



SEARCH

This chapter will reinforce the value of meticulous habit and thoroughness in searching. Only through constant practice and refinement will a search team settle into truly effective methods. A new crewmember will learn to concentrate on the tasks involved in searching, spotting and manoeuvring through search patterns. The CCGA crew will learn to take these tasks one step at a time and never cut corners.

SEARCH

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Harvey Stops and Listens

January 13th, 1998 Bella Bella, British Columbia

“Mayday, Mayday this is the RED FIR X We are in Deer Passage and we are going down.”

“Red Fir Ten this is Prince Rupert Coast Guard Radio. How many on board your vessel?”

“The Red Fir Ten, Red Fir Ten, this is Prince Rupert Coast Guard Radio. How many on board your vessel?” There was no answer.

The thirty-five foot tug boat had just pulled away from the fuel dock at Bella Bella and was steaming north into a four foot chop. The water was running down the fore deck and draining into an opening just aft of the wheelhouse. The crew of three failed to notice the rising water level in the lazarette. Twenty minutes later the tug began to settle and list to starboard. It was clear that she was sinking and sinking fast. As the wheelhouse filled with water the captain called out a mayday on the radio before he was pulled under when the wheelhouse slipped beneath the waves. Jason Dornan and his girlfriend Arlene managed to escape the vessel as it sank. Arlene began to swim for shore while Jason clung to a half-full propane bottle. Soon the SAR aircraft from 442 Squadron (Rescue 310 Labrador Helicopter and the Buffalo fixed wing search plane) both flew over but they did not see him. Jason thought he was saved when the Department of Fisheries Zodiac approached at high speed, but it passed by.

There was a knock on the door and someone announced, “Hey Harvey the RED FIR X went down in Deer Passage and the Coast Guard is looking for them.” Harvey Humchitt got up from his meeting and left. He stopped by his house and picked up some food, blankets and a sleeping bag. He knew the crew of the RED FIR X and he could not just sit at home and listen to radio so he phoned rescue centre, started up his boat and departed Bella Bella.

About fifteen minutes later he arrived on scene. The sun was setting soon and Harvey knew that time was running out for the tug crew. The DFO Rigid Hull Inflatable was doing a shoreline search of the west side of the passage. Harvey spotted an oil slick at the east end of Troop Narrows. He went over to investigate the slick and shut down his engines to listen. There was a faint cry for help. Harvey turned his head and saw a bump in the water about $\frac{3}{4}$ of a mile from the slick. As Harvey approached the object he saw Jason holding on to the propane bottle. Harvey said:

“Jason don't let go of that can until I get ahold of you.”

Harvey pulled Jason aboard and Jason told Harvey about Arlene. Harvey looked around the beach and saw Arlene lying on the shoreline. She got up and waved.

9.0 Introduction

Years of experience on the water have taught old mariners like Harvey that it pays to take your time and go through the steps if you want to find someone. The most effective searching is done through diligent methodology. The only way to be diligent and methodical is to take the time to prepare yourself and your vessel to handle all contingencies. An experienced coxswain or captain takes the time to brief the crew, discuss the roles of the vessel in this search and share all the information known. Thus the crew becomes actively involved in the solution to the problem. Your unit is not effective until all the minds on board your vessel are focused on the success of your mission. The one time you decide to skip a bay or not bother finishing the last legs of your search pattern is the time that you will miss the survivors you are searching for.

One of the greatest enemies to an effective search is preconceived ideas and assumptions as to where the search subject is. Start searching before you get to the defined search area just in case the position was slightly out. If you are assigned an area to search then you must cover it 100%. As soon as you depart from the JRCC search action plan the SAR system fails.

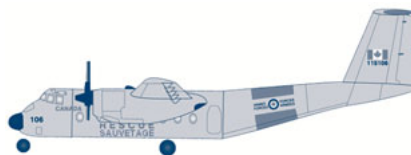
Search activities constitute a small percentage of annual SAR incidents. When CCGA members are called upon to participate in search activities they will most likely join or be joined by other vessels. In some cases, however, you may have to search alone. If you are involved in a major search, there is a good possibility that a Coast Guard SAR Unit or other government vessel will be appointed to lead the operation as On-Scene Commander (OSC). You will then receive your search instructions from the OSC. In situations where such a vessel is not available, you may have to direct your own search activities and/or those of other participating vessels.

9.1 Stage One: Awareness

9.1.1 Who answers the call for help?

When someone asks for help this message can be received in many ways. Coming from a vessel, the call is usually over a VHF radio or cell phone. The Coast Radio Stations (MCTS) will usually hear the radio call first and pass this message on to JRCC. If the call is over the phone the 911 system will re-route the call to JRCC as a marine case. Most searches start with an overdue (O/D) vessel or person being reported over the phone by concerned family members. JRCC will gather as much information as possible about the incident. Once the

resources have been selected, a search action plan is formed.



The most effective searching is done through diligent methodology

9.1.2 Canadian SAR System Responds

JRCC or MRSC gathers information on the case and uses its authority to task vessels; the vessel or vessels to be tasked are alerted by a variety of means including: radio, telephone, pager, or other emergency alert system. If alerted by telephone, a resource is normally given available information. If alerted by other means, vessels normally contact the JRCC by telephone. When ready to depart, the vessel informs JRCC/MRSC of their Estimated Time of Arrival (ETA) and situation report through the radio station. At this point the Coast Radio Station (MCTS) may have further information and instructions from JRCC and will indicate whether the tasking is to proceed. In some instances the CCGA vessel will already be on the water when it is alerted. In these cases the Coast Guard Radio Station (MCTS) would call the vessel on VHF channel 16 and switch to a designated working channel. On the working channel MCTS will pass on instructions about the incident and ask for an ETA. If tasked, the vessel will proceed and transmit regular SITREPs as necessary or as requested by the Joint Rescue Centre.



Communication Setup

1. MCTS will indicate which radio channel is to be used and the frequency of SITREPs they prefer
2. In emergency or special circumstances, you may request MCTS to connect you directly to JRCC/MRSC through a duplex channel. This involves the MCTS setting up a radiotelephone connection through a landline to JRCC/MRSC.

Note:

If you overhear a distress call that goes unanswered after a period of time then you should relay that message to an MCTS station.

9.2 Stage Two: Initial Actions

9.2.1 Search Action Plan Message from JRCC

The search action plan message may be abbreviated depending on mission complexity, but usually contains the following information:

- Distressed vessel's last known position (LKP)
- Nature of distress and severity or urgency
- Weather (actual on scene & forecasted)
- Other SRUs tasked

SMEAC from JRCC

Situation:

- ➔ Brief description of incident, position, and time
- ➔ Number of persons on board (POB)
- ➔ Weather forecast and period for forecast
- ➔ SRUs on scene
- ➔ Primary/secondary search targets, including amount and type of survival equipment

Mission

- ➔ Search area: area, size, corner points, other

Execution:

- ➔ By columns: area, SRU, parent agency, pattern
- ➔ Creep direction, commence search point (CSP), and altitude

Administration

- ➔ OSC collects on scene weather reports from SRUs
- ➔ Who collates information, and resolves discrepancies prior to reports to SMC
- ➔ Parent activity report to SMC at end of day's operations: sorties, hours flown, area(s) searched, and coverage factor(s)
- ➔ OSC reports to SMC

Communications / Co-ordination:

- ➔ Control channels, primary and secondary
- ➔ On scene channels, primary and secondary
- ➔ Monitor channels
- ➔ SAR vessel's aerobeacon and IFF identification
- ➔ Press channels
- ➔ OSC designated
- ➔ On scene time for units
- ➔ Track spacing/coverage factor desired
- ➔ OSC instructions (including DMB instructions)
- ➔ Air space reservations
- ➔ Aircraft safety comments
- ➔ Parent agency relief instructions
- ➔ Authorisation for non-SAR aircraft in the area

- ➔ Distressed vessel's characteristics
- ➔ Time on scene of first SRU

9.2.2 SAR detectives

Finding people takes detective work. That work can be done on the water or on the phone. During searches you should stop and speak to vessels in the area or interview witnesses to an event. You must be thorough and methodical in your questioning and recording of information. All information shall be passed on to JRCC.

