Lifeboats

RNLI / MCA Agreement on Search and Rescue (SAR) Operations and Planning

TP-LB-115

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APPENDICES:

RNLI / MCA - Agreement on SAR Operations and Planning

Aim:

To harmonise SAR theory, procedures and operational requirements

Objectives:

To confirm SAR terminology
To promote good communication between MRCCs and Lifeboats
To confirm understanding of Search models and Patterns
Adopt use for training and operational requirements, HMCG SAR Graphs and Tables by the RNLI as a controlled document

Reference:

IAMSAR MANUAL
HMCG SAR GRAPHS AND TABLES

Scope:

1. Remove use of EDR from RNLI teaching and terminology
2. Adopt use of Sweep width and associated tables by the RNLI
3. Adopt use of ALB and ILB tasking forms
4. Confirm SAR theory and operational procedures as described hereinafter.
5. Appreciate how the MCA develop their search plan

Search and Rescue:

Searching by its very nature involves uncertainty; if the position of a search object is known or could be accurately predicted then no search would be necessary. The most significant factor in a search scenario is the object's location. This involves uncertainties about time and location of an incident and the type of object. Even when these are known within reasonable limits, if a significant amount of time elapses between the distress and arrival on scene of an SRU uncertainty about the object's location will increase. This is due to uncertainties in the available data about environmental factors that cause drift (wind, tide and surface currents) and uncertainties about how the object will respond to these factors.

The aim of SAR is to keep time spent on searching to a minimum as the condition of those in distress degrades the longer the assistance takes. The quicker the casualty is located the higher the probability of survival.

Role of IMO:

The importance of international co-operation in shipping has been recognized for centuries, and has long been manifested in maritime traditions such as ships taking refuge in foreign ports in the event of bad weather and going to the aid of others in distress, irrespective of their nationality.

The Geneva conference 1948

The Geneva conference opened in February 1948 and on 6 March 1948 the Convention establishing the Inter-Governmental Maritime Consultative Organization (IMCO) was adopted. (The name was changed in 1982 to International Maritime Organization (IMO).

The function of IMO provides for the drafting of conventions, agreements or other suitable instruments; provides machinery for consultation among Members and exchange of information; facilitates technical co-operation.

One of the purposes of IMO is ;

> To provide machinery for co-operation among Governments in the field of governmental regulation and practices relating to technical matters of all kinds affecting shipping engaged in international trade, and to encourage the general adoption of the highest practicable standards in matters concerning maritime safety, efficiency of navigation and prevention and control of marine pollution from ships.

SAR Convention

Although the obligation of ships to go to the assistance of vessels in distress was enshrined both in tradition and in international treaties (such as the International Convention for the Safety of Life at Sea (SOLAS), 1974), there was, until the adoption of the SAR Convention, no international system covering search and rescue operations. In some areas there was a well-established organization able to provide assistance promptly and efficiently, in others there was nothing at all.

The 1979 Convention, adopted at a Conference in Hamburg, was aimed at developing an international SAR plan, so that, no matter where an accident occurs, the rescue of persons in distress at sea will be co-ordinated by a SAR organization and, when necessary, by co-operation between neighbouring SAR organizations.

The technical requirements of the SAR Convention are contained in an Annex, which was divided into five Chapters. Parties to the Convention are required to ensure that arrangements are made for the provision of adequate SAR services in their coastal waters.

Role of IMO continued:

Parties are encouraged to enter into SAR agreements with neighbouring States involving the establishment of SAR regions, the pooling of facilities, establishment of common procedures, training and liaison visits. The Convention states that Parties should take measures to expedite entry into its territorial waters of rescue units from other Parties.

The Convention then goes on to establish preparatory measures which should be taken, including the establishment of rescue co-ordination centres and subcentres. It outlines operating procedures to be followed in the event of emergencies or alerts and during SAR operations. This includes the designation of an on-scene coordinator and his duties.

IMO search and rescue areas

Following the adoption of the 1979 SAR Convention, IMO's Maritime Safety Committee divided the world's oceans into 13 search and rescue areas, in each of which the countries concerned have delimited search and rescue regions for which they are responsible.

IAMSAR Manual

Concurrently with the revision of the SAR Convention, the IMO and the International Civil Aviation Organization (ICAO) jointly developed the International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual, published in three volumes covering Organization and Management; Mission Co-ordination; and Mobile Facilities.

The IAMSAR Manual revises and replaces the IMO Merchant Ship Search and Rescue Manual (MERSAR), first published in 1971, and the IMO Search and Rescue Manual (IMOSAR), first published in 1978.

These volumes provide guidelines for a common aviation and maritime approach to organising and providing SAR services.

- The Organisation and Management volume (volume I) discusses the global SAR system concept, establishment and improvement of national and regional SAR systems, and co-operation with neighbouring states to provide effective and economical SAR services.
- The Mission Co-ordination volume (volume II) assists personnel who plan and co-ordinate SAR operations and exercises.
- The Mobile Facilities volume (volume III) is intended to be carried aboard rescue units, aircraft, and vessels to help with performance of a search, rescue, or on-scene co-ordinator function, and with aspects of SAR that pertain to their own emergencies.

This Manual is published jointly by the International Civil Aviation Organisation and the International Maritime Organisation.

Role of HMCG:

The Maritime & Coastguard Agency (MCA) provides a response and co-ordination service for maritime SAR, counter pollution and salvage.The SAR role is undertaken by HM Coastguard, which is responsible for the initiation and co-ordination of civil maritime SAR. This includes the mobilisation, organisation and tasking of adequate resources to respond to persons either in distress at sea or to persons at risk of injury or death on the cliffs and shoreline of the UK. As part of its response, the MCA provides Coastguard Rescue Service Teams for cliff and shoreline search and rescue purposes.

HMCG is equipped and organised to act as national co-ordinator of all civil maritime Search and Rescue (SAR). In responding to reports of casualties at sea or on the coast, HM Coastguard will can call upon a wide range of facilities made available by the organisations participating in UKSAR. These are known as Declared Assets, which are facilities designated as being available for civil maritime SAR according to a specific standard or set criteria.

The full list of declared SAR Facilities is extensive, but includes:

- HMCG own auxiliary Initial Response and Coastguard Rescue Teams;
- Inshore lifeboats, all-weather lifeboats and inshore rescue hovercraft operated by the Royal National Lifeboat Institution
- other nominated inshore rescue services
- Search and Rescue helicopters under contract to the MCA
- Ministry of Defense SAR helicopters and fixed wing aircraft operated by the Royal Air Force (RAF) and Royal Navy (RN)
- Emergency Towing Vessels (ETV) - powerful tugs contracted to the MCA
- nominated Fire Service teams for cliff and mud rescue as well as firefighting and chemical incident response for vessels at sea
- nominated beach lifeguard units

HMCG initiates and co-ordinates civil maritime SAR around the UK and over a large part of the Eastern Atlantic. The UK SAR area is monitored by a network of 19 Maritime Rescue Co-ordination Centres (MRCC). Amongst other tasks HMCG MRCCs are responsible for:

- Maintaining an electronic radio watch on VHF DSC Ch 70 (156.525 MHz) around the whole of the UK coastline and up to 30m offshore.
- Maintaining a continuous, loudspeaker, listening radio watch on VHF Ch16 (156.8MHz) the UK Distress, Urgency, Safety and calling frequency.
- Broadcasting Maritime Safety Information (MSI) to set schedules.

Role of the RNLI:

The Royal National Lifeboat Institution is a registered charity that saves lives at sea. It provides 24-hour on-call service to cover search and rescue requirements out to 100 nautical miles from the coast of the United Kingdom and Republic of Ireland and a seasonal beach lifeguard service on appropriate beaches in the south west of England. The RNLI is independent from Government and continues to rely on voluntary contributions and legacies for its income.

Concept of Operations

The RNLI saves lives at sea throughout the United Kingdom and the Republic of Ireland by providing:

- A strategically located fleet of all-weather lifeboats which are available at all times and tactically placed inshore craft which are subject to weather limitations.
- A Beach Lifeguard service on a seasonal basis where appropriate.
- Safety education and accident prevention.

to a defined standard of performance, commensurate with the resources available, using trained and competent people who, wherever possible, are volunteers.

Strategic Performance Standards

The RNLI aims to:

- Achieve an average launch time of 10 minutes from notification to the RNLI.
- Reach all notified casualties where a risk to life exists, in all weathers, out to a maximum of 100 nautical miles.
- Reach at least 90% of all casualties within 10 nautical miles of Lifeboat stations within 30 minutes of launch in all weathers.
- Reach any beach casualty up to 300m from shore within the flags on RNLI lifeguard patrolled beaches, within 3.5 minutes.

The acknowledgement of the particular fast response times required for the Thames, has led to the following declared level of cover for the tidal reaches of the Thames: The RNLI will provide a lifeboat service on the tidal reaches of the River Thames west of Longitude 000º 33 East which aims to reach 95% of reported casualty locations within 15 minutes of notification to the RNLI in moderate weather conditions.

Role of the SMC: (Search and Rescue Mission Coordinator)

In the UK the SAR Mission Co-ordinator (SMC) is the Coastguard Officer assigned to co-ordinate response to an actual or apparent distress situation from first notification of the incident until its conclusion, or until a suitable relief takes over. The SMC is responsible for planning and coordinating the response to an incident and maintaining communications with search and rescue units including the lifeboats. The SMC will keep all SRUs, including lifeboats, informed of any relevant development in the SAR mission and will expect, and should receive, periodical SAR situation reports from the lifeboat, especially upon initially reaching the scene of the incident.

SRU Commander :

The SRU Commander may be any one of the following; All Weather Lifeboat Coxswain, Inshore Lifeboat Helmsman, Hovercraft Commander or a person in charge of any other SRU.

Duties of the Search and Rescue Unit (SRU):

1. The SRU Commander's primary responsibility is the safety of the crew and the lifeboat / hovercraft.
2. The SRU Commander has a duty to communicate his local area knowledge to the SMC.
3. The SRU Commander has a responsibility to carry out the search plan as required by the SMC. However, should local circumstances dictate that this is not practicable, or the SRU Commander has good grounds to believe that the plan requires modifying in light of, for example, on-scene conditions, his experience and/or local knowledge, then consultation shall take place with the SMC about alternatives.

SRU Commander as the On Scene Coordinator (OSC):

When two or more SAR facilities are working together on the same mission, on scene coordination (OSC) may be required to best organise the activities of all or some of the participating units and be the eyes and ears of the SMC. The appointment of the OSC is the responsibility of the SMC and may be made in consultation with the responding vessels and/or search and rescue units (SRU). A SRU Commander may be requested to act as OSC.

The SMC may only *request* a SRU Commander to assume the duties of the OSC, which he can decline. He may decline on a number of grounds: the weather, the complexity of the operation or that there is a more capable vessel / better qualified candidate for the position. It is unlikely that the SMC will request a lifeboat to take on the role of OSC as well as being involved as a search unit at the same time. However, where a search consists of a number of leisure craft or small fishing vessels the SMC may well request that the SRU Commander co-ordinates the progress of these vessels since they are not trained in SAR and may have difficulty in understanding what is required of them.

The SRU Commander, as OSC, has a responsibility to ensure that his additional duties are carried out correctly.

The commander of each SRU, under direction of an OSC, remains in command and is responsible for the safety of their vessel and crew at all times.

As the OSC, the SRU Commander has a responsibility to carefully consider safety implications before making requests of other vessels (particularly as he is quite likely to have greater knowledge of the locality and conditions than other vessels involved in the SAR incident) The OSC must ensure there is a suitable safe separation in distance between units engaged in a search.

