OUTLINE

• Part I - Classifying a SAR case
• Part II - Maritime Drift
  – Finding the Datum from the LKP (Last Known Position)
• Part III - Search Patterns
Classifying SAR Cases
MSAP

Hey, you guys, relax! Some good Samaritan's going to haul us out of this mess!!

Ref: CG Addendum, Section 4.1
Objective

- SELECT a Safe Haven
- CLASSIFY a SAR case
- SELECT the appropriate response to a request for assistance.
Key People

• **SAR Coordinator (SC)** – High Level - Overall staffing and equipment responsibility

• **SAR Mission Coordinator (SMC)** - District/Sector Level - Runs the SAR Mission

• **On Scene Coordinator (OSC)** – Designated to coordinate SRU’s in a specific area

• **Search and Rescue Unit (SRU)** – Facility with qualified personnel and equipment – USCG, USCG AUX, or other asset.
The SMC

“The SMC is usually in the best position to assess the circumstances … and to take whatever steps are necessary to promote safety of life and property”
# SAR Stages

All SAR Cases go through 5 Stages:

<table>
<thead>
<tr>
<th>5 Stages of the SAR System</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Awareness</td>
<td>Receive the call</td>
</tr>
<tr>
<td>➔ Four most important pieces of information gathered in Awareness stage</td>
<td>Last known position (LKP), nature of distress (NOD), persons on board (POB), description</td>
</tr>
<tr>
<td>2. Initial Actions</td>
<td>Alert SAR facilities, perform communications checks</td>
</tr>
<tr>
<td>3. Planning</td>
<td>Specify search area, make search/rescue/delivery plans</td>
</tr>
<tr>
<td>4. Operations</td>
<td>Conduct search &amp; rescue, emergency care, deliver</td>
</tr>
<tr>
<td>5. Conclusion</td>
<td>Documentation</td>
</tr>
</tbody>
</table>
Emergency Phases

- During the Planning Stage, the SMC classifies the SAR case into one of Three Emergency Phases
  - Uncertainty
  - Alert
  - Distress
- Used to determine appropriate action.
- Can change as things progress
Uncertainty Phase

• An UNCERTAINTY phase exists when there is knowledge of a situation that may need to be monitored, or to have more information gathered, but that does not require moving resources.
  
  – *Doubt is usually associated with the UNCERTAINTY phase*
Alert Phase

- An ALERT phase exists when a craft or person is experiencing some difficulty and may need assistance, but is not in immediate danger or in need of immediate response
  - Apprehension is usually associated with the ALERT phase
Distress Phase

• The DISTRESS phase exists when grave or imminent danger requiring immediate response to the distress scene threatens a craft or person
  – USCG resources (including Auxiliary) respond.
Overdue Craft  IAMSAR Vol II 3.3.4

- **Distress when communications searches are exhausted following the Alert phase**
- **For Aircraft:**
  - Fuel is exhausted
  - Information received that indicates distress
- **For Ships:**
  - Information received that indicates distress
Definitions

• On Scene

• Safe Haven
  - A place that can accommodate and will accept the safe mooring of the vessel, and has available means of communication, normally a telephone
Policy

• **Distress = Immediate Response**
  - Anybody can help
    • Commercial providers, county/local govts, etc.
  - How does the SMC locate this help?
  - **UMIB**
    • “Hello all stations, …”
Policy

• No Conflict Concern
  – Private organizations, state and local organizations, and Good Samaritans are acceptable sources of SAR assistance
  – When volunteered or available, their help can be used without concern for conflict with commercial providers
Policy

- In other words, This policy is not designed to give all the non-distress work to commercial providers. It is designed to stop the Coast Guard from competing with commercial providers in non-distress situations.
Policy

- Guiding Principles in Non-Distress 4.1.5.3
  - Broadcast request for assistance
  - If assistance can be rendered within a reasonable time (1 hour), no further action by CG
  - Otherwise, CGAUX facility or CG resource may be used
Policy