Solve the case on the phone

In some small communities JRCC often does not have the local knowledge or resources to investigate the case thoroughly. This is where an auxiliary unit can help. After checking in with JRCC, the auxiliary unit may offer to check out some areas and people locally. If JRCC thinks this is a good idea then you can devise a contact list and start investigating. Many times JRCC will already have made calls to the family or relatives and need your unit on the water. If the missing person/persons are known in the community then an auxiliary unit can call the relatives, friends and witnesses to gather more information about the case. Remember you are acting as an agent for JRCC not on your own. All information gathered must be passed on to JRCC before you make your next move.

Overdue Vessels

If requested by JRCC:

- ⇒ Contact marina managers or wharfingers to see if the missing vessel has been in the area. If so, find out when they were there, when they left, and where they were going. (Boaters change their plans and forget to tell anyone, but may have mentioned alternate plans).
- ⇒ Check every vessel carefully for licence number, description, and name. Remember that there is no time limit on a search. The vessel description may not always be accurate. Check each boat closely. There have been cases where the search has been for a pleasure craft, and the boat turned out to be a sailing vessel or a fishing boat.
- ⇒ Check the parking lot for the missing person's vehicle (assuming they have one). If the vehicle is still there, the person may not have returned yet. If the vehicle is not there, then the person may have returned, yet not told anyone. Relay this information to the CGRS by radio to JRCC via land line.
- ⇒ Check all of the marina and floats. The missing party may have returned and tied up at a dif-

ferent spot.

- ⇒ If there are other people around on the floats, tell them who you are and what you are doing. You may receive unexpected information concerning the whereabouts of the missing vessel.

9.2.3 Preparing Yourself to Search

You must be physically and mentally prepared to search for indefinite periods of time. CCGA vessels have searched for many hours only stopping for replenishment and refuelling, and if necessary a change of crew. You can review the spotting and scanning procedures before you go as well as checking your personal safety gear.

Before you step on the vessel ask yourself:

Are you ready to search for extended periods of time?

- Am I dressed warmly?
- Do I need a change of clothes?
- Do I need to contact my family and advise them?
- Do I have medications that I need?
- Do I have a toothbrush or a comb?
- Do I have snacks or water available?
- Do I have contact lenses if so do I have spare glasses and sunglasses?
- Do I have personal flashlight and notebook?
- Do I have necessary phone numbers and resource lists?
- Has my crew written everyone's names on the unit status board on shore so people know who is on board the vessel?

9.2.4 Pre- Departure Briefing

Your coxswain will take some time during the team preparation to brief the crew and share the details of the case. If you know the information then you can be one of minds working to solve the mystery. By getting the entire crew involved each crewmember gets a personal stake in the success of the search.

9.2.5 Preparing Your Vessel for Searching

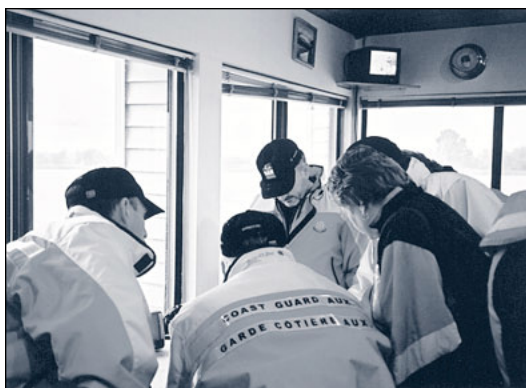
Pre-departure inspection

Once you are prepared you must ready the vessel. One crewmember can read out the items on the pre-departure list and the other can inspect the critical gear. The vessel should not depart until this pre-departure inspection is complete.



A few minutes of prep can save time and embarrassment on scene.

Note:
A searcher should be aware of their fatigue level.



Search Communications review and check

The radio watch can check in with the Coast Guard Radio Station and verify the designated search channels as well as announcing the departure (see Initial Departure message, Chapter 4).

On Scene Commander (OSC)

The selection of an On-Scene Commander (OSC) and/or a Coordinator of Surface Search (CSS) is based on the experience of the individual, the capability and type of vessel.

The OSC is usually the Captain of a SAR vessel or aircraft. On occasions, another vessel may be designated as CSS. If the Joint Rescue Co-ordination Centre has not designated an OSC, and your vessel is on-scene with other vessels, you may be assigned the CSS position. The duties of a CSS may be transferred to another vessel, but frequent transfer is not recommended since it inevitably leads to confusion. Consult with JRCC before transferring this function.

9.3 Stage Three: Searching

9.3.1 Making the Search Action Plan Happen

The captain/coxswain will ensure all are aware of their duties and ready to carry them out.

First On scene

As your vessel nears the search area the coxswain/captain will slow down to search speed and everyone will start to look for objects in the water. Here the search plan can be reviewed and any comments or concerns by the crew and spotters can be addressed. The captain will ensure all are aware of their duties and ready to carry them out.

9.3.2 Datum and LKP

Datum: is defined as the most probable location of the search object for a given time corrected for total drift.

Normally provided by JRCC, datum is the starting point for most searches. To find datum, the Last Known Position (LKP) of the search object is corrected for the drift it would experience in a given time period. In other words, JRCC uses object drift formulas and computers programmed with local current and tide information to estimate where the search subject will most likely be by the time you arrive.

Commence Search Point

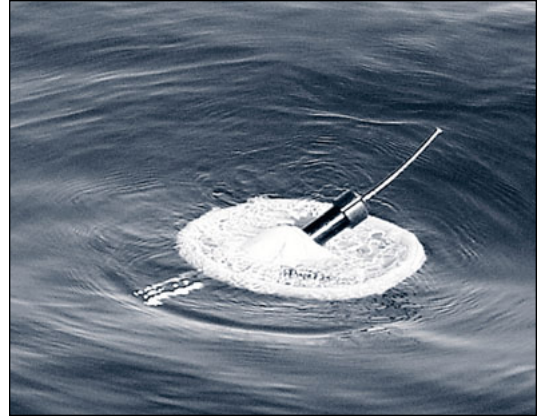
If searching for a person in the water, one of the first steps upon arriving at commence search point is stopping the vessel to look and listen. JRCC needs the real wind and current information from the scene and it will be your job to supply that data. The Datum Marker Buoy (DMB) is the tool that JRCC uses to gather this information. With a large search, sometimes JRCC will assign a vessel to simply stay by the DMB and relay its position constantly. The JRCC can ask that the DMB be deployed anywhere in the search area. Your next actions may well determine your success in finding the target.