Duties of the OSC:

1 **Carry out search plan as directed by SMC.**

Note: Remember you know the area and local conditions and this information will greatly assist the SMC. Ensure that a full dialogue takes place between you and SMC so that you understand the plan and what is expected of you and that the SMC understands any limitations you may have in carrying out the plan.

2 **Ensure reports are compiled and sent every 30 minutes as a Situation Report (SITREP).**

3 **Co-ordinate on-scene communications between units.**

Note: It is important to explain to other units your (and the SMC's) intentions and, if appropriate, reasons.

4 **Keep records of the operation:**

- Times of arrival/departure of own and other units
- Areas searched
- Track spacing
- Sightings reported and their positions and times
- Actions taken & results achieved

5 **Keep as much information as possible on your paper chart and as tidily as you can as this will greatly assist in writing up a complicated service. If it is difficult to record all the details pass the information as a radio message – it will be recorded by the MRCC.**

6 **Liaise with the SMC as to when SRU's are no longer required.**

For example: If a search is moving close inshore and a large merchant vessel has been involved in the offshore search, or weather conditions deteriorate and an ILB has been assisting in the search.

7 **To report numbers and names of survivors – this is most important when there are a large number of survivors, as accurate records need to be kept to ascertain who is still missing.**

Note: Do not pass over voice circuits the identities of any deceased. It may be pertinent to pass names of survivors over more secure circuits where possible (e.g COACs PMR).

8 **General points:**

- Do consider the safety implications before making requests of other vessels.
- Do ensure such requests are not interpreted as an order that has to be obeyed against the better judgment of the units or volunteers.
- Before making a request for action, be reasonably satisfied of the relevant expertise of the unit being requested to assist.
- Do ensure that if a request for action involves risk then the unit or volunteer is made aware of all risks that are known to you as OSC.

9 **Other Considerations:**

- Speed: Speed of slowest vessel less one knot – or slower if considered appropriate in the conditions.
- Other Vessels Problems: Manoeuvrability; manpower – high sided vessels cannot recover survivors from the water without great risk and difficulty.

Search Area Determination:

Search Planning

Search planning is the process of determining an area or areas to be searched and developing a search plan for a drifting maritime target, the position of which is unknown.

Search Area

The search area is the geographic area determined by the SMC as most likely to contain the search object. It is determined by utilising the objects last known position (LKP) and calculating a datum(s) from drift vectors (ie, the effects of wind and tide) for the elapsed time from drift start to arrival on scene of a SRU. Sometimes, to take account of search duration, the datum time adopted by the SMC will be after the expected arrival of the SRU.

A fix error, associated with the last known position, along with a drift error (normally up to 30% of the resultant drift vector) is applied to produce an area around the datum(s) in which the search object could be.

The optimum outcome for the SMC is to search the whole of this area to an acceptable level of thoroughness. This outcome is attained when the actual SRU track spacing is equal to or less than the corrected sweep width for the particular search target. It may not always be possible to achieve this optimum as a track spacing may be required which is greater than sweep width to meet other operational requirements. These might include the necessity to cover the search area before darkness, the approach of adverse weather, SRU endurance or to avoid known navigational hazards. Sweep widths and track spacing will be discussed later.

Drift Start Position

The Drift Start Position (DSP) is the position from which the target is known or is estimated to have started to drift. The DSP may be a fix i.e. given by the casualty or an observer, or a Dead Reckoned (DR) Position (a calculated position based on the vessel's course and speed only over a period of time, taking no account of outside influences like wind and tide) or an Estimated Position (EP) where some calculations have been made applying tide and leeway or some other estimated start location.

Drift Start Time

The Drift Start Time (DST) is the time at which the target started to drift. This may also be known or estimated.

Datum Time

The time for which the search area is calculated.

Datum Position

A Datum Position is the most probable position in which the drifting target is calculated to be at the datum time, allowing for the effects of tide, current and wind. If only tide and downwind (leeway) drift is considered, as in the case of a rapid response, there is only one datum position at the datum time. Ideally, the target will in theory be in this position at the datum time. However, if divergence is taken into account, (that is, the maximum possible angle of deflection either side of downwind that a target might follow), this will result in three datum positions (see section on S.A.R.I.S.).

- **Rapid Response Method**

The Rapid Response Method (RRM) provides a convenient and quick solution for the calculation of a datum position and therefore a search area. The search area is determined by taking into account the tide and leeway drift (downwind only) acting on a search object from the drift start time to the datum time. It does not take into account divergence or a wind driven current.

When to Use

The main advantage of rapid response is that it can be quickly and easily calculated from data that is available from the onset of the incident and will provide a simple auditable search plan. It is used when:

- *There is a short drift elapse time,* ***generally up to one hour***
- *Units are on or near the scene;*

What is needed is:

- *A drift start position (Often the LKP);*
- *A datum time; (the arrival on scene or commence search time)*
- *Tidal data;*
- *Wind speed and direction;*
- *Downwind leeway drift data (from tables).*

Advantages and Disadvantages of Rapid Response

Advantages:

- *Quick to calculate;*
- *Data readily available;*
- *Datum established with high degree of confidence;*
- *Small search area*
  – generally good coverage and probability of detection (POD);
- *Allows initial good quality search;*

Disadvantages-

- *Wind driven currents not considered;*
- *Divergence not considered;*
- *Not appropriate for long drift elapse times or search objects with high drift rates*

If the SMC elects to use the rapid response method it would generally be the case that the Lifeboat would be directed to proceed to the datum position, stop engines and listen for a moment (if weather conditions permit) and then commence the search from this point. However if the search is for a person in the water within an area where there could be buoys, pot markers or other objects that a casualty can cling to the Lifeboat would normally pass through the last known position (LKP) before proceeding to the commence search point as detailed by the SMC. It is likely to follow that an expanding square or sector search is requested.

SAR- Rapid Response Method - ALB Check Card

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SAR - Rapid Response Method

CHECK CARD

Valid for SAR units arriving on scene and commencing searching within one hour of DST. Consideration to extending this is subject to an accurate DSP and minimal leeway, otherwise a full search area including divergence must be calculated.

1. **Plot the Drift Start Point Position** (DSP)

   On a suitable scale chart, plot the DSP from the fix or DR position and label with the Drift Start Time (DST).

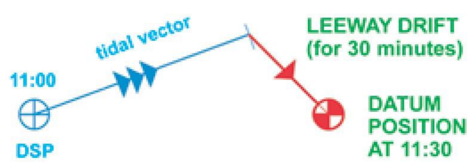
2. **Estimate the time to arrive on scene then work out relevant tidal vector.**

   The estimated time of arrival (**ETA**) at the search area will be determined by the speed of the search vessel and its distance from the scene. After working out the ETA, plot the calculated tidal vector for the relevant time period using information gathered from local tidal diamonds or tidal stream atlas.

   In the following example the **ETA** on scene is **30 minutes.**

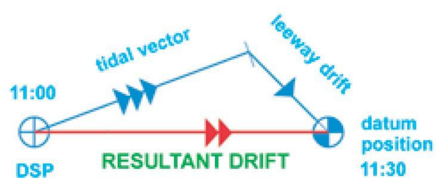
3. **Apply the Leeway Drift Vector (for the same length of time and in the downwind direction)**

   This is applied by using values obtained from the SAR tables for the seach object and is laid off from the end of the tidal vector. The end of the leeway vector is then the **DATUM POSITION**.



4. **Plot the Resultant Drift.**

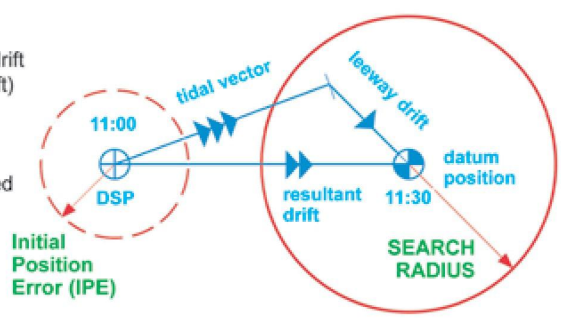
   Plot a line between the DSP and the datum position. This line is referred to as the **RESULTANT DRIFT**. The length of drift must be measured from the chart as the distance is needed to calculate the required search radius.



5 **Calculate the search radius and determine the search area.**

   To calculate the search radius, add the drift error (about one third of the resultant drift) to the initial position error (IPE). Determine the initial position error from tables two and three of the SAR graphs and tables, this error is transferred through to the datum position.

   Plot the search radius from the datum position. Commence a datum search (expanding square or sector) from the datum position.



Navigational Fix Error (IPE) Table:

The table below is for guidance only. If you have more accurate information, then use that.

Means of Navigation	Fix Errors in Nautical Miles
Inertial Navigation System	0
SATNAV (e.g.: DGPS)	0.1 - 0.5 NM
Visual Three Line Fix	1.0 NM
Radar Fix	1.0 NM
Celestial Three Line Fix	2.0 NM
Marine Radio Beacon (3 beacon fix)	4.0 NM

If the means of navigation on the distressed craft is unknown, the SMC should assign an error based on the following:

- 5NM for ships, military submarines and aircraft with more than two engines.
- 10 NM for twin engined aircraft.
- 15 NM for boats, submersibles and single-engine aircraft.

Notes:

On Scene

The coxswain must ensure that arrival in the search area is reported to the SMC along with on scene observations about; (SEE SITUATION REPORT FORM)

a. WEATHER wind direction and speed

b. PRECIPITATION

c. VISIBILITY

d. SEA STATE-sea and swell height plus direction

e. TIDE DIRECTION and RATE-where practicable

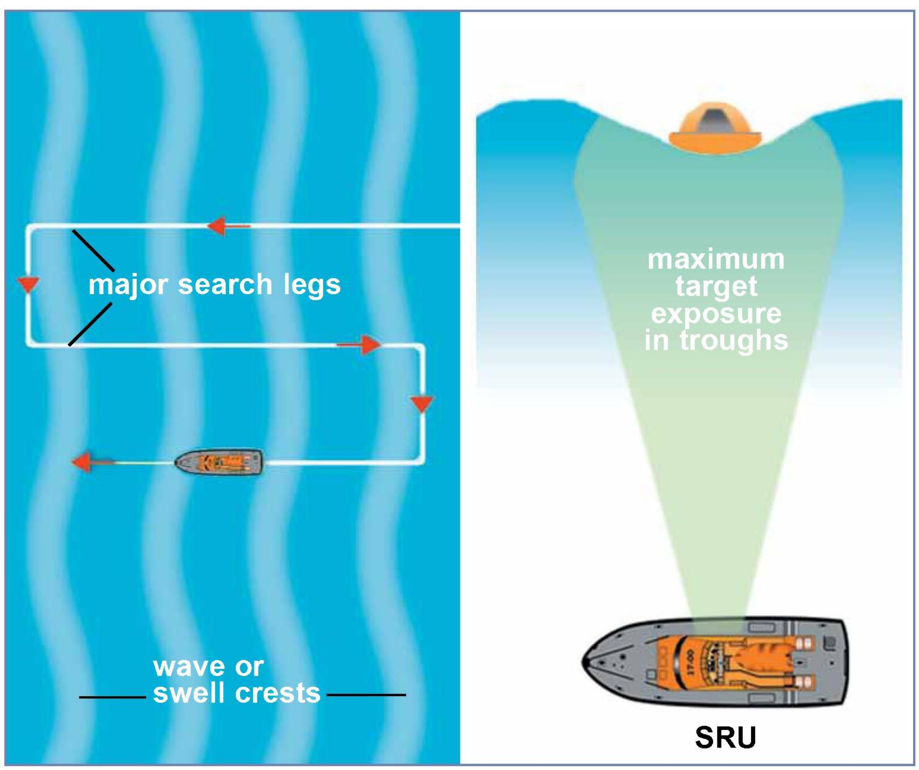
f. ABILITY of LIFEBOAT to search in a particular direction because of glare from the sun or benefit of moonlight and/or best sea keeping direction

g. LOCAL KNOWLEDGE which might be pertinent to the search i.e. unusual tidal features, shallow rocky coastline where ILB, HELO or CLIFF RESCUE might be needed

h. SHALLOW AREAS - where the lifeboat may not be able to search

Orienting Search Areas

Search patterns should be oriented to maximise target exposure to lifeboats. This is especially important in any combination of high sea state, low target freeboard, and low searcher height. Under these circumstances, search leg headings perpendicular to the seas or swells, whichever is dominant, prolong the time that objects are visible on the beam as the SRU passes. This search leg orientation is also best for minimizing roll motion of surface SRUs.