• Three principles that guide assistance to vessels not in distress
  1. First on scene normally provides assistance
  2. If CG or Aux takes vessel in tow, the tow will normally terminate at a safe haven
  3. Once undertaken, there is no requirement to break the tow
Non-Distress Use of CG

- Coast Guard resources normally do not provide immediate assistance in non-distress cases if alternate assistance is available

4.1.5.4
Non-Distress Use of CG

• CG resource may assist in a non-distress situation when no higher priority mission exists and no other capable resource is “reasonably available”
Policy

• Acceptable Auxiliary Employment
• Conflict of Interest Concerns
  – Aux OPFAC shall not be used for commercial assistance
• Assistance to Aux Facilities
• Use of Govt Frequencies
Classify the Case

- Nature of situation
- Position or lack of
- Vessel Desc / Equipment
- Visibility
- Tide, Current

- Wx Conditions
- POB, age, health
- Reliable Comms
- Mariner concerns
- Potential to deteriorate

The “Ten Factor”

CG Add 4.1.6.1
Classify the Case

- Nature of situation
- Position or lack of
- Vessel Desc / Equipment
- Visibility
- Tide, Current
- Wx Conditions
- POB, age, health
- Reliable Comms
- Mariner concerns
- Potential to deteriorate

The “Ten Factor”
Classify the Case

- DISTRESS
- NON-DISTRESS
Distress

- Respond immediately if able
  - UMIB
- First on scene assists
- Intervene if required
- Treat as Non-distress if appropriate

CG Add 4.1.6.2
Non-Distress

- Advise and seek desires
- MARB
- Monitor response
- Maintain comms
- Reasonable time determination

- Simultaneous arrival
- Mariner may decline
- Commercial assistance declined
- If situation deteriorates

CG Add 4.1.6.3
Cases Discovered by AUX Facility

- **Policy:** CG Addendum 4.1.6.4
- May render assistance if they “discover” a vessel requesting assistance that has not been in contact with the CG or commercial provider
- **MUST** notify OC that they intend to assist the vessel
- Do not undertake a tow unless assured of the safety of both vessels and persons onboard (Identify Risks!, GAR)
Safe Haven

- Nearest
- Can accommodate and accept vessel
- Communications
- Exceptions

CG Add 4.1.2.4 & 4.1.6.5
Alternative to MARB

- When no response is evident, the SMC may dispatch CG or Auxiliary vessels
Communications Interference

- “SEELONCE MAYDAY”
- FCC violation to interfere with CG communications

CG Add 4.1.6.8
SMC Responsibilities

• Follow policy
• Familiar with all resources in AOR
  – Commercial providers, State/Local Agencies, Auxiliary, Volunteers
• Semi-annual meetings
  – With commercial providers
  – Before/After boating season

CG Add 4.1.7.1
Review

• What tool is used to classify a SAR incident?
• What are SMC actions for a distress incident?
• What are SMC actions for non-distress, no specific assistance requested?
• What are SMC actions for non-distress, specific assistance requested?
Questions?
Maritime Drift

Ref: CG Addendum Section 3.3.4; Appendix H.3
Objectives

• DETERMINE Datum

• CALCULATE drift of a search object

• DEPLOY a Datum Marker Buoy (DMB)/Self Locating Datum Marker Buoy (SLDMB)
Datum

The expected location of the search object at any given time.

• **Datum is a:**

  • **Position** (GPS fix of LKP)
  • **Line** (LKP anywhere along a track)
  • **Area** (LKP local fishing area)
Forces that Create Drift

- **Current**
  - Search object moves with the water

- **Leeway**
  - Wind causes search object motion relative to the water
Total Water Current (TWC) is the vector sum of currents affecting the search object.