Tips for successful searches

1. Search actively when approaching, and at the commencement point of the search
2. Remind your crew to stop and shut down the engines, if practical, while the spotters look and listen
3. At datum, the coxswain may ask that the datum marker buoy (DMB) be deployed and the time and position be recorded. JRCC will be advised that the DMB is in the water and given its time and position

Confirm the search action plan and everyone's roles

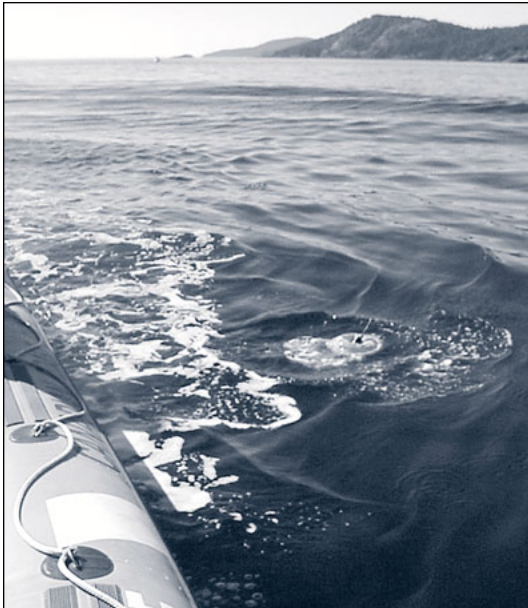
4. Confirm the search action plan and everyone's roles
5. If starting an open water pattern, draw the search pattern on the chart table or console and keep track of the progress



DMB Deployment Steps

- ➔ Prior to arriving on-scene, confirm with the Joint Rescue Coordination Centre that a DMB is required
- ➔ Inform JRCC/OSC immediately after a DMB is deployed, including time, location and frequency (if electronic)
- ➔ Provide regular DMB position updates to JRCC





9.3.3 Target Profile

Target Information

Before arrival at the search area, the coxswain of the search vessel should brief all lookouts as to the nature of possible targets and a review of all of the information known. A search for an overdue vessel can progress into a search for many things, the lookout should understand the types of situations the craft may have encountered, and the targets that may result from those situations.

Stop and Listen

Excerpt taken from the statement of a survivor of a capsized vessel.

“ The search vessel slowed down and dropped a pole in the water just 50 feet from me. I screamed, waved and blew my whistle but they could not hear me over the wind and their engines. They talked for a minute and then drove off. I shivered in the icy waters for another hour before I was spotted by a helicopter...”



Whistles and voices will carry past a person’s sighting distance. It is important that a search vessel stops and listens upon arrival at the commence search point and regularly during the search.

When a possible rescue craft is sighted or heard, survivors will usually grab the closest signalling device available. Lookouts should also be alert for shouts, screams, or whistles from the survivors, as they may see the rescue craft before it sees them. If a single distressed vessel has foundered



prior to the arrival of rescue units, the most probable search objects will be lifeboats, rafts, debris, oil, and people in the water.

Person(s) in the Water

On a perfectly calm day in clear conditions a person in the water can disappear from a spotter’s sight at as little as 100 metres. Locating a person in the water can be a difficult task due to sea state, weather conditions, time of day, and most importantly whether the person is wearing a flotation device. If the person is not wearing a flotation device, in most instances all that will be visible is the head. If they are wearing a flotation device, the head and shoulders will probably be visible. Be on the lookout for floating debris - the missing person(s) may be clinging to it.



LifeRafts and Lifeboats

These targets are designed for high visibility and easier to detect. Lifeboats from large vessels are usually equipped with ample pyrotechnic and visual aids, and may even carry emergency radios. Many of these vessels have power and/or sail propulsion. If more than one boat has been launched, they might be grouped or tied together to make them an easier visual target. Dinghies or rafts from small craft usually have a limited supply of visual detection aids, and in many cases, do not carry any at all.

Target Information Sheet

Size: _____
 Colour: _____
 Name: _____
 Numbers: _____
 Profile: _____
 Type: _____



On a perfectly calm day in clear conditions a person in the water can disappear from a spotter’s sight at as little as 100 metres.

9.3.4 Look to find

A marine distress often involves a vessel still afloat but in need of some assistance. In good weather and sea conditions, larger vessels are normally good visual and radar targets. Small surface vessels are usually more difficult to detect either by visual or electronic means. The best detection aid during good visibility periods is an alert spotter.

The probability of detection of even large vessels in rough seas is greatly over-estimated by many searchers. In some cases, large vessels are not detected until the SRU is close. Small craft are usually extremely difficult to detect under such conditions. In many instances, search aircraft have flown directly overhead without sighting them. At night, if the disabled vessel has the ability to turn on lights, the probability of detection is increased. When searching for a distressed vessel by radar, identification of the target may be hampered by adverse sea conditions, which interfere with radar reception. When searching, lookouts should be alert for pyrotechnics, lights, smoke, or visual signals of any type or colour.

The scene of a major incident is usually marked with considerable debris. Persons in the water are often found in the area of the debris clinging to floating objects.

You may obtain valuable clues to its whereabouts by asking the vessel operator what he can see in the way of prominent landmasses, navigation aids, other vessels, or aircraft. By asking the operator to determine the bearings of such objects, one may be able to cross-reference his observations with your charts, and thus considerably reduce the search area.

One may also ask what depth of water the vessel is in to ascertain a fathom line to follow for search purposes. In darkness you may request the distressed vessel to fire a flare or to use some other type of illumination for you to observe (such as a searchlight). If such equipment is not available to the distressed vessel, you may use your own flares so that the distressed vessel can give you a reciprocal bearing. Whenever flares are used to obtain bearings or for illumination purposes, JRCC must be advised.

9.3.5 Searching at Night

Searching at night is a very demanding task and the darkness and uncertainty of sightings increase fatigue. The spotter must use their eyes, ears and nose to give a survivor every chance. Crewmembers must also remember that their first duty is to the safety of the vessel and they are not simply a spotter but a lookout.

Night Vision Goggles

Night vision goggles (NVGs) help spotters to pick out tiny objects in the dark. They work by magnifying existing ambient light. Ambient light is the total light available from many sources such as the stars, moon, city lights or all of these sources. Many NVGs are the binocular style and to be used correctly they require several adjustments.

Adjusting Your Goggles

- Hold the unit up to your eyes
- Adjust to match your eye width, by moving the controls for the right or left
- Adjust for individual eye focus

NVGs work best in cold, dry air. The effectiveness of the NVGs is reduced by reflected or light from snow, rain, drizzle, fog or even small invisible moisture particles. Direct intense light, from your navigation lights or other vessels close by, can reduce night vision goggles' usefulness. Under some conditions, it is necessary to stop and extinguish all lights in order to utilise NVGs. When working near lit shorelines, try to position the rescue vessel with the shore lights behind you when you are looking at the search area.

Searching Under Parachute Flares

Parachute flares may increase the chance of detecting search objects. This form of illumination has good potential when searching for objects that are located in well-defined search areas on flat land or at sea. Parachute flares are normally dropped from fixed-wing aircraft that are flying above and ahead of the searchers. In this type of search, vessels and helicopters are the most effective SAR Units.

Disoriented or Lost Vessels at Night

Vessels can easily become disoriented when travelling at night. Remember that vessel operators who are in distress are often disoriented. Be prepared to ask the type of questions, which will assist you in determining the correct position of the distressed vessel. If they are wise enough to ask for help early they will prevent grounding, or colliding with another vessel/object. This can involve anything from a full-scale search, to merely asking a vessel to determine what their heading, course and speed was *before* they got lost.