- **Datum Point**

The datum point search area develops the rapid response a stage further by taking into account wind driven current and divergence. This creates three datum points instead of one datum position.

When a datum point area is determined by the Coastguard they will usually use their software search planning program - Search and Rescue Information System (S.A.R.I.S.). The search area determination is based on the following ***calculated*** information:

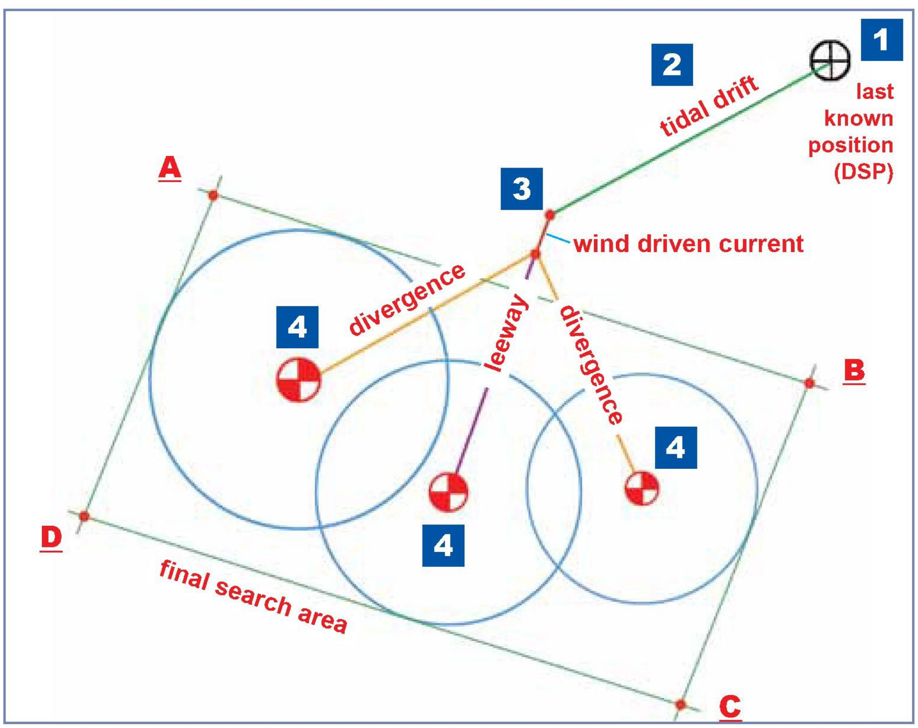
1 **Last Known Position.** This is generally also the Drift Start Position (DSP) (unless the search is a Datum Line search).

2 **Tidal Drift.** This is calculated and plotted based on the time the search object has been in the water. The tidal information is derived from a hydrodynamic tidal database.

3 **Wind Driven Current.** This is calculated using formulae based on surface wind speed data. The result is added to the tidal plot line. *Note: The Coastguard will only consider adding this element to the search plot if the surface wind has been blowing in the same direction for more than 48 hours over a long fetch.*

4 **Leeway Drift.** This is calculated from an established formula. The **Leeway Drift** calculation is based on the type of search object and the anticipated movement as it is pushed across the water by winds blowing against its exposed surfaces. The **Leeway Drift** factor is obtained from Coastguard tables.

Leeway Divergence. The general direction of drift of all search objects will be down wind. However, studies have shown that the search object's actual direction of leeway drift may be up to 60° either side of the down wind direction. Divergence is applied allowing for a maximum possible deflection of the search object either side of the down wind direction, there will be three datum points produced giving rise to three datum areas. These are boxed off into the smallest possible rectangle to produce the search area. It should be noted that the actual search area is that contained within the circles. The circles are boxed-off simply to make assignment of search units easier (it being difficult to search circular areas).



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Sweep Widths and Track Spacing:

Track spacing (S) is the distance between successive search legs

Visual sweep width (W) is a mathematically expressed measure of detection capability based on target characteristics, environmental conditions, height of eye and other limitations. A Sweep width of 1 mile means half a mile either side of the SRU. Sweep width will always be less than twice the maximum detection range (the furthest distance you would normally expect to see a target). The Sweep width concept provides a convenient method to ensure a search area can be accurately covered.

Generally the SMC will provide the Lifeboat with the following;

1. **Search area coordinates**
2. **Commence search position**
3. **Required track spacing**
4. **Leg length and direction of first search leg**
5. **Search pattern required**
6. **Width of search legs or number of legs**
7. **Search speed**

Search speed is assessed by the SMC according to the conditions and target type e.g. slower to locate a person in the water. Lifeboats should always advise the SMC if they cannot achieve the suggested speed or if they can go faster See Annex X (speed).

Sweep Widths and Track Spacing (continued):

The visual sweep width for Lifeboats is obtained from Coastguard SAR graphs and tables using the **small vessel** column, the visibility on scene and type of search object to extract a value.

TABLE 4: Training only - not for operational use

TABLE: UNCORRECTED VISUAL SWEEP WIDTHS (in nautical miles)

		SRU - SURFACE VESSEL					
Search Target	SRU Size (ft)	Small Vessel (40 ft)					
	Visibility (NM)	1	3	5	10	15	20
PIW	Person In Water	0.2	0.2	0.3	0.3	0.3	0.3
Liferafts	1 Person	0.7	1.3	1.7	2.3	2.6	2.7
	4 Person	0.7	1.7	2.2	3.1	3.5	3.9
	6 Person	0.8	1.9	2.6	3.6	4.3	4.7
	8 Person	0.8	2.0	2.7	3.8	4.4	4.9
	10 Person	0.8	2.0	2.8	4.0	4.8	5.3
	15 Person	0.9	2.2	3.0	4.3	5.1	5.7
	20 Person	0.9	2.3	3.3	4.9	5.8	6.5
	25 Person	0.9	2.4	3.5	5.2	6.3	7.0
Powerboats and MFV's	Up to 15 ft	0.4	0.8	1.1	1.5	1.6	1.8
	16 to 25 ft	0.8	1.5	2.2	3.3	4.0	4.5
	26 to 40 ft	0.8	1.9	2.9	4.7	5.9	6.8
	41 to 65 ft	0.9	2.4	3.9	7.0	9.3	11.1
	66 to 90 ft	0.9	2.5	4.3	8.3	11.4	14.0
Sailing Vessels	Up to 15 ft	0.8	1.5	2.1	3.0	3.6	4.0
	16 to 20 ft	0.8	1.7	2.5	3.7	4.6	5.1
	21 to 25 ft	0.9	1.9	2.8	4.4	5.4	6.3
	26 to 30 ft	0.9	2.1	3.2	5.3	6.6	7.7
	31 to 40 ft	0.9	2.3	3.8	6.6	8.6	10.3
	41 to 50 ft	0.9	2.4	4.0	7.3	9.7	11.6
	51 to 75 ft	0.9	2.5	4.2	7.9	10.7	13.1
	75 to 90 ft	0.9	2.5	4.4	8.3	11.6	14.2
Ships	90 to 150 ft	1.4	2.5	4.6	9.3	13.2	16.6
	151 to 300 ft	1.4	2.6	4.9	10.3	15.5	20.2

Visual sweep width (W) is a mathematically expressed measure of detection capability based on target characteristics, environmental conditions, height of eye and other limitations. A Sweep width of 1 mile means half a mile either side of the SRU. Sweep width will always be less than twice the maximum detection range (the furthest distance you would normally expect to see a target). The Sweep width concept provides a convenient method to ensure a search area can be accurately covered.

Sweep Widths and Track Spacing (continued):

To the **uncorrected sweep width** a weather correction may be applied as the table below:

TABLE 5: WEATHER CORRECTION

TARGET TYPE	WINDS 9 Knots or less SEAS <2 feet	WINDS 10 to 16 Knots SEAS 2-4 feet	WINDS above 16 Knots SEAS >4 feet
PERSON IN WATER (PIW) OR TARGET LESS THAN 30 FT LONG (equivalent length)	NO CORRECTION	**0.50** (divide by 2)	**0.25** (divide by 4)
ALL TARGETS MORE THAN 30 FT LONG (equivalent length)	NO CORRECTION	**0.90** (reduce by 10%)	**0.90** (reduce by 10%)

In applying this correction the actual sea state should take primacy over wind speed. For example you might be working in an area, which is experiencing wind against tide conditions and where the sea is higher than normally expected for a particular wind speed. If you do not have an accurate report of the sea conditions then you should be guided by the wind speed. It is important to advise the MRCC SMC of these conditions and what the Lifeboat coxswain considers to be a suitable weather correction (if applicable).

The **sweep width** is multiplied by the weather correction factor (if applicable) to produce the **corrected sweep width**.

A fatigue correction may also be applied if the crews are excessively tired (also obtained from the tables). This results in the corrected sweep width, which represents the ideal track spacing.

PROBABILITY OF DETECTION (POD)

The effectiveness of the search is measured by the percentage probability that the target will be detected (POD).

POD bears a direct relationship between the **corrected sweep width** and the actual **track spacing** used; i.e. the Coverage Factor.

$$\textbf{Coverage Factor (C)} = \frac{\textbf{Sweep Width (W)}}{\textbf{Track Spacing (S)}}$$

It can be mathematically shown that with the Sweep Width (W) equal to Track Spacing (S); i.e. Coverage Factor of 1 the POD is 79% (from a POD curve, not shown).

The SMC will not compromise on the search area for the sake of a better POD; The objective is to search the entire area, regardless of POD. The SMC will try to achieve a POD of 79% or better (maybe by employing more units) but in any event will want to search the whole area not just part of it. Searching the whole area once might enable another search to be carried out later thus increasing the cumulative POD.

Note: An unsearched area has a POD of zero.

It is important to note that if the SMC has several SRUs available, then each of these may be allocated to search a smaller sub-area. The idea here is that between them, the SRUs will cover the whole area.

AREA searches:

An **AREA** search requires co-ordinates to determine the area needing to be searched. These can be Latitude and Longitude co-ordinates supplied by the Coastguard derived from calculations made as previously described.