- Wind current
- Tidal current
- Other water currents
Measuring TWC

• Deploy a datum marker

• How else can it be done?
DMB/SLDMB

- Provides the best information on TWC in a localized area

- **CAUTION!** Provides information only while in the water and for the water area through which it traveled.
Inside the SLDMB

Preparing for Deployment

- Parachute Cap
- Static Line
- Buoy Data Info Label
- Water Soluble Tape
Inside the SLDMB – Deployed
Leeway

Movement through water caused by winds blowing against the exposed surfaces of the search object.
Leeway

• Speed of the object relative to the water

• The more sail area the search object has, the greater the wind force on the object

• Completely submerged objects and objects that are awash with no appreciable sail area are assumed to have no leeway
Leeway Calculations

- CG Addendum H.3.4.1
- Use Table H-7

- **Wind (W) > 6 knots:**
  - Leeway Speed = \([\text{Multiplier} \times W] + \text{Modifier}\)

- **Wind (W) < 6 knots:**
  - Leeway Speed = \([\text{Multiplier} + \text{Modifier}/6]\times W\)
Table H-7 Leeway Speed and Direction Values for Drift Objects

<table>
<thead>
<tr>
<th>Category</th>
<th>Sub Categories</th>
<th>Primary Leeway Descriptors</th>
<th>Secondary Leeway Descriptors</th>
<th>Leeway Speed (kts)</th>
<th>Multiplier</th>
<th>Modifier (kts)</th>
<th>Divergence Angle (deg)</th>
<th>St Err (kts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIW</td>
<td>Vertical</td>
<td></td>
<td></td>
<td></td>
<td>0.011</td>
<td>0.07</td>
<td>30</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td>Sitting</td>
<td></td>
<td></td>
<td></td>
<td>0.005</td>
<td>0.07</td>
<td>18</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td>Horizontal</td>
<td>Survival Suit</td>
<td></td>
<td></td>
<td>0.012</td>
<td>0.00</td>
<td>18</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Scuba Suit</td>
<td></td>
<td></td>
<td>0.014</td>
<td>0.10</td>
<td>30</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deceased</td>
<td></td>
<td></td>
<td>0.015</td>
<td>0.08</td>
<td>30</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td>Maritime</td>
<td>No</td>
<td>no canopy, no drogue</td>
<td></td>
<td>0.042</td>
<td>0.03</td>
<td>28</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ballast</td>
<td>no canopy, w/ drogue</td>
<td></td>
<td>0.057</td>
<td>0.21</td>
<td>24</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Systems</td>
<td>canopy, no drogue</td>
<td></td>
<td>0.044</td>
<td>-0.20</td>
<td>28</td>
<td>0.10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>canopy, w/ drogue</td>
<td></td>
<td>0.037</td>
<td>0.11</td>
<td>24</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>Survival Craft</td>
<td>Shallow</td>
<td></td>
<td></td>
<td>0.030</td>
<td>0.00</td>
<td>28</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ballast</td>
<td>no drogue</td>
<td></td>
<td>0.029</td>
<td>0.00</td>
<td>22</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Systems and Canopies</td>
<td>with drogue</td>
<td></td>
<td>0.032</td>
<td>-0.02</td>
<td>22</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Canopy</td>
<td>Capsized</td>
<td></td>
<td>0.017</td>
<td>-0.10</td>
<td>8</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deep Ballast</td>
<td>(See Table H-7A for Levels 4-6)</td>
<td></td>
<td>0.030</td>
<td>0.02</td>
<td>13</td>
<td>0.20</td>
</tr>
<tr>
<td>Other Maritime</td>
<td>Life Capsule</td>
<td></td>
<td></td>
<td></td>
<td>0.038</td>
<td>-0.08</td>
<td>22</td>
<td>0.05</td>
</tr>
<tr>
<td>Survival Craft</td>
<td>USCG Sea Rescue Kit</td>
<td></td>
<td></td>
<td></td>
<td>0.025</td>
<td>-0.04</td>
<td>7</td>
<td>0.10</td>
</tr>
<tr>
<td>Aviation</td>
<td>No ballast, w/ canopy</td>
<td></td>
<td>4-6 person, w/ drogue</td>
<td></td>
<td>0.037</td>
<td>0.11</td>
<td>24</td>
<td>0.05</td>
</tr>
<tr>
<td>Life Rafts</td>
<td>Evac/Slide</td>
<td></td>
<td>4-6 person</td>
<td></td>
<td>0.028</td>
<td>-0.01</td>
<td>15</td>
<td>0.10</td>
</tr>
<tr>
<td>Person-Powered</td>
<td>Sea Kayak w/ Person on aft deck</td>
<td></td>
<td></td>
<td></td>
<td>0.011</td>
<td>0.24</td>
<td>15</td>
<td>0.10</td>
</tr>
<tr>
<td>Craft</td>
<td>Surf board w/ person</td>
<td></td>
<td></td>
<td></td>
<td>0.020</td>
<td>0.00</td>
<td>15</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td>Windsurfer w/ person and mast &amp; sail in water</td>
<td></td>
<td></td>
<td></td>
<td>0.023</td>
<td>0.10</td>
<td>12</td>
<td>0.10</td>
</tr>
</tbody>
</table>
Example