- Ask the vessel to relay the relative bearings of passing ships, aircraft, prominent landmarks, and the depth of the water in the area
- Ask the vessel to flash navigation or search lights, use their sound signals to help identify their location; and fire flares if necessary
- If VHF radio communications have been established, Vessel Traffic Services (VTS) may assist with their Direction Finding (DF) equipment, or by providing the positions of unidentified radar targets

Locating lost vessels requires the keen detective skills and local knowledge of the CGA crews. It includes piecing together all of the information and clues as to determine the correct location of the dis-

CAUTION:

NVGs will narrow your field of vision, and adversely affect night vision. Do not attempt to operate a vessel or conduct searches by NVGs alone.



tressed vessel. It usually boils down to asking the right questions on the radio or telephone.



9.3.6 The Use of Spotters

Spotter Versus Lookout

The Collision Regulations require that the vessel keep a lookout at all times. That lookout is concerned with safety of the ship and prevention of collisions.

Spotting Procedures

The more spotters you have, the greater the chance of detecting the search object. Normally, CCGA Units must make do with three spotters and a helmsman. If possible, use reserve personnel to rotate with spotters on duty, and to provide support (i.e. hot drinks, light snacks, conversation, navigation, or perhaps to prepare equipment to be used later in the mission).

The training, practice and experience of your spotters are also important factors. Military tests show that trained spotters are less subject to fatigue. The chances of detection improve if spotters are familiar with the appearance of objects in the water, such as people in lifejackets, lifebuoys, liferafts, and people swimming.

Spotting Position

The best spotting positions depend on the size and layout of the vessel. For the average vessel, if there are sufficient crew, place one spotter on each side, scanning forward and to the side. If possible, position one spotter looking aft.

Spotter Fatigue

Long searches cause crew/spotter fatigue. Fatigue occurs more rapidly under adverse sea conditions and

low visibility. Frequent rotation of lookouts helps postpone the onset of fatigue. If replacements are not available on the vessel, shift lookouts from one side of the vessel to the other at 30-minute intervals.

Keep spotters warm and comfortable. With well-trained spotters and favourable conditions, efficiency can be maintained for 2 hours. After that, performance falls off drastically.

When searching from within the wheelhouse or cabin, ensure that all windows are clear (inside and out) prior to departure. This prevents false sightings and constant re-focusing of the eyes when scanning across smudges or cracks in the windows. Dirty glass will also reduce the passage of light, so a dim light may not be seen when looking through it.

Sunglasses should be used when scanning up-sun, and are recommended for continuous use during searches in bright daylight, or high-glare conditions. Sunglasses that filter rays from the infrared and ultra-violet spectrum provide proper eye protection.

Binoculars should not be used for scanning. Once an object has been located, binoculars may be used to identify it. Binoculars should be kept clean and readily available to the spotter. Cup the eyepieces of binoculars with fingers to prevent eye injury.

It is normal for a person to require 30 minutes or more to become fully adapted to night vision. Therefore, avoid glare and reflection on board in order to preserve night vision. Illumination inside the wheelhouse should be red in colour, and should be kept to a minimum.

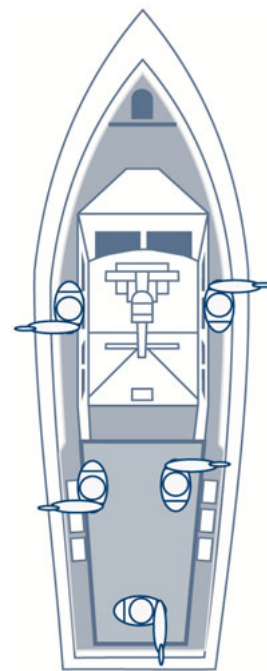
Rotate positions every half-hour, increasing frequency during poor or dull weather, to maintain your vessel as an effective search resource.

Maintain eye contact with any sighting. Attention should be attracted through a pre-arranged method of reporting – by hailing, intercom, or other means. At no time should eye contact be lost with the sighted object.

Scanning Technique

Active search requires conscious effort. It is sometimes compared to doing push-ups with your eyes. A spotter must search the sector by starting a sweep near the vessel, working your way out in a series of parallel lines to the edge of the search sector. When the sweep has been completed, a five to ten second rest can be taken followed by another search of the sector.

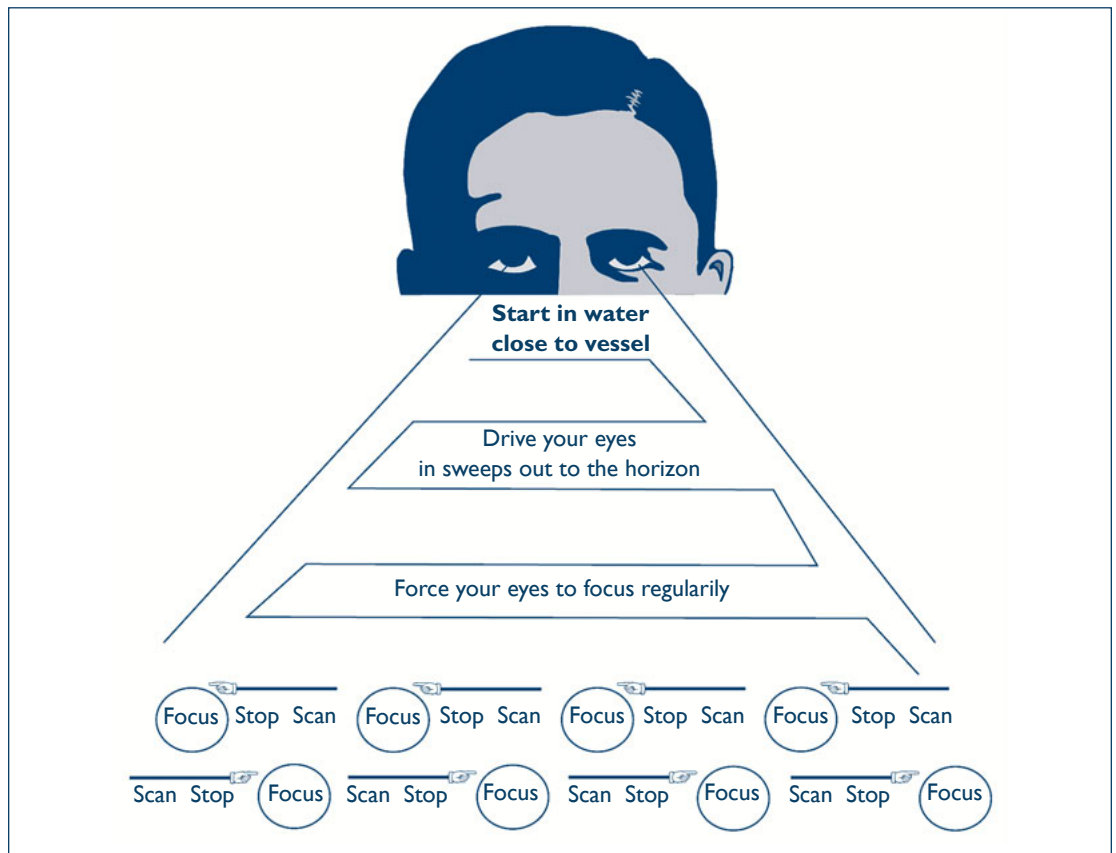
With the eyes focused straight ahead, the spotter should move his/her head to search the assigned area. Searching an area using eyes alone, without any head movement, can lead to an overexertion of the eye muscles, causing early fatigue.



