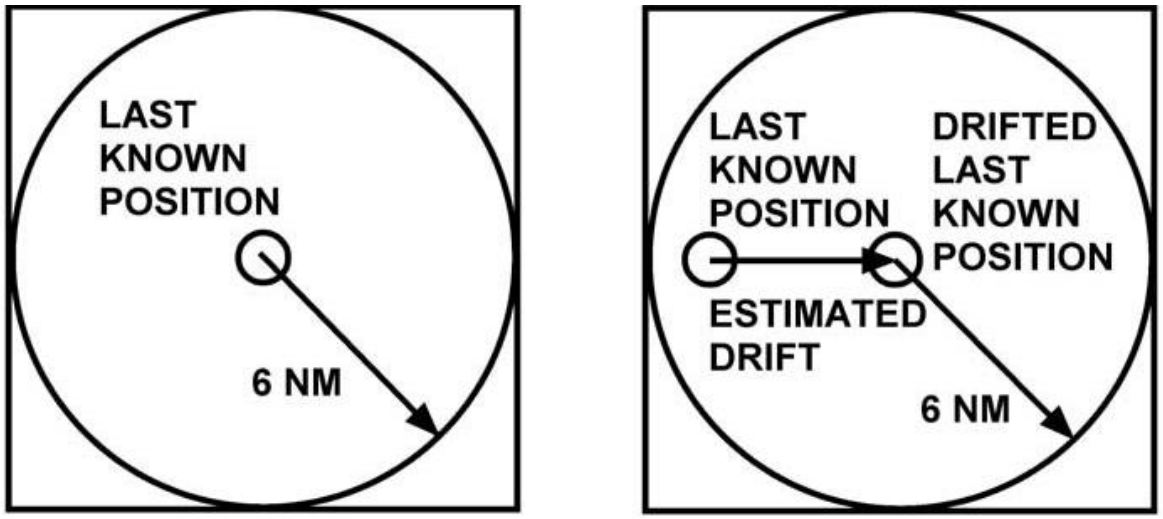


Figure 15-20
Initial Response Search Area

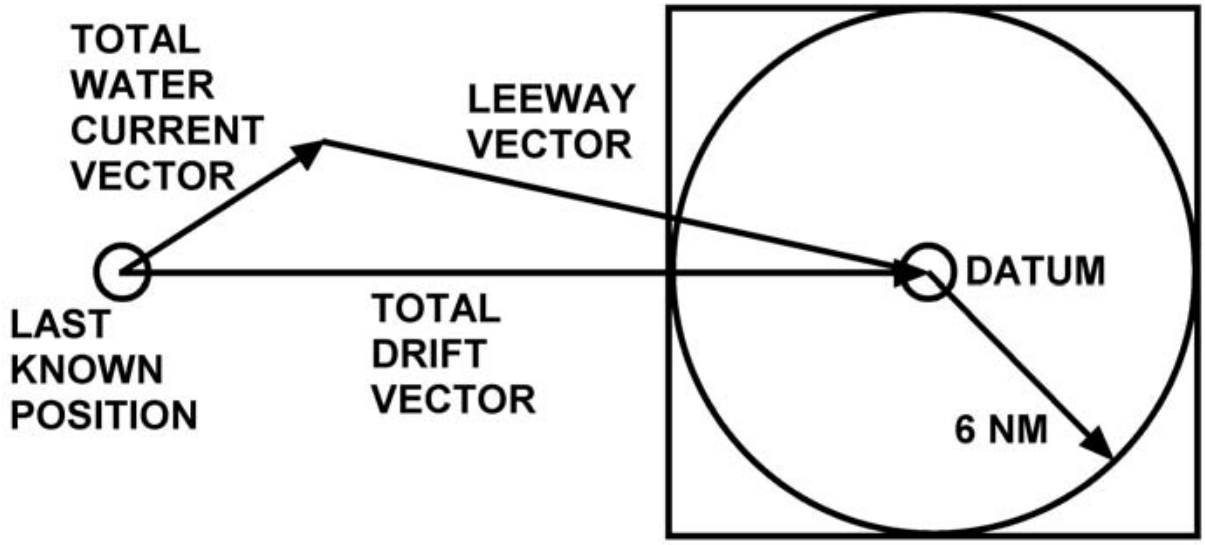


Figure 15-21
Vessel Adrift

E.19. Keeping the IC Updated

The SRU shall also keep the IC constantly updated on conditions, findings, and when nearing completion of initial response search. This direction should not preclude and SRU from using an alternate search pattern or area when it is clearly not practical (e.g., narrow waterway or other physical barrier).