- CG receives call at 0800 hrs reporting PIW
  - We have no other info about PIW
- SRU can be on scene at 1300 hrs
  - Drift interval = 5 hrs
- Current Set = 030°, Current Drift = 0.5 kts
  - Calculate TWC movement [5hrs x 0.5kts = 2.5 nm]
- West wind at 10 kts
  - Direction of leeway = 090°
  - Leeway = [0.011 x 10kts] + 0.07kts = 0.18 kts
  - Leeway Distance = 0.18 kts x 5hrs = 0.9 nm
Divergence Angle

- Leeway divergence angle is the divergence of the drift object from the downwind direction due to the lack of symmetry of a drift object.
Drift (knots) is estimated as the vector sum of the total water current and the leeway.
Review

❖ What two forces make up Drift?

❖ The expected location of the search object at any given time.

❖ The movement of a search object caused by winds blowing against exposed surface?

❖ What provides the best info for total water current in a localized area?
SAR PATTERNS

OBJECTIVES

• Understand role of key people in SAR process
• Understand SAR patterns, and when to use each
• Determine what to do as an initial response
Resources

- Boat Crew Seamanship Manual

- Search and Rescue – A Guide for Coxswains
Coxswain’s Responsibility

In accordance with Coast Guard Regulations, COMDTINST M5000.(series), the coxswain shall be responsible for, in order of precedence:

– 1. The safety and conduct of passengers and crew;
– 2. The safe operation and navigation of the boat assigned; and
– 3. The completion of the sortie or mission(s) assigned or undertaken pursuant to Coast Guard policy and regulations.
SAR Patterns

• Trackline, Single Unit, Return (TSR)
• Parallel, Single Unit (PS)
• Creeping Line, Single Unit (CS)
• Sector, Single Unit (VS)
• Expanding Square, Single Unit (SS)

Also know:
• Barrier Search
Search patterns are designated by letters.

- The first letter indicates the general pattern group:
  - T = Trackline
  - P = Parallel
  - C = Creeping Line
  - V = Sector
  - S = Square

- The second letter indicates the number of SRU’s assigned to that pattern:
  - S = Single Unit
  - M = Multi-unit

- The third letter indicates specialized patterns or instructions; the two most commonly used are:
  - R = Return
  - N = Non-return
Trackline, Single Unit, Return (TSR)
Designation: *Tango Sierra Romeo*

Used when:
• The intended route of the search object is known, and
• A rapid and reasonably thorough coverage of the missing craft’s intended track and the area immediately adjacent, such as along a datum line (intended track corrected for drift) is desired.