Spotters in their assigned sections

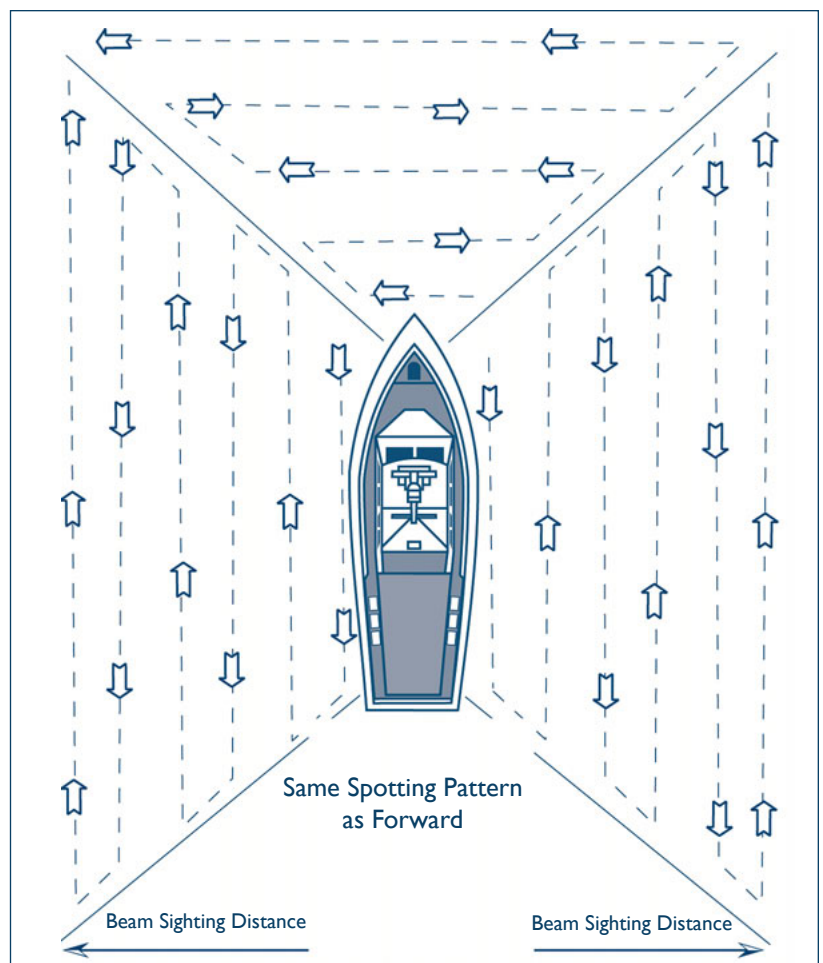


There should be absolutely no smoking. Tests have shown that smoking seriously hampers night vision.



The sequence of **SCAN-FOCUS-SCAN** should be performed in 10° to 15° segments, allowing your eyes to register objects within an 8° radius around the focused position. If you scan continuously without focusing, or focus beyond the 15° limit, your efficiency is reduced.

The retinal cells in the periphery of your vision are more sensitive to points of light than the cells in your middle focus area. You will find, when searching at night, that weak lights are detectable at the edge of sight, but not ahead. Focusing slightly higher than the horizon helps with detection.



9.3.7 Recognising a distress

Most important to your operations are the distress signals that you may see or hear. In some situations you may be the only link between the vessel in distress and the SAR system. Knowing the distress signals and knowing how to respond to them is of paramount importance for anyone involved in maritime search and rescue

Pyrotechnics

The following are some pyrotechnic emergency signals you may encounter:

- gun or explosive signal fired at about one minute intervals;
- red or orange flare fired one at a time in short intervals;
- rocket parachute showing a red light;
- orange smoke;
- any flames on a vessel.

Flag hoists

Flag hoists are a quick method of emergency signalling, but can only be used in the daytime.

These are some of the best known examples:

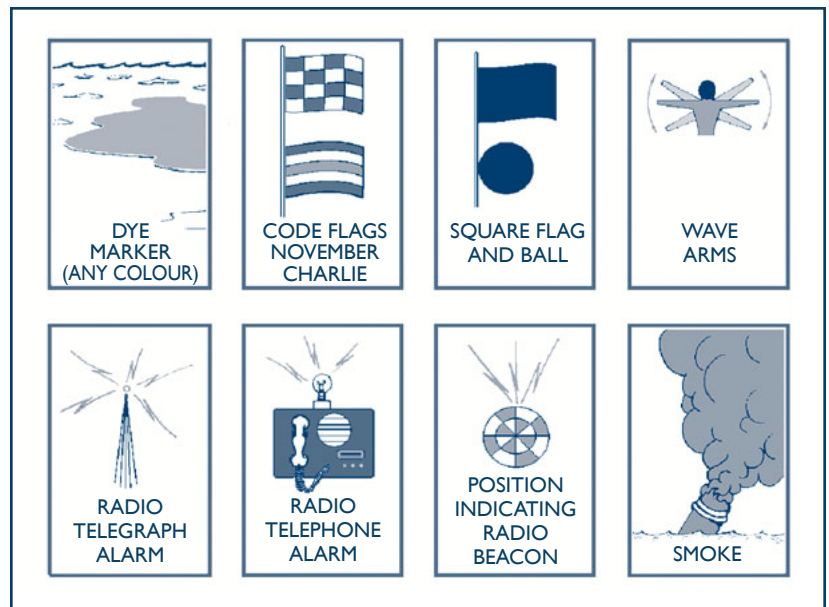
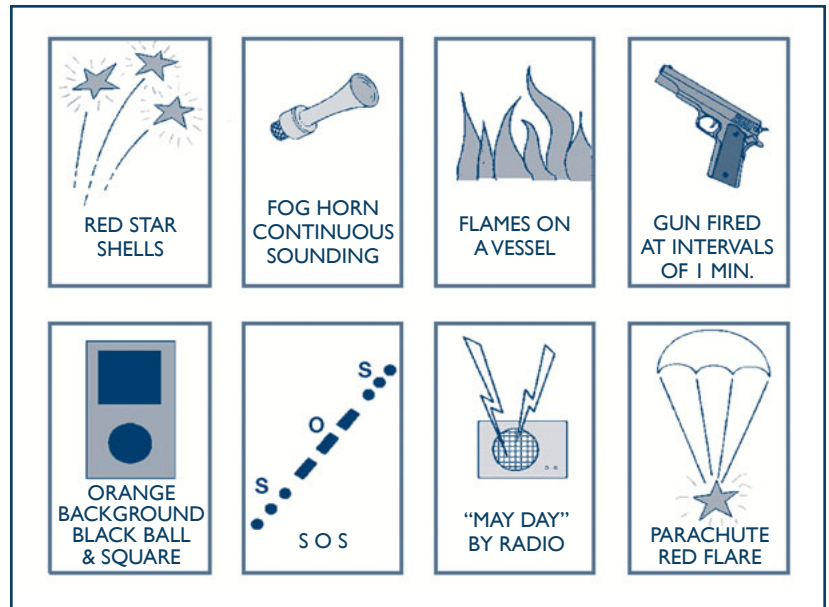
- a square flag with a ball, or ball-shaped object above or below the flag;
- an orange flag with a black ball and black square on it;
- November Charlie (N/C) flag.

Handsignals

Possibly the oldest form of signalling is hand signals, but like other methods of visual communication, the signals are not standardised and can be easily misunderstood. Crew members must be constantly alert for hand signals being sent by other mariners that are not standard distress signals, but that may be attempts to indicate an emergency situation.

These three standard hand signals are used as distress signals:

- slowly raising and lowering an outstretched arm
- signalling with an oar raised in the vertical position
- holding a life jacket aloft



Lightsignals

- The Morse code symbols “SOS” (Save Our Souls) transmitted by a flashing light may be used to communicate distress.