(Alternatively, the Coastguard may supply co-ordinates as points on a chart where local knowledge is assumed, for example: -*Search from the Boathouse to the Pier up to one mile offshore.)*

The Coastguard will always pass on Latitude and Longitude search area co-ordinates as follows:

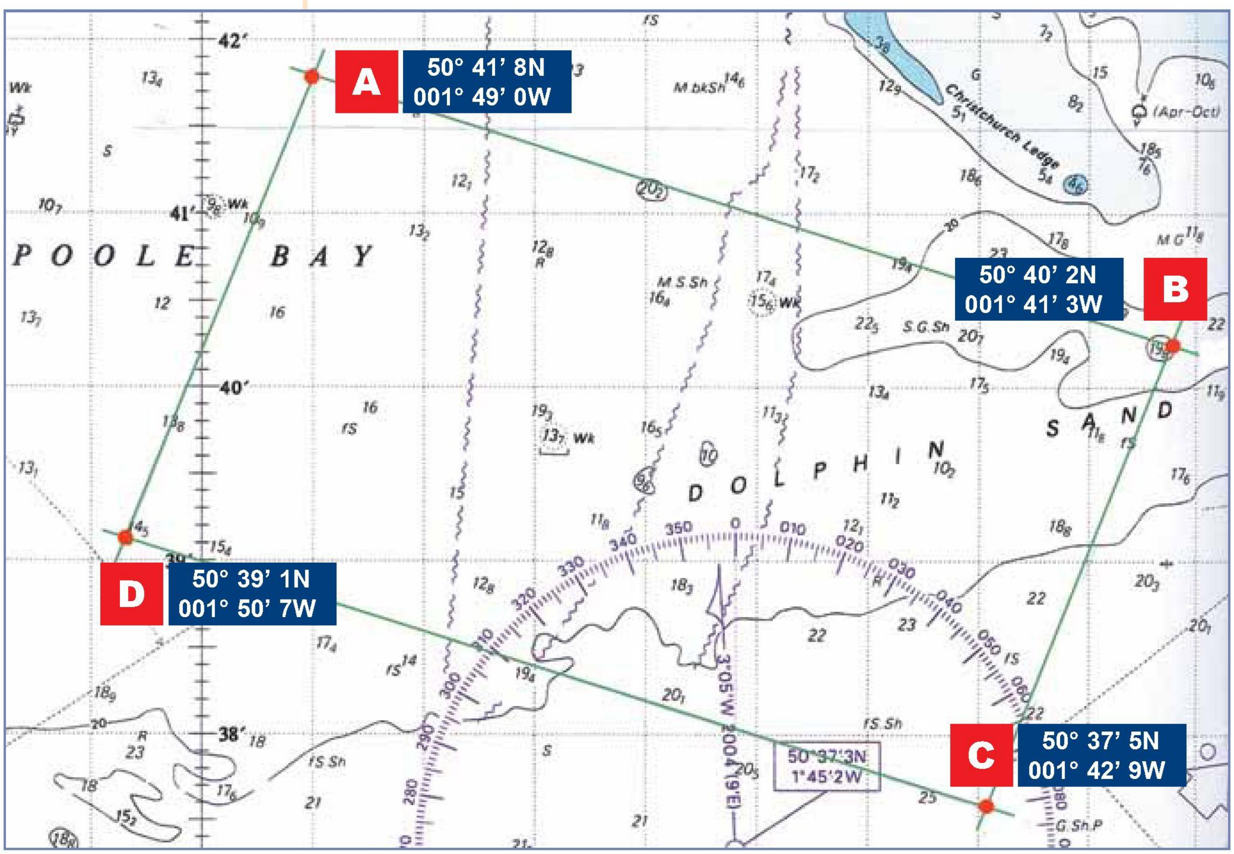
- **A**- Alpha
  This co-ordinate will always be the most Northerly point unless the area is orientated N/S/E/W when it will be the NW corner. The remainder of the co-ordinates will be given in a clockwise direction.
- **B**- Bravo
- **C**- Charlie
- **D**- Delta

Example: Search area as follows;

Alpha:	***050° 41' 8N 001° 49' 0W***	***Bravo:***	***050° 40' 2N 001° 41' 3W***
Delta:	***050° 39' 1N 001° 50' 7W***	***Charlie:***	***050° 37' 5N 001° 42' 9W***

Note: Positions will be supplied to one decimal place.

The search area should then be plotted on the chart as follows:



AREA searches:

Single Vessel Searches:

- **PARALLEL TRACK (Ground Based)**

Where the **longest** leg of the search is parallel with the **longest** edge of the search box.

1 Optimum use-when there is an equal probability the target could be anywhere in the search area.

2 Track Spacing-usually supplied by the SMC and obtained in conjunction with the Sweep width tables and search criteria.

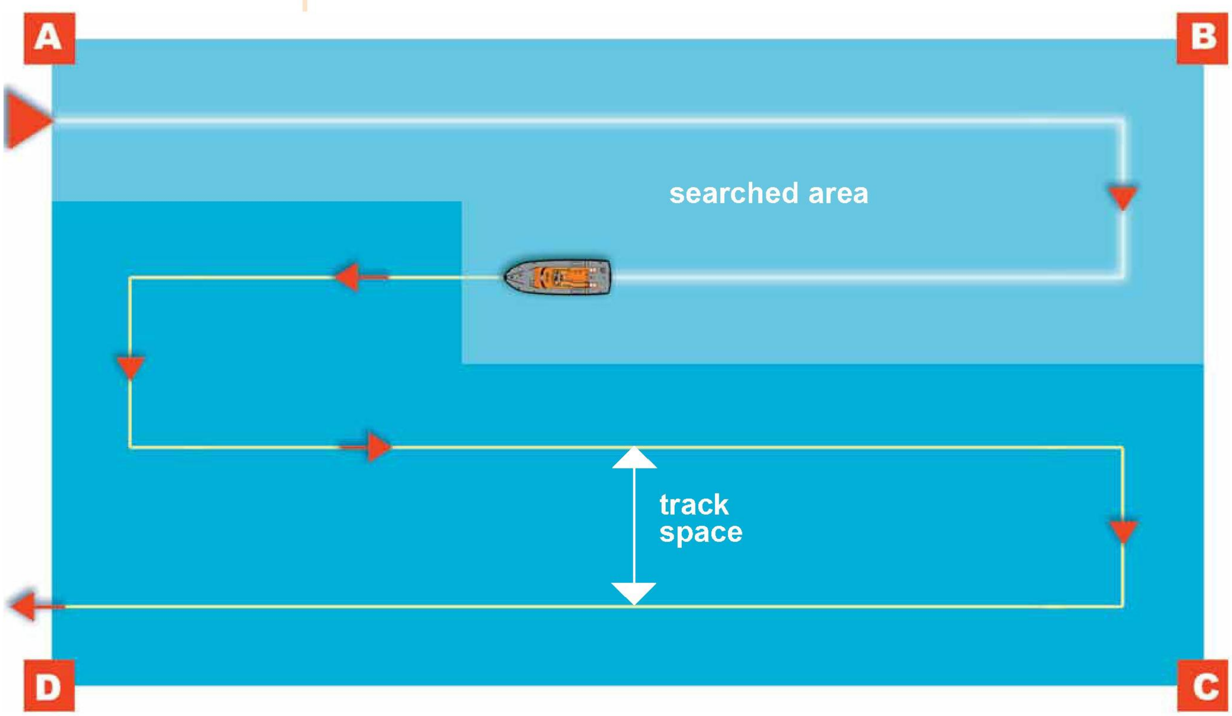
3 Can be used in single or multi vessel situations.

4 Commence search position (CSP) is generally one half track space in from box edge.

5 As this is a ground based search the pattern can best be utilised using electronic navigation equipment.

Generally the SMC will provide the Lifeboat with the following;

1. **Search area coordinates**
2. **Commence search position**
3. **Required track spacing**
4. **Leg length and direction of first search leg**
5. **Search pattern required**
6. **Width of search legs**
7. **Search speed** *(noting that Lifeboat should always suggest slower speeds if this would improve search performance e.g. spray would be reduced, lookouts could safely be on deck etc)*



AREA searches:
Single Vessel Searches:

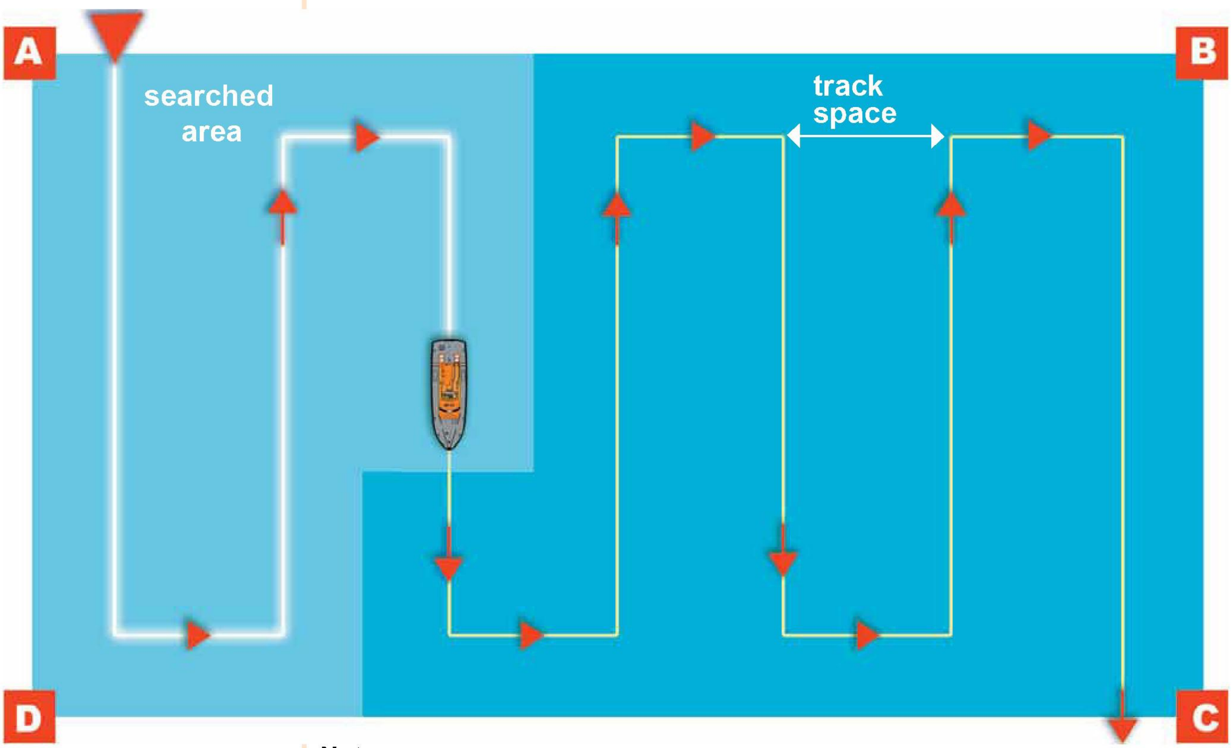
- **CREEPING LINE AHEAD (Ground Based)**

Where the **longest** leg of the search is parallel with the **shortest** leg of the search box.

1. Optimum use-when there is a greater probability the target could be closer to one end than the other of the search area.
2. Track Spacing- Track Spacing-usually supplied by the SMC and obtained in conjunction with the Sweep width tables and search criteria.
3. Can be used in single or multi vessel situations.
4. Commence search position (CSP) is generally one half track space in from box edge.
5 As this is a ground based search the pattern can best be utilised using electronic navigation equipment.

