Expanding Square Search Pattern

Hey! I'm over here!!!
Expanding Square Search

Characteristics:

- Used in relatively small search areas
- There is a good starting point
- Provides uniform coverage
Expanding Square Search

How do we do that ????
We use our: Expanding Square Search Pattern Plotting Aid
Expanding Square Search

**Execution:**

- **Commence Search Point** is at datum (provided by SAR Mission Coordinator)

- First leg is down drift

- All turns are **90 degrees** to the right

- Search leg length is increased by **one track space** on every other leg.
Expanding Square Search

The Search and Rescue Mission Coordinator (SMC) provides:

- Commence Search Point (CSP)
  - Where you begin
  - Lat and Lon
Expanding Square Search

- Begin your search at the Commence Search Point – CSP
- This is provided by SAR Mission Coordinator (SMC)

Lat \( xx^\circ xx.x' \) 
Long \( xxx^\circ xx.x' \)
Expanding Square Search

SMC also provides:

- **Track Spacing (separation)**
  - This will be the distance between parallel search tracks
  - This also happens to be the length of the first leg of the search
Expanding Square Search

- The SMC provides Track Spacing

- Track Spacing also equals the length of Leg 1 of the search

For example: ½ mile
Expanding Square Search

To begin your search you need to:

- Determine the constant speed at which you will run your vessel during the search
- Calculate the time to run the first leg of your search based on this constant speed
Expanding Square Search

- Using your search plotting aid, calculate the time for running the first leg based on the distance of the Track Spacing and the speed you will go.

For example:

If I run the search at 5 knots, how much time must I run to go ½ mile?

You can use your plotting aid to get the answer.
Speed is how fast your boat will run during the search.

Nautical Miles is the Track Spacing given by the SMC.

The intersection indicates how many minutes you will run the first search leg. In our example this is 6 minutes.

<table>
<thead>
<tr>
<th>NAUTICAL MILES</th>
<th>5Kts</th>
<th>8Kts</th>
<th>10Kts</th>
<th>12Kts</th>
<th>15Kts</th>
<th>18Kts</th>
<th>20Kts</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>6:00</td>
<td>3:00</td>
<td>2:30</td>
<td>2:00</td>
<td>1:40</td>
<td>1:30</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>12:00</td>
<td>7:30</td>
<td>5:00</td>
<td>4:00</td>
<td>3:20</td>
<td>3:00</td>
<td></td>
</tr>
<tr>
<td>1.5</td>
<td>18:00</td>
<td>11:16</td>
<td>9:00</td>
<td>7:30</td>
<td>6:00</td>
<td>5:00</td>
<td>4:30</td>
</tr>
<tr>
<td>2</td>
<td>24:00</td>
<td>15:00</td>
<td>12:00</td>
<td>10:00</td>
<td>8:20</td>
<td>7:30</td>
<td></td>
</tr>
<tr>
<td>2.5</td>
<td>30:00</td>
<td>18:15</td>
<td>15:00</td>
<td>12:30</td>
<td>10:00</td>
<td>8:20</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>36:00</td>
<td>22:30</td>
<td>18:00</td>
<td>15:00</td>
<td>12:00</td>
<td>9:00</td>
<td></td>
</tr>
<tr>
<td>3.5</td>
<td>42:00</td>
<td>26:15</td>
<td>21:00</td>
<td>17:30</td>
<td>14:00</td>
<td>11:40</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>48:00</td>
<td>30:00</td>
<td>24:00</td>
<td>20:00</td>
<td>16:00</td>
<td>13:20</td>
<td></td>
</tr>
<tr>
<td>4.5</td>
<td>54:00</td>
<td>33:45</td>
<td>27:00</td>
<td>22:30</td>
<td>18:00</td>
<td>15:00</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>60:00</td>
<td>37:30</td>
<td>30:00</td>
<td>25:00</td>
<td>20:00</td>
<td>16:40</td>
<td></td>
</tr>
<tr>
<td>5.5</td>
<td>66:00</td>
<td>41:15</td>
<td>33:00</td>
<td>27:30</td>
<td>22:00</td>
<td>18:20</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>72:00</td>
<td>45:00</td>
<td>36:00</td>
<td>30:00</td>
<td>24:00</td>
<td>20:00</td>
<td></td>
</tr>
<tr>
<td>6.5</td>
<td>78:00</td>
<td>48:45</td>
<td>39:00</td>
<td>32:30</td>
<td>26:00</td>
<td>21:40</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>84:00</td>
<td>52:30</td>
<td>42:00</td>
<td>35:00</td>
<td>28:00</td>
<td>23:20</td>
<td></td>
</tr>
<tr>
<td>7.5</td>
<td>90:00</td>
<td>56:15</td>
<td>45:00</td>
<td>37:30</td>
<td>30:00</td>
<td>25:00</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>96:00</td>
<td>60:00</td>
<td>48:00</td>
<td>40:00</td>
<td>32:00</td>
<td>26:40</td>
<td>24:00</td>
</tr>
</tbody>
</table>
You will need to remember (write down) the time you calculated to run the first leg

- We will call the value of the initial leg run time by the name “X”
- The value of X will be used in conjunction with your plotting aid to determine the length of time to run all future legs of the search

In our example, X is 6 minutes
Expanding Square Search

- The heading of your initial search leg will be with the current

In our example: 000°
In our example this is 000°. Rotate the dial on your plotter until the arrow for LEG 1 is pointing to the heading that the current is flowing. This will be your initial heading. In our example this is 000°.
Expanding Square Search

- Run the first leg of your search for the initial time and at the speed you calculated.
  - In our example, 6 minutes at 5 knots heading 000°

- At the end of your calculated time, turn right 90° (all turns are 90° to the right).