Possibly the oldest form of signalling is hand signals

S ... O --- S ...

Strobe lights

Strobe lights (possibly attached to a personal flotation device) can also be used. Distress strobe lights will usually emit 50-70 flashes per minute.

9.3.8 Shoreline Searches

Vessels engaged in shoreline searches must be aware of navigational constraints and any limitations imposed by sea conditions.



This pattern is used primarily for situations in which it is probable that survivors and/or debris have washed ashore. It should be used in conjunction with any pattern, which nears a shoreline (particularly a lee shore). In general, rigid hull inflatables commonly get this assignment. Their shallow draft and tilting engines allow them to land if necessary. They allow crews to check in behind trees, logs and rocks for even the smallest bits of debris. Spotters should also scan the shoreline aft to check bays, which run parallel to the shoreline, as well as up the slope of the shore, looking for discarded lifejackets, wet drag mark up otherwise dry rocks.

Searchers using this pattern should exercise caution in navigation to avoid running aground on shoals, reefs, or bars.

Vessels engaged in shoreline searches must be aware of navigational constraints and any limitations imposed by sea conditions. Spotters should consider the possibility of survivors clinging to navigational aids such as buoys, or to rocks off shore. Survivors may make their way to any dry land they drift close enough to see. Survivors may also anchor their boat or raft, or tie it to an offshore navigational aid if they drift into shallow water but still cannot see land or believe they cannot make it to shore unaided.

9.3.9 Search Patterns

Occasionally a Canadian Coast Guard Auxiliary vessel will be required to perform an open water search pattern. When arriving on scene at a search datum JRCC may ask your vessel to commence an open water search pattern.

Terms used to describe search patterns:

- ⇒ **Commence search point:** Position where the SRU begins the first leg of the search.
- ⇒ **Search leg:** One of a number of successive tracks run by the SRU.
- ⇒ **Cross leg:** Tracks that connect search legs.
- ⇒ **Track space:** Distance between adjacent search legs.

- ⇒ **Major axis:** Longest side of a rectangular search area.
- ⇒ **Minor axis:** Short side of a rectangular search area.
- ⇒ **Creep direction:** Direction of advance of SRU within search area.
- ⇒ **Beam sighting distance:** Lateral distance searched on both sides of SRU (1/2 trackspacing and normally less than maximum detection range).

Track spacing

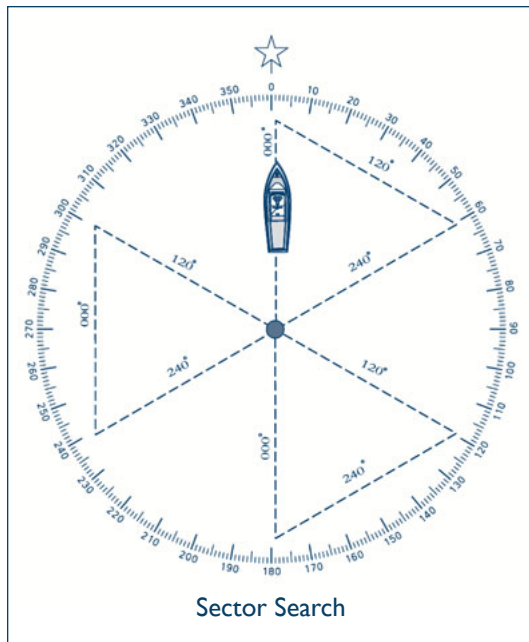
This is the distance between adjacent search legs. Track spacing can be controlled by the search planner and is based on detection capability. The more difficult the object is to detect, the closer the track spacing should be. Track spacing will normally be provided by JRCC.

Track spacing is a function of sweep width and the desired coverage factor. Sweep width is obtained from tables, which have been compiled from tests conducted on the detectability of search objects under various conditions. It is used to find the optimum track spacing and hence coverage of the search area. Sweep width is affected by:

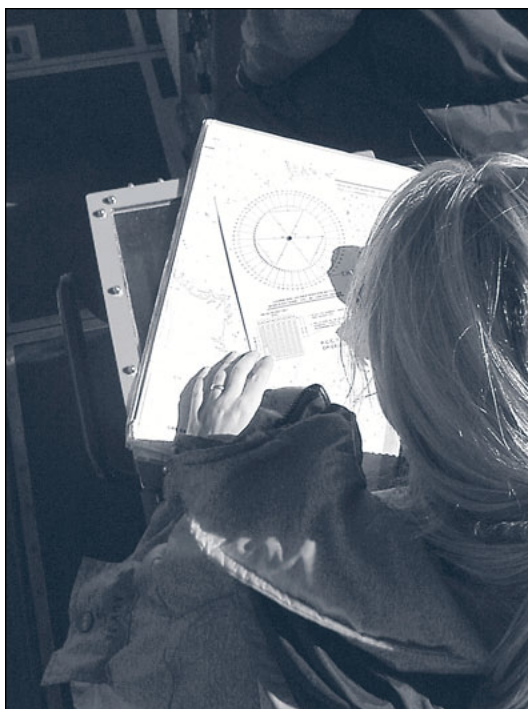
- Size and type of the search object
- Sea conditions
- Flotsam
- Glassy water, and windblown spray
- Search craft speed
- Type of search craft
- Search altitude for aircraft
- Search crew fatigue

Since this calculation is completed prior to the search actually getting underway it is important that the SRU master advise JRCC, once on scene, of the prevailing conditions thereby enabling the search planner to verify his/her calculation.

Sector Search – Victor Sierra (VS)

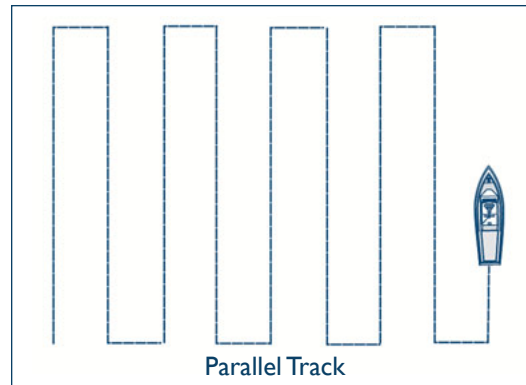


The sector pattern is used when the datum is established with a high degree of confidence and when the target is small (such as a person in the water). The SRU repeatedly passes through the datum. The pattern resembles the spokes of a wheel with the centre of the wheel at datum. One must calculate an appropriate track space and search speed as well as be able to measure elapsed time. When starting, the Datum Marker Buoy is placed at the datum (and reported to JRCC) and the search began with the initial course being in the direction of the drift or magnetic north.