Generally the SMC will provide the Lifeboat with the following;

1. **Search area coordinates**
2. **Commence search position**
3. **Required track spacing**
4. **Leg length and direction of first search leg**
5. **Search pattern required**
6. **Width of search legs**
7. **Search speed** *(noting that Lifeboat should always suggest slower speeds if this would improve search performance e.g. spray would be reduced, lookouts could safely be on deck etc)*



Note:

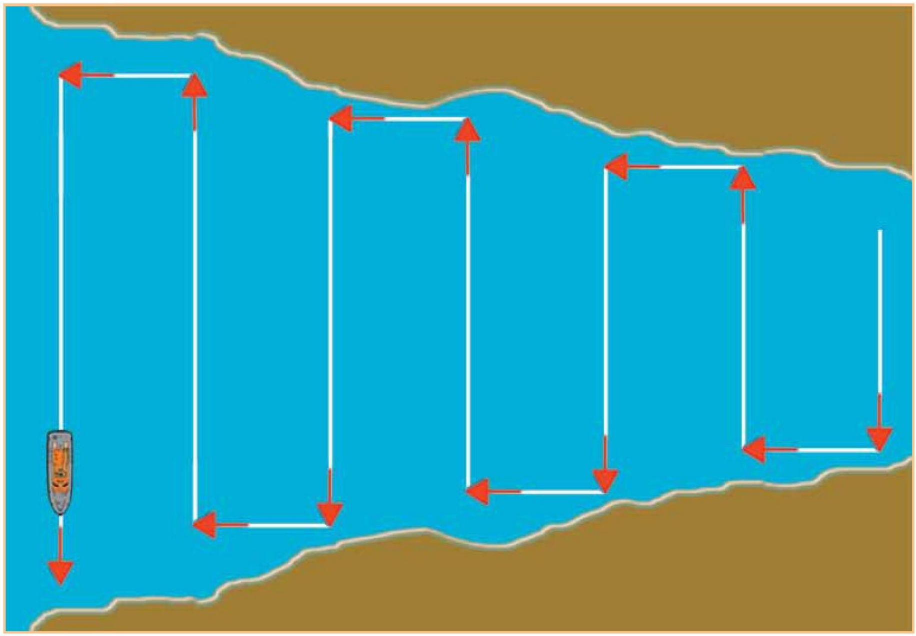
The SMC may ask the SRU(s) to commence searching at the down-drift end of a search area if there is concern that the search object(s) may be close to the down-drift boundary and may possibly be about to drift outside of the calculated search area.

AREA searches:
Single Vessel Searches:

- **Keyhole Search**

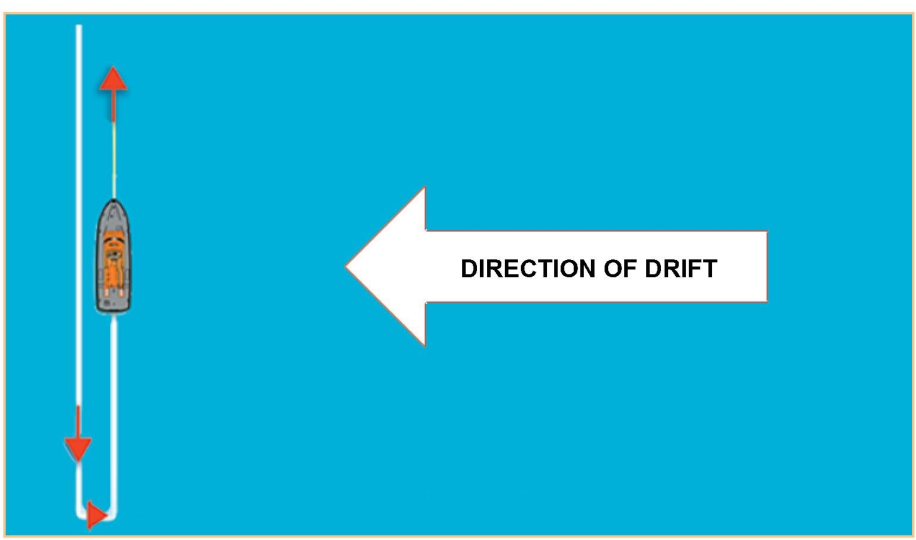
This search is similar to a creeping line ahead search, used in river estuaries, between islands or in lochs. The length of each leg is dictated by the river or loch banks.

It should be noted that each alter course is 90° regardless of river bank profile therefore it is possible that some of the search area will not be covered. A solution is to use an ILB to search parallel to the banks in conjunction with the main search.



- **Goalkeeper Search**

This search is carried out backwards and forwards across the downdrift path of the search object. The objective is to detect the object as it drifts down towards the SRU. It should be noted that the length of the legs should not be too great otherwise the target may drift past the 'goal' whilst the lifeboat is proceeding away from it. If the distance is too great, the lifeboat crew may not be able to see the target.



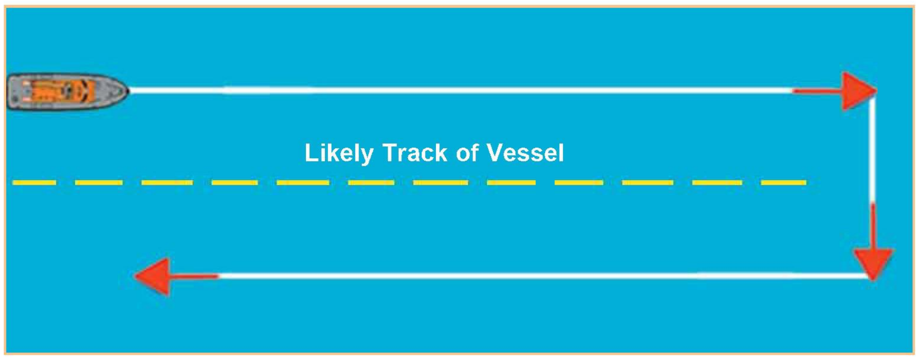
AREA searches:

Single Vessel Searches:

- **Track Line Search**

A Track Line Search is used when a vessel is reported missing without trace whilst on passage. This search concentrates on the vessel's intended or likely track and is a useful form of rapid response prior to undertaking a more thorough search of what is likely to be a large search area.

The search may consist of a single sweep along the length of the vessel's track. If the search is to consist of two legs, then each leg would be half a track spacing either side of the vessel's track, Three sweeps would consist of one leg along the vessel's track with a second and third sweep at one track spacing to either side.

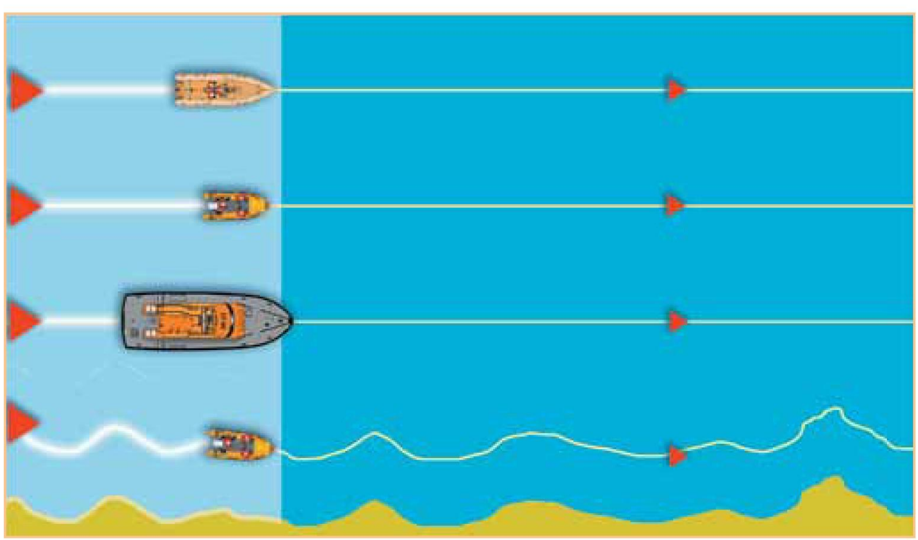


Multi-Vessel Searches:

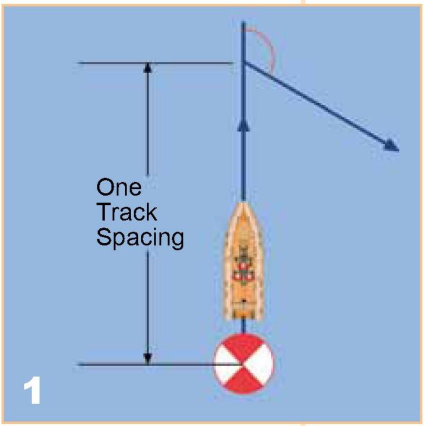
This search is based on the same principles as the single vessel parallel track and creeping line ahead search pattern. The search vessels are spaced at the required track spacing in line abreast and will generally proceed at the speed of the slowest vessel.

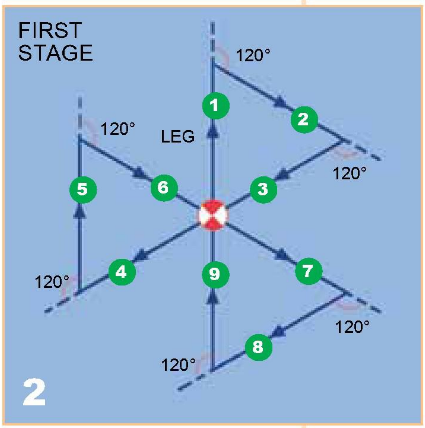
This is a useful search pattern when using vessels with limited navigational capability e.g. ILBs, Fishing Vessels, etc. The vessel which can navigate accurately acts as the 'mother' craft and all other vessels take position to one side, or on both sides of it, one track spacing apart. At the end of each leg, all the craft have to move up or down one track spacing and start the next leg of the search.

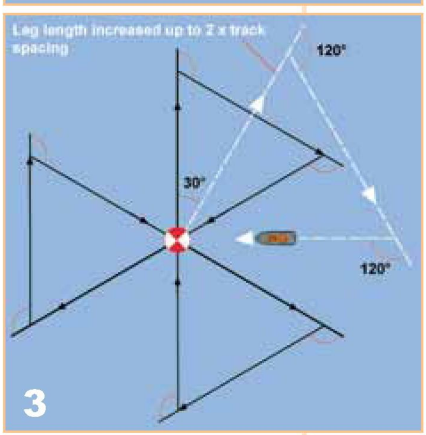
An alternative to vessels searching line abreast would be for the search area to be split up into sub-areas for additional SRU's.

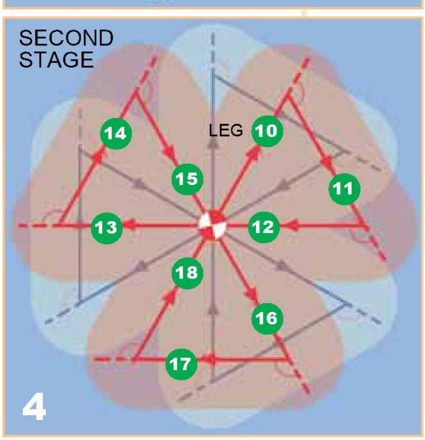


DATUM search:









- **SECTOR Search (Water Based)**

a. The first stage of the search begins by making the first leg downtide (or consider using the nearest cardinal point to the downtide direction from the datum). However, if an empty inflatable or dinghy for example is located you may consider going upwind to look for a person in the water.

b. **Throughout this search it is important that course and speed remain constant**. On completing the first timed leg make a 120° turn to starboard. *Note: All turns in this type of search are 120° to Starboard.*

c. If a visible datum is available then on legs three, six and nine the crew are to look out for the datum. If the datum is not directly over the bow this would indicate that; either errors were made in holding the boat's course or there were strong tidal/wind effects on the datum/boat. The boat's course should be altered to pass through the datum position, then returned onto the original heading as shown on diagram 2.

d. After nine timed legs the first stage of the search is complete as shown on diagram 3.

e. Diagram 4 shows the full extent of the search if a second evolution has been completed using a constant leg length. Note that the second stage is carried out as the first but with a 30° offset.