- Use your plotting aid to find your new heading and the time to run for this next leg.
The heading you should follow on the next leg is found by taking the number of the leg you will be on; in this case Leg 2.

And carrying it down to the parallel line that passes through the center of the dial.

Follow this line out to the edge of the dial to get your course heading.

In our example, the heading for Leg 2 is 90°.
The time you should stay on this new heading must be calculated by multiplying $X$ (Leg 1 run time) times a multiplier shown on the plotter.

Follow the line on the plotter for the new leg (in this case Leg 2) back toward the center of the dial until you see a number in front of the letter $X$. 

This is the number you multiply times your value for X to determine the length of the run time for this leg.

In the case of Leg 2, the number in front of X is 1. So the run time for Leg 2 = 1 * X

In our example the run time for Leg 2 is:

1 * 6 minutes = 6 minutes
Expanding Square Search

- Run Leg 2 for the time you calculated at your constant speed and on the heading you determined from your plotting aid.

In our example, 6 minutes at 5 knots heading 090°
Expanding Square Search

- Run Leg 2 for the time you calculated at your constant speed and on the heading you determined from your plotting aid.

- At the end of your calculated time, turn right 90°.

- Use your plotting aid to find your new heading and time to run for this next leg.
The heading you should follow on the next leg is found by taking the number of the leg you will be on; in this case Leg 3.

And carrying it across to the parallel line that passes through the center of the dial.

Follow this line out to the edge of the dial to get your course heading.

In our example, the heading for Leg 3 is $180^\circ$. 
The time you should stay on this new heading must be calculated by multiplying $X$ (Leg 1 run time) times the multiplier shown on the plotter.

Follow the line on the plotter for the new leg (in this case Leg 3) back toward the center of the dial until you see a number in front of the letter $X$. 
This is the number you multiply times your value for \( X \) to determine the length of the run time for this leg.

In the case of Leg 3, the number in front of \( X \) is 2. So the run time for Leg 3 = \( 2 \times X \).

In our example the run time for Leg 3 is:

\[ 2 \times 6 \text{ minutes} = 12 \text{ minutes} \]
Expanding Square Search

- Run Leg 3 for the time you calculated at your constant speed and on the heading you determined from your plotting aid.

In our example, 12 minutes at 5 knots heading 180°.
Expanding Square Search

- Run Leg 3 for the time you calculated at your constant speed and on the heading you determined from your plotting aid.
- At the end of your calculated time, turn right 90°.
- Use your plotting aid to find your new heading and time to run for this next leg.
The heading you should follow on the next leg is found by taking the number of the leg you will be on; in this case Leg 4.

And carrying it to the parallel line that passes through the center of the dial.

Follow this line out to the edge of the dial to get your course heading.

In our example, the heading for Leg 4 is $270^\circ$. 
The time you should stay on this new heading must be calculated by multiplying X times the multiplier shown on the plotter.

Follow the line on the plotter for the new leg (in this case Leg 4) back toward the center of the dial until you see a number in front of the letter X.
This is the number you multiply times your value for X to determine the length of the run time for this leg.

In our example the run time for Leg 4 is:

\[ 2 \times 6 \text{ minutes} = 12 \text{ minutes} \]

In the case of Leg 4, the number in front of X is 2. So the run time for Leg 4 = \( 2 \times X \).
Expanding Square Search

- Run Leg 4 for the time you calculated at your constant speed and on the heading you determined from your plotting aid.

In our example, 12 minutes at 5 knots heading 270°
Expanding Square Search

- Run Leg 4 for the time you calculated at your constant speed and on the heading you determined from your plotting aid.
- At the end of your calculated time, turn right 90°.
- Use your plotting aid to find your new heading and time to run for this next leg.
The heading you should follow on the next leg is found by taking the number of the leg you will be on; in this case Leg 5.

And carrying it to the parallel line that passes through the center of the dial.

Follow this line out to the edge of the dial to get your course heading.

In our example, the heading for Leg 5 is 000°.
The time you should stay on this new heading must be calculated by multiplying X by the multiplier shown on the plotter.

Follow the line on the plotter for the new leg (in this case Leg 5) back toward the center of the dial until you see a number in front of the letter X.
This is the number you multiply times your value for $X$ to determine the length of the run time for this leg.

In our example the run time for Leg 5 is:

$$3 \times 6 \text{ minutes} = 18 \text{ minutes}$$
Expanding Square Search

- Run Leg 5 for the time you calculated at your constant speed and on the heading you determined from your plotting aid.

In our example, 18 minutes at 5 knots heading 000°
Expanding Square Search

- Run Leg 5 for the time you calculated at your constant speed and on the heading you determined from your plotting aid.
- At the end of your calculated time, turn right 90°.
- Use your plotting aid to find your new heading and time to run for this next leg.
Expanding Square Search

- Continue to use your search plotter to determine the heading and time to run for each subsequent leg of the search.
Expanding Square Search

- The time to run a search leg is increased by the time to run one track space after every two legs.

- In our example the time to run one track space is six minutes.
ANY QUESTIONS?