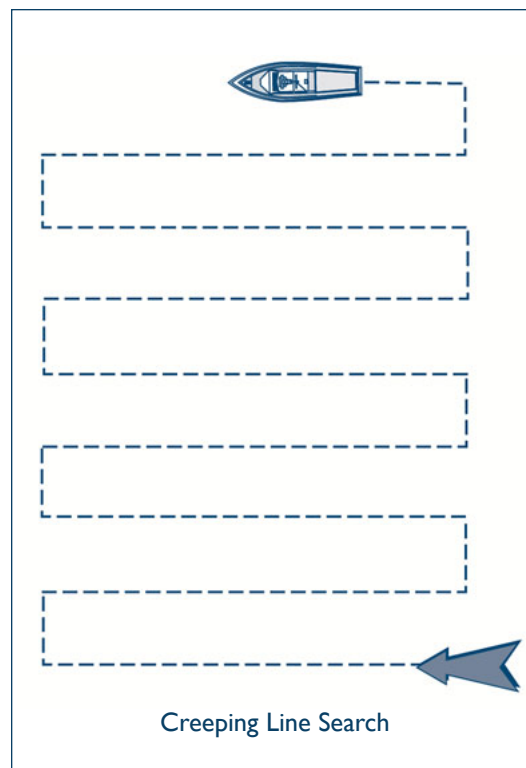
Parallel Track – Papa Sierra (PS)

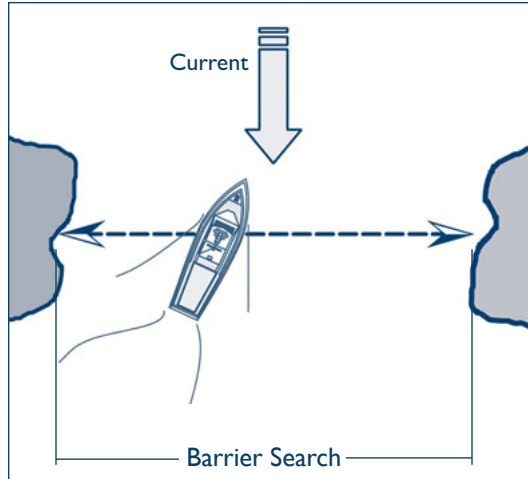
The parallel track pattern is used for general areas of probability where no precise datum is available. It can be used by a single vessel or several vessels to locate targets of all sizes.



Creeping Line – Charlie Sierra (CS)

The creeping line pattern is similar to the parallel track pattern and is used in similar circumstances. The legs however, are much shorter than in a parallel track search, making the creeping line more effective in areas of drift or current such as those experienced in narrow bays or channels. In these cases, run the legs cross-current and progress against the flow. Use this pattern where the search object is believed to be in one end of the search area.



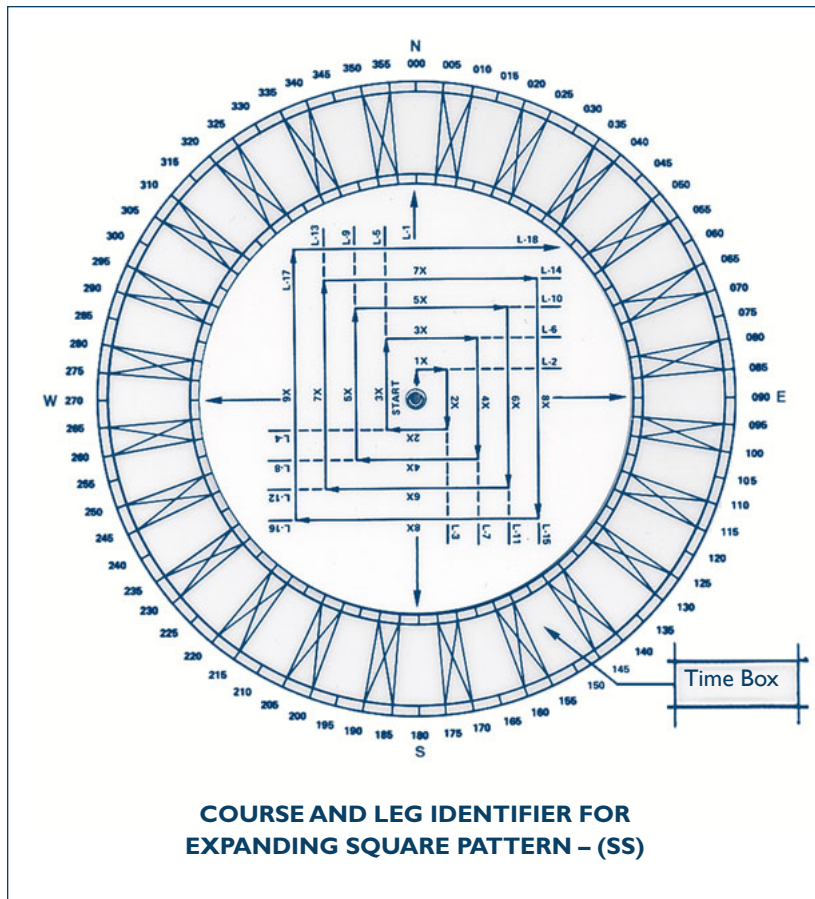


Barrier Search – Bavo Sierra (BS)

The barrier search pattern is used in search areas where strong currents are experienced. The purpose of the barrier search is to detect a search object that is being swept down current. The barrier is usually set downstream of the projected datum. It is the only pattern that uses fixed geographical points of reference. In order to conduct a barrier search, keep position against the current by employing diagonal sweeps upstream.

Expanding Square Search (SS)

An Expanding Square search is used when there is a relatively precise datum, i.e. time of distress and on-scene time of SAR unit very short, and total drift or drift state of search object very small. First, the Datum Marker Buoy is set afloat at the datum (and position reported to JRCC). The track spacing is determined from what is being searched for, and the search speed is set (usually between 5 and 10 knots, when searching for persons in the water). Careful notes should be kept on this search, of what length legs have already be completed in which direction.



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

Expanding Square Search Computation Table

Track/Space	1 kts	2 kts	4 kts	5 kts	6 kts	9 kts	10 kts	12 kts
0.5	30:00	15:00	7:30	6:00	5:00	3:20	3:00	2:30
1.0	60:00	30:00	15:00	12:00	10:00	6:40	6:00	5:00
1.5	90:00	45:00	22:30	18:00	15:00	10:00	9:00	7:30
2.0		60:00	30:00	24:00	20:00	13:20	12:00	10:00
2.5		75:00	37:30	30:00	25:00	16:40	15:00	12:30
3.0		90:00	45:00	36:00	30:00	22:00	18:00	15:00

9.3.10 Drifting with the Datum

Since it is very difficult to measure distance at sea (particularly at night), elapsed time is used to determine the length of each leg of a search pattern.

One has to remember that search patterns are scribed out on the surface of the ocean and not on the earth. If the water is moving then so is your pattern. Electronic navigation aids such as GPS give a marine navigational position in reference to the bottom of the ocean not the surface. As you manoeuvre your vessel through the shape of an expanding square or the triangles of a sector search remember that every leg of your pattern is being twisted and distorted by the effects of wind and current. This is why search patterns using GPS and radar can force your boat to go to the wrong place. When getting a pattern assigned by JRCC ask if they would like an electronic search over ground or a surface search that drifts with the datum marker.

9.3.11 Driving the pattern

A minimum of three crewmembers are required to have a vessel to perform a successful search pattern. Even with three crewmembers the vessel may drive the pattern but the spotter effectiveness will be limited, because each crewmember is busy managing the vessel around the search pattern.

Positions for a stopwatch pattern

Helm:

The person at the helm must practice the manoeuvring of the vessel through the turns and legs of the search patterns. A real search is not the time to learn how to do this.