Notes:

1. Optimum use - when datum information is very fresh i.e. for man overboard or upon location of debris/wreckage.
2. If there is no physical datum, one should be created utilising a rated fender or lifebuoy if possible.
3. This is the only search that sweeps the datum and immediate area around the datum a number of times and so has a much higher probability of detection close to the datum than the other patterns discussed.
4. This search is conducted in legs where the leg length is equivalent in distance to one Track Spacing (normally the Corrected Sweep width - obtained from the table).
5. The first leg is generally in the direction of drift with turns of 120° to the right at the end of specific legs. If no success after one full rotation the leg length can be increased up to two Track Spacings with the pattern being moved 30° clockwise and repeated.

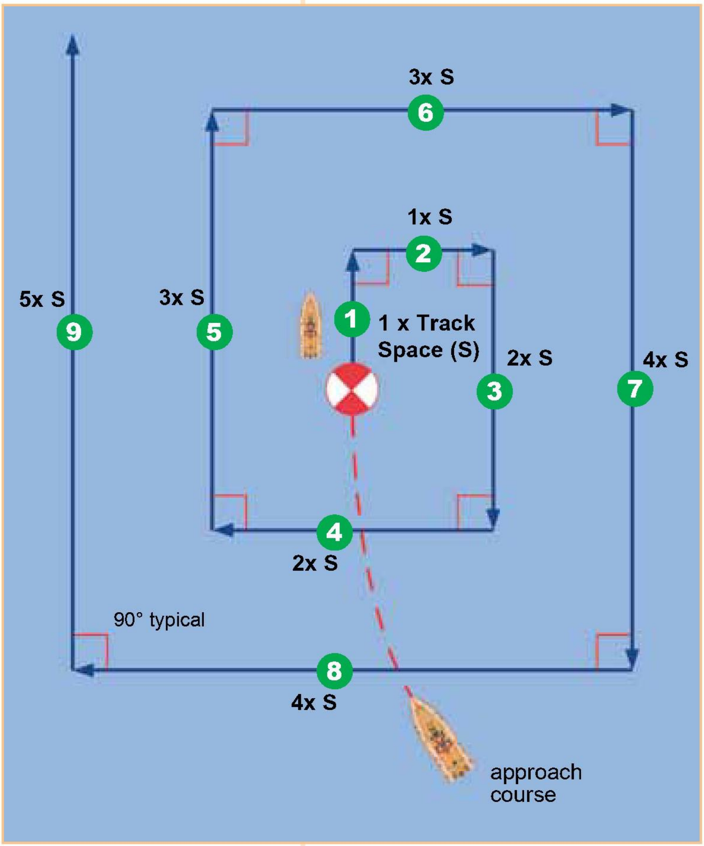
Useful Hints:

- Calculate all leg bearings before departing the datum.
- If a crewmember is monitoring the time, ask to be told the new course and bearing 10 seconds *before* the turn, not on the turn.
- Tick each completed leg off on the RNLI checkcards.
- Do not use landmarks to drive a leg as this prevents the boat drifting with wind and tide.

ADVANTAGES:	DISADVANTAGES:
Passing through the datum ensures the search moves with wind and tide. The immediate area around the datum position is searched several times.	It can be confusing and result in crew not undertaking the search effectively. The crew may search for the datum and not the casualty.

DATUM search:

• **EXPANDING SQUARE Search (Water Based)**



a. *Leg lengths are based on the sweep width / track spacing.*

b. *The first stage of the search begins by making the first leg downtide (or consider using the nearest cardinal point to the downtide direction from the datum). However, if an empty inflatable or dinghy for example is located you may consider going upwind to look for a person in the water.*

c. **Throughout this search it is important that course and speed are steady**. *On completing the first timed leg make a 90° turn to starboard.* **All turns in this type of search are 90° to Starboard.**

Useful Hints:

- *Use the cardinal points North, South, East and West to make steering easy.*
- *If a crewmember is monitoring the time, ask to be told the new course and bearing 10 seconds before the turn, not on the turn.*
- *Tick each completed leg off on the RNLI checkcards.*
- *Do not use landmarks to drive a leg as this prevents the boat drifting with wind and tide.*

Notes:

1. **Optimum use**- used to commence the search at the datum when the search object is confidently anticipated to be within a relatively small area. It is well suited to a rapid response search with little or no leeway.
2. Has the same potential coverage as Parallel track and Creeping line ahead but the search is conducted in legs starting from the datum where the leg length is equal to a Track spacing (normally the Corrected Sweep width- obtained from the table) with each turn being 90° to the right so, from datum,
   i. leg 1 = Track spacing
   ii. leg 2 = Track spacing
   iii. leg 3 = 2 x Track spacing
   iv. leg 4 = 2 x Track spacing
   v. leg 5 = 3 x Track spacing etc……..
3. Best carried out as a :through the water" search (i.e. using compass and log) to allow the pattern to drift with the search object.

ADVANTAGES:	DISADVANTAGES:
Very easy to carry out. Starts at a datum position and expands outward. The Helm is able to carry out the search with no imput required from the crew (ILB).	The boat may be unfavourably positioned for extended periods of the search - for example: running across the sea or into the sun.

Appendices:

Search Sweep Widths: RNLI Inshore Lifeboats

The RNLI has agreed that it will adopt the Coastguard SAR GRAPHS and tables for the calculation of sweep widths and execution of search patterns.

Recognising the environment, restricted crew numbers, limited visual range, the desire for rapid response to situations and infrequency of use aboard ILBs, RNLI inshore lifeboats will adopt a standard set of pre-calculated sweep widths for a predetermined set of circumstances. It should be noted that these sweep widths are calculated based on the theory contained within the agreed tables and graphs outlined above.

The pre-calculated sweep width will be presented in 'check card format' *(included - see following pages)* whilst the under pinning knowledge of how the figures have been calculated will be covered 'broad brush' on residential training courses to enhance overall understanding.

For the purposes of calculation the following base lines have been used:

- **Height of eye of an ILB negates the consideration of visibility >3NM for persons in the water and >5NM for liferafts, ILBs will already be searching at their maximum horizon below these figures.**
- **Sweep widths >1.5NM have been excluded as this likelihood is beyond the reasonably expected operation of a single ILB.**
- **Liferafts >8 persons, powercraft>40', MFVs >40' and ships have been excluded for the same reason as above.**
- **Actual leg length times have been adjusted to the nearest 15 seconds** *(this produces no error greater than 0.03NM and is therefore viewed as acceptable risk – see table on following page).*
- **Maximum search speed 20kts, moderate conditions (ILB) 12kts and Rough conditions (ILB) 8kts.**

The aims and justification for the deviation from the application of the standard SAR graphs and tables are below:

- **Reduce time wasted calculating the precise figure.**
- **Speed up the process of actually beginning to search.**
- **Limit the amount of information visible upon the check card**
- **Increase the confidence of SMCs and ILB helms regarding the execution of searches.**
- **Limit the opportunity for errors in the calculation process.**

Appendices:

Search Sweep Widths: RNLI Inshore Lifeboats

RNLI Inshore Lifeboats - Calculations Underpinning the Justification of Standardised Sweep Widths

RNLI Inshore Lifeboats - Calculations Underpinning the Justification of Standardised Sweep Widths

Targets	Recommended SAR graph sweep widths: Swep Width A	Sweep Width B	Sweep Width C	TimeA	RNLI Amended Sweep Width	Time B	RNLI Amended Sweep Width	Time c	RNLI Amended Sweep Width	Maximum error caused by rounding of figures: Error 1, NM	Error 2, NM	Error 3, NM
	(<16kts <2' sea)	(16-25kts 2-4'sea)	(>25kts >4'Sea	m/sec	(<16kts <2' sea)	m/sec	(16-25kts 2-4'sea)	m/sec	(>25kts >4'Sea			
Assumed Speed	20 Knots	12 Knots	8 Knots		20 knots		12 knots		8 knots			
Person in water												
Visibility < 3NM	0.2	0.1	0.05	0.36	30 Secs	0.30	30 secs	0.24	30 secs	-0.03	0.00	0.01
	Values above 3NM visibility are not valid due to the height of eye of the ILB											
Liferaft <4Pers												
Visibility 1NM	0.7	0.35	0.18	2.06	2 minutes	1.45	1min 45 secs	1.21	1min 15 secs	-0.03	0.00	-0.01
Visibility 3NM	1.7	0.85	0.425	5.06	5 Minutes	4.18	4 minutes 15 secs	3.18	3 minutes 15 sec	-0.03	-0.01	-0.01
Visibility 5NM	2.2	1.1	0.55	6.36	6 minutes 30 secs	5.30	5 minutes 30 secs	4.08	4 minutes	-0.03	0.00	-0.02
	Values above 5NM visibility are not valid due to the combined height of eye of the ILB and target.											
Liferaft 4-8 Pers												
Visibility 1NM	0.8	0.4	0.2	2.24	2 minutes 30 secs	2.00	2 minutes	1.30	1 minute 30	0.03	0.00	0.00
Visibility 3NM	2	1	0.5	6.00	6 minutes	5.00	5 minutes	3.45	3 minutes 45 secs	0.00	0.00	0.00
Visibility 5NM	2.7	1.35	0.68	8.06	8 minutes	6.45	6 minutes 45	5.06	5 minutes	-0.03	0.00	-0.01
	Values above 5NM visibility are not valid due to the combined height of eye of the ILB and target.											
	For liferafts >8 person the assumption is a multi unit response, therefore negating the requirement for inclusion in this table											
Powerboat and MFV												
<15'												
Visibility 1NM	0.4	0.2	0.1	1.12	1 minute 15secs	1.00	1 minute	0.45	45 secs	0.03	0.00	0.00
Visibility 3NM	0.8	0.4	0.2	2.24	2 minutes 30 secs	2.00	2 minutes	1.30	1 minutes 30 secs	0.03	0.00	0.00
	For Visibility >3NM track spacing exceeds 1.5NM and therefore it is deemed that and ILB would not be the most suitable/primary SAR unit.											
15-40'												
Visibility 1NM	0.8	0.4	0.2	2.24	2 minutes 30secs	2.00	2 minutes	1.30	1 minute 30 secs	0.03	0.00	0.00
	For Visibility >1NM and vessels >40' track spacing exceeds 1.5NM and therefore it is deemed that and ILB would not be the most suitable/primary SAR unit.											
Sailing vessels												
Any size	0.8	0.4	0.2	2.24	2 minutes 30 secs	2.00	2 minutes	1.30	1 minute 30 secs	0.03	0.00	0.00
	For Visibility >1NM (all sizes) track spacing exceeds 1.5NM and therefore it is deemed that and ILB would not be the most suitable/primary SAR unit.											

Appendices: Search Sweep Widths: RNLI Inshore Lifeboats - ILB Check Card

TP-ILB-134 ISSUE B - Date of last revision: November 2010

CHECK CARD

SAR - Corrected Sweep Widths for RNLI Inshore Lifeboats

ONLY TO BE USED IN THE ABSENCE OF CLEAR GUIDANCE FROM THE COORDINATING AUTHORITY

The visual sweep width for RNLI Inshore Lifeboats is based on the Coastguard SAR graphs and tables, using the small craft column. For ease of use, recognising the difficulties in operating small craft with limited crew, standard sweep widths based on 20kts, 12kts and 8kts have been calculated for a range of conditions. Recognising the capabilities of Inshore Lifeboats and the restrictions imposed by height of eye, the table is limited to maximum calculation factors of 5NM visibility and 1.5NM maximum sweep width.