Description:
Usually the first search effort in an overdue case since it’s assumed that the search object is near track and either it will be easily seen or the survivors will signal. The SRU searches out ½ track space (S) in the direction of the intended track from the origin to the destination and ends ½ S on the other side of the origin.
Parallel, Single Unit (PS)

Designation: *Papa Sierra*

*Used when:*
- The search area is large,
- The location of the search object is approximate, and
- Uniform coverage is desired.

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

Designation: Charlie Sierra

Used when:
• The search area is large,
• The location of the search object is approximate, but there is a greater chance that the search object is at one end of the search area versus the other (i.e. debris was found on one end during a previous search), and
• Uniform coverage is desired.

Description:
The SRU searches parallel to the short side (minor axis) of the search area, moving over one track on the return. This process continues until the entire search area has been searched or the search object is located. The Commence Search Point (CSP) is located ½ track space (S) inside the search area in the specified corner.
Minor axis
Sector, Single Unit (VS)

Designation: Victor Sierra

Used when:
• The search area is small,
• The location of the search object is well known, and
• A concentrated search is desired.

Description:
The SRU goes to the best known location of the search object. This becomes the center (datum) of the search area. Datum should be marked with a buoy, life ring, strobe light, etc. The first leg will begin from datum in the direction of drift for one track space (S). If there is no drift, the first leg will be true north, 000°T, the second leg is 120°T, the next is 240°T and so on. On the 3rd, 6th, and 9th legs, steer on your marker, once passed, return to your base course. All course changes are 120° to the right and the length of all legs are equal to one S. A second search (with the same SRU – VS) is performed by rotating the search pattern 30° to the right beginning at datum. A second search (with a second SRU – VM) is performed by rotating the search pattern 90° to the left beginning at datum.
Expanding Square, Single Unit (SS)

Designation: *Sierra Sierra* (SS)

**Used when**
- The search area is small,
- The location of the search object is known within relatively close limits, but some doubt exists about the distress position, and a concentrated search is desired.

**Description:**
The SRU goes to the best known location of the search object. This becomes the center (datum) of the search area. Datum should be marked with a buoy, life ring, strobe light, etc. The first leg will begin from datum in the direction of drift for one track space (S). If there is no drift, the first leg will be true north, 000°T; the second leg is 090°T, the next is 180°T and so on. All course changes are 90° to the right. Search leg length is increased by one track space on every other leg. Multiply your track space (S) by the numbers shown in the search pattern below to determine leg length. A second search is performed by rotating the search pattern 45° to the right.
SMC PROVIDED SEARCH PATTERN

<table>
<thead>
<tr>
<th>NAME</th>
<th>S/V ABBY ROAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>CENTER</td>
<td>41-21.0N 070-57.9W</td>
</tr>
<tr>
<td>LENGTH</td>
<td>10.40 NM</td>
</tr>
<tr>
<td>WIDTH</td>
<td>4.00 NM</td>
</tr>
<tr>
<td>MAJOR AXIS</td>
<td>065 T</td>
</tr>
<tr>
<td>MINOR AXIS</td>
<td>335 T</td>
</tr>
<tr>
<td>CREEP DIRECTION</td>
<td>065 T</td>
</tr>
<tr>
<td>TRACK SPACING</td>
<td>0.80 NM</td>
</tr>
<tr>
<td>FIRST TURN</td>
<td>RIGHT</td>
</tr>
<tr>
<td>CSP</td>
<td>41-17.5N 071-02.8W</td>
</tr>
<tr>
<td>CORNER PT #1</td>
<td>41-25.0N 070-52.7W</td>
</tr>
<tr>
<td>CORNER PT #2</td>
<td>41-21.4N 070-50.5W</td>
</tr>
<tr>
<td>CORNER PT #3</td>
<td>41-17.0N 071-03.1W</td>
</tr>
<tr>
<td>CORNER PT #4</td>
<td>41-20.6N 071-05.3W</td>
</tr>
</tbody>
</table>
EN ROUTE