The driver must be able to perform the following tasks:

- ➔ Keep a lookout ahead for objects and dangers to the vessel
- ➔ Use the vessel's wake trail to estimate the turn angle and bring the vessel around to 90° turns and 120° turns without the use of the compass (which may be spinning)



Use the compass to sight a landmark for the next heading and use that landmark to swing the vessel to the new heading

- ➔ Use the compass to steady the vessel on the new course after the compass stops spinning
- ➔ Adjust the throttles during the turns to maintain a constant search speed

Timer:

The person on the stopwatch will perform the following tasks:

- ➔ Draw the pattern and brief the Helm and Navigation watch of the action plan
- ➔ Calculate the compass courses of the search legs and record them
- ➔ Calculate the times of the search legs and record them
- ➔ Set up the stopwatch to count down the leg times
- ➔ Give the helm a five-second warning for the next turn and the compass course for the new search leg



- ➔ Cross off the pattern legs as they are completed
- ➔ Keep eyes up and search your sector

Navigation Watch and Speed Control:

The person on the navigation watch will perform the following tasks:

- ➔ Perform all regular Navigation Watch duties
- ➔ Watch the vessel's course and speed
- ➔ Relay the speed to the helm
- ➔ Watch the radar for contacts
- ➔ Keep a lookout for dangers to the vessel

Extra spotters should search their assigned sectors

9.3.12 Finding Things

Flotsam and Jetsam

Objects that have drifted free of wreckage (flotsam) and items that have been thrown overboard (jetsam) are hard to distinguish. That is why when you are searching, everything that you sight or find is evidence until you have definitely ruled it out. Any items such as life jackets, pillows, fuel tanks, bottles, paddles etc. are treated as flotsam and reported to JRCC immediately. The crew must record the positions of all suspicious objects and include this information with the SITREP.

Objects that have drifted free of wreckage and items that have been thrown overboard are hard to distinguish

Abandoned Vessels

When coming across a vessel adrift, treat it as though there might be a person or persons on board. Survivors may be in the water, a raft or in a dinghy close by.

Use your detective skills to find the clues:

- ➔ Is the vessel full of fishing gear, with lines out?
- ➔ If vessel has an engine check the position of the throttle and gear lever
- ➔ Check the fuel level in the gas tank
- ➔ Check the temperature of the engine exhaust
- ➔ Check the vessel's mooring lines: are they coiled neatly in the vessel or is the bowline hanging out and broken?
- ➔ Where are the paddles: stowed or missing?

Always advise JRCC of the position and circumstances of a vessel adrift, along with a complete description of the vessel, contents, markings, weather on scene, and indications of time since occupied.

9.4 Other Search Units

When dealing with other SAR resources it is important that you keep track of the communications and unit tasks. Many different agencies can be involved in a large-scale search and it is beneficial to be aware of the other units capabilities.



Surface Vessels

Surface vessels are used for searching, and for their ability to execute a rescue or stabilise a marine incident under a wide range of conditions. Surface vessels can be divided into two broad categories: boats and ships.

Boats

- ➔ Small vessels make limited search platforms because of the spotter's low height of eye and the movement of the vessel in rough conditions
- ➔ Rescue boats are usually deployed for fast, short-range rescues in sheltered waters, and searches in shallow or confined waters
- ➔ Often an open-boat design, providing crew and survivors with limited protection from the elements

Ships

- ➔ Superior to small vessel because of the height of eye advantage
- ➔ Offer more protection from the elements
- ➔ Capable of operating away from their home port for days or weeks
- ➔ Can provide greater level of care to survivors

When dealing with other SAR resources it is important that you keep track of the communications and unit tasks.

Canadian Navy / Department of National Defence (DND)



The bridges of warships make good search resources because they have many spotters and constant relief. Their radar is superior to that of other ships. Navy ships are fast, manoeuvrable, high endurance vessels that also pack the communications capable of controlling both aircraft and vessels on-scene. Naval vessels also make excellent rescue ships, since they can get to the rescue scene quickly, using their helicopters and rigid hull inflatables (RHIs) to rescue and transport survivors.

Royal Canadian Mounted Police (RCMP)

The RCMP have several high-speed catamarans in the Pacific Region, each providing a solid platform for search and rescue operations. Local detachments also have small boats capable of aiding in a search. RCMP members have good local knowledge and their vessels are generally capable of participating in in-shore SAR, but should be cautioned against proceeding in adverse weather conditions.

Fishing Vessels

Fishing vessels generally make good rescue platforms. A fisher's local knowledge makes them an invaluable resource, especially during inshore searches.

Weather is the biggest factor for these vessels, particularly with the smaller inshore boats.

Pleasure Craft

Pleasure craft can make good search vessels, but care must be taken in their tasking. Most pleasure craft owners have little nautical training, and probably no SAR training, so when they are tasked to assist, you must make certain that they can complete the tasking safely.

Weather is a primary concern for these vessels. Every effort should be made to avoid tasking pleasure craft in adverse weather conditions.

Other Local Resources

Other local marine SAR resources may be available. Consult with local fire and police departments, commercial operators and organised volunteer groups concerning their search and rescue plans.

Aircraft

- Most suitable platform for conducting a search. Their speed and search height allow them to effectively cover large areas
- Good SAR aircraft have a relatively quick transit/cruising speed, and a slower speed for searching (100-150 kts). Faster aircraft can still be used for conducting electronic searches, or for sweeping large oceanic search areas
- Helicopters are excellent SAR aircraft. They have fairly limited range, when compared to fixed wing aircraft, so their strength is in the rescue, rather than in the search
- When properly equipped, helicopters are excellent platforms for conducting coastal “crawls” (day or night)

Primary Air Resources

Each Search and Rescue Region has dedicated SAR air resources provided by a Department of National Defence Cormorant helicopter offering the following capabilities:

Searching

- Visual detection day
- Visual detection night (illumination flares, lights)
- Electronic Direction Finding
- Visibility (time-of-day, lighting, mist, haze, smoke)
- Weather endurance
- Range
- Low search speed



9.5 Example of Log Entries During a Search

Abbreviated Excerpts taken from search log, Coast Guard Ship *Gordon Reid*

CCGS Gordon Reid SAR Events Log	
	<i>May 16th Year 1995 JRCC W95-0560 14-foot skiff found overturned 34 year old male missing</i>
<i>1423</i>	<i>Mayday Relay vessel "Go Getter" advises man missing from skiff, Kumealon Inlet area 53 43.6' N 129 49.6 W</i>
<i>1428</i>	<i>Coast Guard Ship Gordon Reid, and GR 1 (733) , CCGS Point Henry, USCG Helo 6022, all tasked</i>
<i>1442</i>	<i>GR1, GR and Point Henry all underway ETA 1 Hour other vessels underway</i>
<i>1507</i>	<i>VAJ (Prince Rupert Coast Guard Radio) co-ordinates channels and advises vessels on scene of search plan.</i>
<i>1543</i>	<i>JRCC advises Gordon Reid to Commence (BS) pattern search at Pitt Point Point Henry is tasked to interview reporting party on board "Go Getter"</i>
<i>1552</i>	<i>Point Henry advises subject has been missing for five hours last seen 1115 hrs. and was not wearing a PFD or warm clothing. The skiff was found overturned in open water at 1400hrs</i>
<i>1616</i>	<i>All areas 2nm from LKP have been searched by units Shoreline search Kumealon bay complete and nothing found. Search Area expanding</i>
<i>1644</i>	<i>A/C 6022 completes shoreline and open-water patterns</i>
<i>1708</i>	<i>Helo R456 arrives on scene and commences open water search</i>
<i>1724</i>	<i>Commercial Diver searches bottom near LKP and negative results Reporting vessel feels that survival chances are minimal</i>
<i>1737</i>	<i>JRCC advises most areas have been covered twice shoreline search commencing for third time</i>
<i>1839</i>	<i>RCMP advised and on route</i>
<i>1927</i>	<i>JRCC advises all units stand down negative results (search time 5.1 hours)</i>
	<i>WX: GR1 Crew</i>
	<i>SS: calm Kelly</i>
	<i>Wind: 15kt NW Armstrong</i>
	<i>Sky: clear Smith</i>