FOR PRACTICAL PURPOSES SWEEP WIDTH EQUALS TRACK SPACING (AREA SEARCHES) AND INITIAL LEG LENGTH (DATUM SEARCHES).

	WIND SPEED / SEA STATE ON-SCENE		
	<16kts / <2' Sea	16-25kts / 2-4' Sea	>25kts / >4' Sea
	ASSUMED SPEEDS		
TARGET TYPE	20 knots	12 knots	8 knots
PERSON IN WATER	SWEEP WIDTHS		
Visibility <3NM	30 secs (0.17 nm)	30 secs (0.10 nm)	30 secs (0.07 nm)
LIFERAFT <4 PERSONS			
Visibility 1NM	2 mins (0.67 nm)	1 min 45 secs (0.35 nm)	1 min 15 secs (0.17 nm)
Visibility 3NM	5 mins (1.67 nm)	4 mins 15 secs (0.85 nm)	3 mins 15 secs (0.43 nm)
Visibility 5NM	6 mins 30 secs (2.16 nm)	5 mins 30 secs (1.10 nm)	4 mins (0.53 nm)
LIFERAFT 4-8 PERSONS			
Visibility 1NM	2 mins 30 secs (0.83 nm)	2 mins (0.40 nm)	1 min 30 secs (0.20 nm)
Visibility 3NM	6 mins (2.00 nm)	5 mins (1.00 nm)	3 mins 45 secs (0.50 nm)
Visibility 5NM	8 mins (2.66 nm)	6 mins 45 secs (1.35 nm)	5 mins (0.67 nm)
POWER AND MFV <15'			
Visibility 1NM	1 min 15 secs (0.42 nm)	1 min (0.20 nm)	45 secs (0.10 nm)
Visibility 3NM	2 mins 30 secs (0.83 nm)	2 mins (0.40 nm)	1 min 30 secs (0.20 nm)
POWER & MFV 15-45'			
Visibility 1NM	2 mins 30 secs (0.83 nm)	2 mins (0.40 nm)	1 min 30 secs (0.20 nm)
SAILING VESSELS	2 mins 30 secs (0.83 nm)	2 mins (0.40 nm)	1 min 30 secs (0.20 nm)

Visual sweep width (W) is a mathematically expressed measure of detection capability based on target characteristics, environmental conditions, height of eye and other limitations. A Sweep width of 1 mile means half a mile either side of the SRU. Sweep width will always be less than twice the maximum detection range (the furthest distance you would normally expect to see a target). The Sweep width concept provides a convenient method to ensure a search area can be accurately covered.

Appendices: *AREA searches:*

SEARCH AREA COMPUTATIONS: Time to complete one leg in minutes and seconds.						
	SPEED					
LEG LENGTH	3 knots	5 knots	8 knots	10 knots	15 knots	20 knots
0.05 NM	01:00	00:30	00:20	00:20	00:10	not viable
0.1 NM	02:00	01:00	00:45	00:35	00:25	00:20
0.2 NM	04:00	02:30	01:30	01:15	00:50	00:35
0.3 NM	06:00	03:30	02:15	01:45	01:10	00:55
0.4 NM	08:00	05:00	03:00	02:20	01:30	01:10
0.5 NM	10:00	06:00	03:45	03:00	02:00	01:30
0.6 NM	12:00	07:30	04:30	03:30	02:30	01:45
0.7 NM	14:00	08:30	05:15	04:15	02:45	02:15
0.8 NM	16:00	09:30	06:00	05:00	03:15	02:30
0.9 NM	18:00	10:30	07:00	05:30	03:45	02:45
1.0 NM	20:00	12:00	07:30	06:00	04:00	03:00
1.1 NM	22:00	13:00	08:00	06:45	04:45	03:15
1.2 NM	24:00	14:30	09:00	07:30	05:00	03:30
1.3 NM	26:00	15:30	10:00	08:00	05:15	04:00
1.4 NM	28:00	17:00	10:30	08:30	05:45	04:15
1.5 NM	30:00	18:00	11:15	09:00	06:00	04:30
1.6 NM	32:00	19:00	12:00	09:30	06:30	04:45
1.7 NM	34:00	20:00	13:00	10:00	07:00	05:00
1.8 NM	36:00	21:00	13:30	11:00	07:15	05:30
1.9 NM	38:00	22:00	14:30	11:30	07:45	05:45
2.0 NM	40:00	24:00	15:00	12:00	08:00	06:00
2.5 NM	50:00	30:00	18:45	15:00	10:00	07:30
3.0 NM	60:00	36:00	22:30	18:00	12:00	09:00
3.5 NM	-	42:00	26:15	21:00	14:00	10:30
	-	48:00	30:00	24:00	16:00	12:00
4.5 NM	-	54:00	33:45	27:00		13:30
5.0 NM	-	60:00	37:30	30:00	20:00	15:00

ANNEX A: ALB TASKING FORM

TP-ALB-133 ISSUE B - Date of last revision: November 2010

SAR - ALB Tasking Form - 1

CHECK CARD

1. Description of incident

Note: Entry sequence is based on Laserplot.
For SIMS entry see terminology and sequence of entry in right hand margin.

2. Search Target: ....

3. Commence Search Position: .... (2)
(√, Sweep width inside the search area on both axis)

4. Target Information: ....

Size / Length
Colour
Sail / Fishing number
Persons on board (POB)
Detection aids carried

5. Type of search: .... (1)

6. Leg length (Range): .... [Length] (3)

7. Direction of first leg (COG): .... [Orientation] (4)

8. Track Spacing (Lane width): .... (5)

9. First turn left or right (if applicable): .... (6)

10. Search Speed (SOG): ....

11. Number of legs: .... [Width] = Spacing (8) x legs (7)

Advise CG when commencing penultimate leg

Other Info
Sub area / SAR unit search area
Alpha
Bravo
Charlie
Delta
Through Water or Over the Ground Search

ANNEX A: ALB TASKING FORM .. continued

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CHECK CARD

SAR - ALB Tasking Form - 2

12. On scene coordinator (OSC) and channel: ....

13. Other search units involved and channels: ....

14. Other Information: ....

Additional casualty information
MMSI number
Drift start position (DSP)
Datum time
Search duration
Distress channel

Lifeboat to Coastguard

Weather
Wind Direction (in degrees) and speed
Sea state
Swell height and direction
Known tidal rate and direction

Other Information
Preferred search direction (due to visibility / sea conditions etc)
Other vessels in area
Other local knowledge
Additional requirements e.g. Cliff rescue, helicopter

Coordinating station .... Day time group ....

ANNEX B: ILB TASKING FORM

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CHECK CARD

SAR - ILB Tasking Form

1. Description of incident

2. Search Target: ....

3. Commence Search Position: ....

4. Search Type: ....

5. Direction of first leg (COG): ....

6. Leg length: ....

7. Search Speed (SOG): ....

8. Track spacing: ....

9. Number of legs: ....

Advise CG when commencing penultimate leg

Other Info Drift Start Position (DSP) Through Water or Over the Ground Search

10. Communications

Other units tasked On scene channels On scene coordinator

Coordinating station .... Day time group ....

Lifeboat to Coastguard

Weather Wind Direction (in degrees) and speed Sea state Swell height and direction Known tidal rate and direction **Other Information** Preferred search direction (due to visibility / sea conditions etc) Other vessels in area Other local knowledge Additional requirements e.g. Cliff rescue, helicopter

Appendices: • Leeway Drift Rate Table: *HMCG SAR Table*

NOT TO BE USED FOR OPERATIONAL PURPOSES AS THIS IS NOT A CONTROLLED DOCUMENT

Type of Target		Leeway rate formula u = mean wind speed (kts)	Divergence + / -
Person In Water (PIW)	PIW Unknown state (mean values)	0.011 x u + 0.07	40°
	PIW with lifejacket	0.02 x u	45°
	Vertical	0.005 x u + 0.07	24°
	Sitting	0.012 x u + 0.004	24°
	Survival suit, face up	0.014 x u + 0.1	40°
	Scuba suit, face up	0.007 x u + 0.08	40°
	Deceased, face down	0.015 x u + 0.08	40°
Marine Life Rafts	No ballast pockets, general (mean values)	0.042 x u + 0.03	38°
	No ballast pockets, no canopy, no drogue	0.057 x u + 0.21	32°
	No ballast pockets, no canopy, with drogue	0.044 x u - 0.2	38°
	No ballast pockets, with canopy, no drogue	0.037 x u + 0.1	32°
	No ballast pockets, with canopy, with drogue	0.03 x u	38°
	Shallow ballast pockets, with canopy (mean values)	0.029 x u - 0.004	30°
	Shallow ballast pockets, with canopy, no drogue	0.032 x u - 0.02	30°
	Shallow ballast pockets, with canopy, with drogue	0.025 x u + 0.14	30°
	Shallow ballast pockets, with canopy, capsized	0.017 x u - 0.1	11°
	Deep ballast pockets, with canopy, unknown capacity and loading (mean values)	0.03 x u + 0.015	20°
	4-6 man deep ballast pockets, with canopy, loading and drogue unknown, general (mean values)	0.029 x u + 0.04	20°
	4-6 man deep ballast pockets, with canopy, no drogue, loading unknown	0.038 x u - 0.04	20°
	4-6 man deep ballast pockets, with canopy, no drogue, light loading	0.038 x u - 0.04	20°
	4-6 man deep ballast pockets, with canopy, no drogue, heavy loading	0.036 x u - 0.03	20°
	4-6 man deep ballast pockets, with canopy, with drogue, loading unknown	0.018 x u + 0.03	16°
	4-6 man deep ballast pockets, with canopy, with drogue, light loading	0.016 x u + 0.05	32°
	4-6 man deep ballast pockets, with canopy, with drogue, heavy loading	0.021 x u	27°
	15-25 man deep ballast pockets, with canopy, loading and drogue unknown, general (mean values)	0.036 x u – 0.085	14°
	15-25 man deep ballast pockets, with canopy, no drogue, light loading	0.039 x u – 0.06	12°
	15-25 man deep ballast pockets, with canopy, with drogue, heavy loading	0.031 x u + 0.07	12°
	Deep ballast pockets, with canopy, capsized	0.009 x u	16°
	Deep ballast pockets, with canopy, swamped	0.01 x u - 0.04	11°
Aviation Life Rafts	4-6 person, no ballast pockets, with canopy, no drogue	0.037 x u + 0.11	32°
Personal Water Craft	Sea Kayak, with person, with aft deck	0.011 x u + 0.24	20°
	Home made wooden raft	0.015 x u + 0.17	23°
	Home made wooden raft, with sail	0.079 x u - 0.17	45°
	Surfboard, with person	0.02 x u	20°
	Windsurfer, with person, with mast and sail in the water	0.023 x u + 0.1	16°
Sailing Vessels	Mono hull, full keel, deep draft, heavy displacement	0.03 x u	65°
	Medium displacement yacht	0.04 x u	60°
	Mono hull, fin keel, shoal draft	0.04 x u	65°
Power Vessels	Totally enclosed lifeboat/ life capsule	0.038 x u - 0.08	30°
	Outboard, no drogue	0.07 x u + 0.04	35°
	Light displacement cabin cruiser	0.07 x u + 0.04	35°
	Medium displacement cabin cruiser	0.04 x u	60°
	Flat bottomed, Boston Whaler	0.034 x u + 0.04	30°
	V-hull	0.03 x u + 0.076	20°
	V-hull, swamped	0.017 x u	20°
	Sports boat, cuddy cabin, modified V hull	0.069 x u - 0.08	25°
	Sport Fisher, center console, open cockpit	0.06 x u - 0.09	30°
	Commercial fishing vessel, type unknown, general (mean values)	0.037 x u + 0.02	65°
	Commercial fishing vessel, side/stern trawler	0.042 x u	65°
	Commercial fishing vessel, long liner	0.037 x u	65°
	Commercial fishing vessel, gill-netter	0.04 x u + 0.006	45°
	Coastal Freighter	0.028 x u	65°
Flotsam	Fishing vessel general debris	0.02 x u	14°
	Cubic meter bait/fish box, general, loading unknown	0.013 x u + 0.27	42°
	Cubic meter bait/fish box lightly loaded	0.026 x u + 0.18	20°
	Cubic meter bait/fish box, full load	0.016 x u + 0.155	44°