E.20. Appropriate Search Pattern

The re-established operations and search procedures for the first SRU on scene should be to immediately report the on-scene conditions and findings to the IC. Next the appropriate search pattern should be used.

E.20.a. Surface SRUs
Usually an expanding square (SS) is used. This is because it concentrates the search closer to datum and usually there will only be a short period of time on the initial response before the IC gives direction and information for conducting and starting a first search. If the search area is confined or there is reason to have a high degree of confidence for the selected datum (e.g., debris found), the surface SRU may use a sector search (VS). Other search patterns may be used as appropriate.

E.20.b. Helicopter SRUs
Often AirMed, Life Flight, or the DPS helicopters will aide in the search. They should work closely with surface SRU's and land SRU's.

E.20.c. Initial Track Spacing
Track spacing for the initial response search by surface or helicopter SRUs can be determined by using the following:

Search Object	Good Conditions Wind < 14 kts Seas < 2 ft	Poor Conditions Wind > 15 kts Seas > 2 ft.
PIW	0.1*	0.1*
< 15 ft	0.5	0.2
• 15 ft	1.0	1.0

*>0.1 up to SRUs minimum ability to navigate.

Section F. Search Preparations

Introduction
Before beginning a search, all available facts about a case must be collected. The IC should provide most of this information as the search action plan. The checklist below will help determine whether everything needed to begin a mission is available. Once all available facts are collected and the required search planning is performed, the mission is ready to get underway.

NOTE: In an emergency, this information can be passed to the boat crew while en route to a search area.

F.1. Questions
Answers to the following questions will help determine if everything has been accomplished before getting underway.

- What is the object of this search?
- How many people are involved?
- What are the circumstances of their distress?
- What is the assigned search area?
- What search pattern will be used?
- What is the desired search speed?
- What special equipment is required?
- What radio frequencies will be used?

- Are all required charts aboard?
- What are the weather and sea conditions?
- Who is the IC?
- Who is the OCS?
- What unusual circumstances may be encountered? How will they be corrected for?
- What does the vessel in distress have for survival equipment?
- What radio frequencies will they use?
- Are other units assigned? If So:
    - What kind?
    - What are their search speeds?
    - What search patterns will they employ?

F.2. Briefing Crew

Crewmembers will be briefed before getting underway. Make sure all crewmembers:

- Understand the mission.
- Know what they are looking for.
- Know where the search will be conducted.
- Understand how the search will be conducted.

Section G. Conducting a Search

Introduction

It is critical that an SRU perform all duties assigned in a correct and predictable fashion. In this case, the term SRU includes the vessel, crew, and equipment, search planners, OSCs, ICs, and others all make plans based on assumptions they have made. These assumptions are considered when making decisions that could have life and death consequences for someone who may be the object of a major search effort. One assumption made by SAR planners is that the SRU, its crew, and equipment all perform as planned, completing all missions assigned unless advised otherwise.

G.1 Failing a Mission

In some instances, however, SRUs have failed to properly complete their assigned mission. Reasons may include not having proper equipment onboard, or a crewmember not fully prepared, trained or qualified, or a failure to complete some task. There have been instances when an SRU failed to fully search an assigned area or, due to careless navigation, failed to search in the area assigned. Actual searches and rescues are typically carried out when conditions are at their worst, making even simple and routine tasks extremely difficult. Accurate navigation, observant lookouts, and trained and knowledgeable crewmembers can make the difference between successful cases and disasters.

G.2. Professionalism

All effort expended to carefully gather key information, to plan the most effective search, or to select exactly the right SRU is wasted, if the SUR performing the search or rescue fails to do so in a professional manner to the best of its ability. If not able to complete the search (e.g., equipment failure, poor visibility, or worsening weather), the IC should be advised of the areas that were searched.