While traveling to the CSP:

– Brief the crew
– Assign lookout duties
– Search for object en route
  • Include shoreline search
  • Look for PIW clinging to buoy
First SRU On Scene

Without specific tasking from the SMC, you should report on scene weather conditions to the SMC and prepare for your initial search. Refer to the following table for initial track spacing:

<table>
<thead>
<tr>
<th>Initial Track Spacing (NM)</th>
<th>Search Object</th>
<th>Good Conditions Winds &lt; 15 Knots Seas &lt; 3 Feet</th>
<th>Poor Conditions Winds ≥ 15 Knots Seas ≥ 3 Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PIW</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td>Vessels &lt; 15 Feet</td>
<td>0.5</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td>Vessels ≥ 15 Feet</td>
<td>1.0</td>
<td>0.5</td>
</tr>
</tbody>
</table>
### Speed / Time Table in Minutes : Seconds

<table>
<thead>
<tr>
<th>Track Spacing</th>
<th>6 Kts</th>
<th>7 Kts</th>
<th>8 Kts</th>
<th>9 Kts</th>
<th>10 Kts</th>
<th>11 Kts</th>
<th>12 Kts</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1 0.1</td>
<td>01:00</td>
<td>00:51</td>
<td>00:45</td>
<td>00:40</td>
<td>00:36</td>
<td>00:33</td>
<td>00:30</td>
</tr>
<tr>
<td>0.2 0.2</td>
<td>02:00</td>
<td>01:43</td>
<td>01:30</td>
<td>01:20</td>
<td>01:12</td>
<td>01:05</td>
<td>01:00</td>
</tr>
<tr>
<td>0.3 0.3</td>
<td>03:00</td>
<td>02:34</td>
<td>02:15</td>
<td>02:00</td>
<td>01:48</td>
<td>01:38</td>
<td>01:30</td>
</tr>
<tr>
<td>0.4 0.4</td>
<td>04:00</td>
<td>03:26</td>
<td>03:00</td>
<td>02:40</td>
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<td>03:45</td>
<td>03:20</td>
<td>03:00</td>
<td>02:44</td>
<td>02:30</td>
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<td>0.6 0.6</td>
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PARALLEL PATTERN WITHOUT CONSIDERING CURRENT
Compass Course

- True
- +Variation
- =Magnetic
- +Deviation
- =Compass
- (add West)

- True course from chart
- +Variation from compass rose
- =Magnetic course
- Add deviation caused by boats own magnetic field (table for each boat)
- =Compass course
Probability of Success (POS)

- Goal is to maximize the Probability of Success
- **Probability of Success (POS)** = Probability of Detection (POD) \( \times \) Probability of Containment (POC)
- **Probability of Containment** = Probability search area is in the right place – Calculated by SMC
- **Probability of Detection** = Probability object will be detected if it’s in the search area – track spacing, crew fatigue and weather effected.
- POS typically is less than 50% - Wearing PLB will improve it.
HELMSMAN RESPONSIBILITIES?
RESPOND TO HELM AND ENGINE SPEED COMMANDS
USE SEAMANS EYE

DOES COXSWAIN HAVE TO BE AT HELM?
NO
Currency Maintenance - Coxswain
Correctly piloted and labeled navigational charts during a three leg course run given by the QE. Some or all of the following were demonstrated during the run. Discussed mission with crew.

- 1. Assigned lookouts.
- 2. Correctly converted from true to compass course.
- 3. Speed, Time, and Distance computed.
- 4. ETA computed within a reasonable time.
- 5. Deployed Datum Marker Buoy (as applicable).
• 6. Reported on-scene weather and conditions to Operational Commander.
• 7. Fixes taken and properly labeled to verify facility's position. (No GPS)
• 8. Came up to course and speed prior to passing datum marker for 1st leg (VS)
• 9. Kept the controlling unit informed of mission operations and conducted scheduled Position and Ops Normal Reports.
Questions