Situation Report Check Card

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SAR - Situation Report Form (SITREP)

CHECK CARD

To be passed every 30 minutes, or when the situation changes, to MRCC for the search mission co-ordinator (S.M.C)

From Lifeboat to Coastguard (Arrival on scene and every 30 mins):

Sitrep Number ……………………………………………………………………………

Position ……………………………………………………………………………

Lifeboat Course ………………………………… Speed…………………………………

Weather on scene:

Wind- Direction…………………………… Speed……………………………
(in degrees)

Sea State ……………………………………………………………………………

Swell- Height ……………………………Direction ……………………………

Precipitation……………………………………………………………………………

Visibility……………………………………………………………………………

Estimate of tidal current rate and Direction…………………………………………

Preferred search speed……………………………………………………………

Other vessels in the area ……………………………………………………………

Other Information:

Ability of lifeboat to search in a particular direction i.e. because of glare from sun or seakeeping, or benefit of moonlight. Any useful local knowledge e.g. tidal features, cliff rescue requirements etc.

……………………………………………………………………………

……………………………………………………………………………

……………………………………………………………………………

Notes:

1. Each sitrep concerning the same casualty should be numbered sequentially.
2. 'No Change' may be passed for complete or sections of the sitrep as appropriate but with NEW sitrep number.
3. When the incident is concluded A FINAL SITREP should be issued as confirmation.
4. After initial on scene sitrep, subsequent sitreps must include the lifeboats course and intended movement.

Crew Briefing:

Crewmembers must 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.

The coxswain / helm / commander is responsible for the safe operation of the lifeboat / hovercraft, the safety of all crewmembers on board, and the supervision of lookouts. The coxswain / helm / commander must brief the lookouts so that they are able to perform their duties properly. The following should be considered:

- ☐ The coxswain / helm / commander must ensure that lookouts realize the importance of their duties. Lookouts must understand that there are lives at stake and they should search as intently as they would wish someone to search for them. Motivating the lookouts to think positively creates a good chance of success.
- ☐ Lookouts should have a full understanding of the details of the case. They should know the nature of the distress, the object of the search, assets involved and possible variations to the scenario.
- ☐ Caution lookouts to be alert for audible signals of distress such as a whistle or shouting, particularly at night. This may require, if sea state and conditions allow, regularly stopping the boat and engines.
- ☐ Assign the lookouts a sector of the vessel to search from, and explain the track spacing of the search. Some guidance as to how far from the side of the vessel they should search can be given at this time.
- ☐ Instruct lookouts on how to search the area and how to delay fatigue and maintain interest.
- ☐ Keep the crew informed of updates and progress of the search including the activities of other units involved in the search.
- ☐ Instruct lookouts on the preferred method of reporting a sighted object. The reports should be continuous until the coxswain has sighted the object.
- ☐ The coxswain / helm / commander should always confirm to crewmembers the sighting of the object reported.
- ☐ As the supervisor of the lookouts, the coxswain / helm / commander should ensure proper rest for the lookouts and consider rotation of duties. Light conversation between lookouts should be encouraged as a means of keeping them alert, but conversation should not detract from their main duty.

Notes:

Locating Surface Craft

A Marine distress often involves a vessel still afloat but in need of 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 by either visual or electronic means. The best detection aid during good visibility is an alert lookout.

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 radar is used in the search for a distressed vessel, adverse sea conditions may interfere with radar and hamper identification of the target. When searching, lookouts should be alert for pyrotechnics, lights, smoke, or visual signals of any type or colour. 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.

The scene of a major incident is usually marked with considerable debris. Often an oil slick is present. The debris will usually be found downwind of the origin of the oil slick, and boats and rafts will usually be downwind of debris. Persons in the water are often found in the area of the debris clinging to floating objects. If the vessel was abandoned sometime before sinking, lifeboats, rafts, and personnel may be located upwind of the point of the foundering. Because of this, SRU's should search in all directions from the oil and debris area.

Scanning Techniques:

Visual Search Procedures

The lookout's method of eye search is called scanning. Scanning is a systematic step-by-step method of visually searching for objects. Good scanning technique will ensure objects and casualties are detected as quickly, and from the greatest distance, as possible. Scanning also reduces eye fatigue allowing the searcher to perform well for greater periods of time and with less discomfort than 'normal' looking.

Be conscious at all times that there is no one else scanning your search sector. You have a heavy responsibility to stay alert and to be thorough. A lookout should use the proper equipment, have a methodical approach to searching, and be able to report any sightings within the assigned sector to the search vessel coxswain in a clear manner.

With the eyes focused straight ahead, the lookout should move his / her head from side to side 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.

This will give any stationery objects in your field of vision the appearance of moving. As the human eyes are designed to detect moving objects this will allow the person scanning to maximise their eyes detecting potential.

The sequence of "SCAN-FOCUS-SCAN" should be performed in segments of 10-15°, as this technique allows 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, efficiency decreases.

Fatigue, boredom and environmental stressors can affect your ability to scan. Be aware that after prolonged scanning in light conditions that offer little or no contrast, your eyes develop a tendency to focus short of where you think you are looking. To prevent this, periodically focus on a close object such as whitecaps or the bow of the boat.

Relate the speed for searching the assigned area to the speed of the search platform. The faster the search vessel proceeds through an area, the faster you have to search the sector.

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 ultraviolet 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 lookout.

Rotate positions every half-hour, with increased frequency during poor or dull weather. In good conditions, you will be effective for no more than two hours without rest. After this time, your concentration will deteriorate rapidly, and the vessel will become less effective as a search unit.

Maintain eye contact with any sighting. Attention should be attracted through a prearranged method of reporting by hailing, intercom, or other means. At no time should eye contact with the sighted object be lost while notifying the coxswain.

Scanning Techniques continued:

For daylight searches, the position of the sun is important. The searcher will see objects more easily and from greater distances when looking away from the sun. The effect of haze is much greater when looking towards the sun, so that objects on sea and land lose their distinctive colours and may be lost in a pattern of glaring light and shadows. Looking away from the sun, the land and the sea are much darker, there is no glare, the haze is more transparent, white-caps are highly visible, and all coloured objects tend to contrast more with their back-grounds. Therefore, search patterns should be orientated so that look-outs spend as little time as possible looking towards the sun.

Night Scanning

Your eyes respond slowly at night and pick up moving objects more readily than fixed objects. Most people refer to this as ‘Night Vision’.

While red lights are preferable for use at night, if white lights / spot lights / or illumination flares are being used on or near your boat close one eye. Closing of one eye will allow you to preserve your night vision in that eye. Once the light has passed you will find the eye that remained dark-adapted will still allow you to see a great deal when compared to the eye that was exposed to the white light.

Scan as you would in daytime until you think you see an object. Look around the object you think you see but do not look directly at it. Because of the way your eyes are structured to gather light your side or peripheral vision works better at night. Object may actually seem to disappear when you look directly at them at night.

In night searches, weak lights are detectable at the edge of sight, not at the point of focus. Consequently, focus slightly higher than the horizon and be alert for distant flares or other visual distress signals.

It is usual for a person to take up to 30 minutes or more to become fully adapted to night-light. Therefore, avoid glare and reflection on board in order to preserve night vision.

Flare Searches

Visual search effectiveness at night may be reduced unless it is known that the survivors have night signalling devices such as flares or lights, or can generate light in some other way.However detection aids such as radar, infrared devices, low-light television, or passive night vision goggles may also enable standard search techniques to be reasonably effective at night.

The use of illuminating pyrotechnics does not appreciably increase the chance of detection. This type of illumination has very limited potential in searches for anything other than large objects located in well defined search areas .

Flares must be handled with care by crewmembers familiar with their use.It is essential that approval for use of pyrotechnics is obtained from the SMC and should include confirmation that rescue helicopters are clear of the discharge area.

Search By Infrared Devices

Infrared (IR) devices, such as IR TV cameras or Forward-Looking Infrared (FLIR), are passive detection systems used to detect thermal radiation. They operate on the principle of detecting temperature differences to produce a video picture. Therefore, IR devices can often detect survivors by their body heat.

Scanning Techniques continued:

Night Vision Equipment

Use of night vision equipment (NVE) can be effective in searches carried out by lifeboats. The following factors may influence the effectiveness of NVEs for searching:

- NVE quality
- Crew training and experience
- Environmental conditions (meteorological visibility, moisture, moonlight, cloud coverage, precipitation, etc.)
- Level and glare of ambient light like moonlight and starlight, and artificial light like illumination from search, navigation and other lights, inside and outside the lifeboat, and whether the light sources are within the NVE wearer's view
- Search craft speed
- Height of the observers above the surface
- Surface conditions (like the presence of snow) and sea state
- Size, illumination, and reflectivity of the search object (reflective tape on survivors or their craft can significantly improve the chances of detection with NVEs
- Types of survival equipment or light sources (like signalling devices and pyrotechnics) used by the survivors

Glare should be minimised as much as possible within the lifeboat where the NVE users are stationed. Also, proper scanning techniques are important for reducing the adverse effects of moonlight or artificial light sources like lighthouses, offshore rigs, ships steaming lights, etc.

Visible moonlight can significantly improve detection of unlit search objects when using NVEs. Search object light sources, like strobe or similar lights, or even cigarettes, can greatly improve detection even in poor visibility conditions such as light snowfall.

Detection can be improved by illuminating an area from behind the NVE. However it is essential that the light source remains out of view of the NVE to prevent dazzling the operator or damaging the NVE.

Lifeboat Search Speed:

The SMC will have planned the search assuming the lifeboat being able to operate at a certain speed. If this is not feasible in the conditions found on scene, the SRUCommander should immediately inform the SMC and advise what speed is achievable so that the search plan duration and number of search units required can be re-calculated - if necessary.

The search speed is governed by a number of factors:

1. The type and size of search object e.g. A person in the water in slight seas will be more difficult to detect than a small vessel in the same conditions. When searching for a person in the water the speed could be considerably slower than when searching for a small vessel where the maximum speed of the lifeboat could be utilised after consideration of the other factors involved.

2. The maximum speed of the lifeboat.

3. Expected search duration in relation to lifeboat fuel load and consumption.

4. Requirement to maintain a steady platform so that lookouts are effective.

5. Ability of the lifeboat to maintain accurate search legs.

6. International Regulations For Preventing Collisions At Sea with special regard to Rule 6 (Safe Speed) and Rule 19 (Conduct of Vessels in Restricted Visibility) as they still apply even in a SAR scenario.

7. The higher the search speed the less time there is for lookouts to examine their sweep areas.

8. The size of the area to be searched.

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