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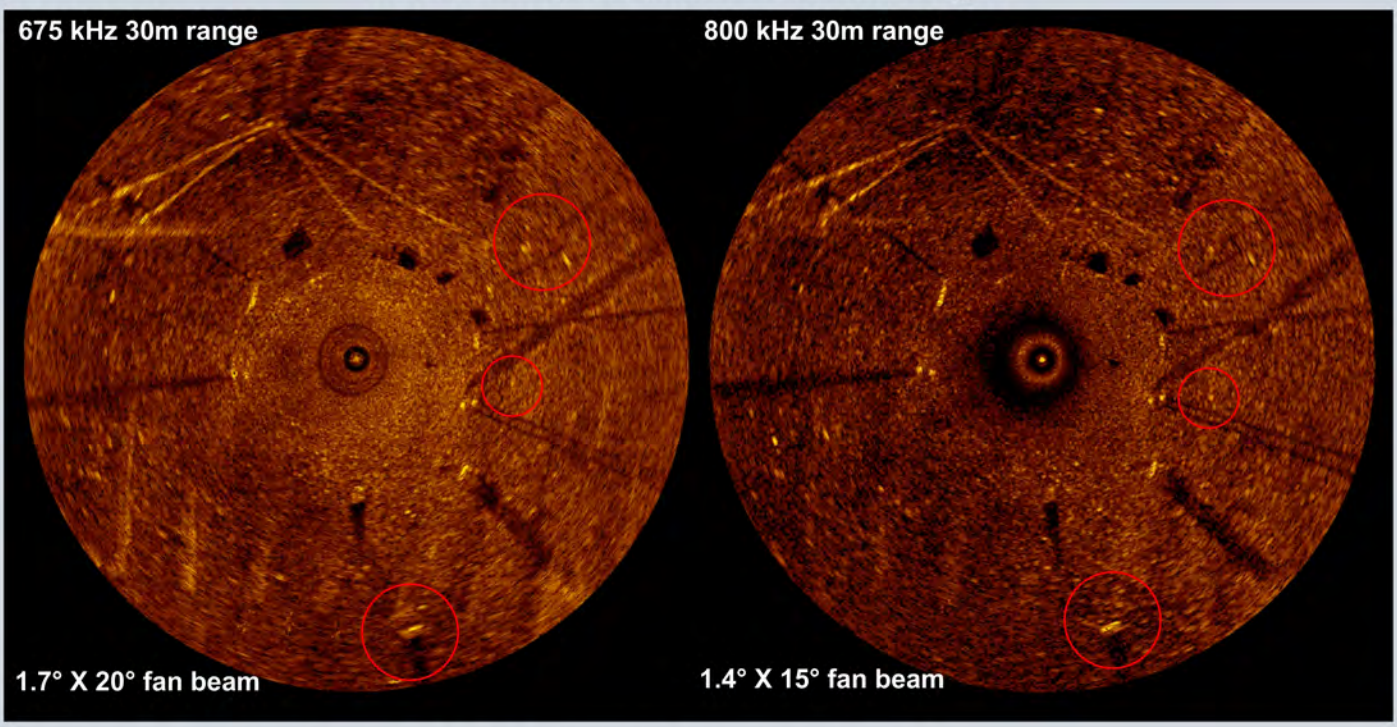
SEARCH and RECOVERY
LCROVs and SCANNING SONAR

Photographs courtesy **Seabotix**

The MS 1000 and the 650m depth-rated Mini Sonar Head are ideally suited for Search and Recovery (SAR) Teams using Low Cost ROVs (LCROVs). Two keys to operating a small vehicle for SAR ROV operations are tether management and knowing the position of the ROV within the search area.

The Mini Sonar Head's bare-face transducer eliminates the thermal defocusing issues of oil-filled domed heads, and its "tunable" frequency from 625 kHz – 800 kHz provides range and resolution advantages over the smaller, domed, scanning sonar heads offered by other manufacturers.

MS 1000 Tunable Mini Sonar Head Images



Increasing the frequency from 675 kHz to 800 kHz decreases the beam angle by 0.3°; this significantly improves the sonar's transverse resolution, target clarity and shadow definition.

THE FULL PICTURE

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LCROVs and SCANNING SONAR SEARCH PATTERNS

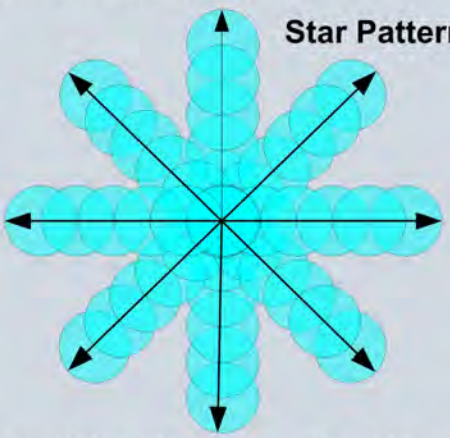
One of the biggest challenges using an LCROV is knowing where it is in the search area. Most small ROVs are not equipped with a tracking system so how does the operator know its location?

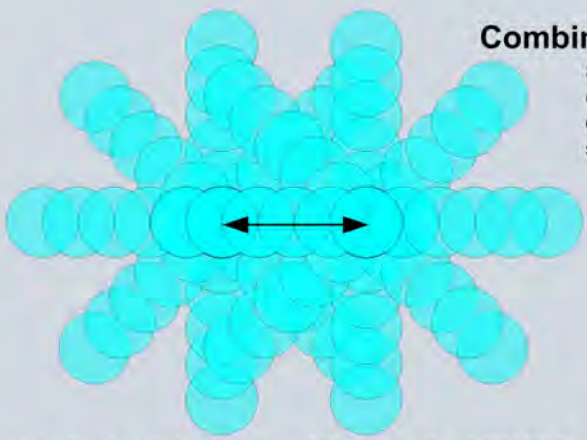
When the seabed is relatively flat, use a "star" search pattern.

Tape the ROV umbilical with chainage markers (use colored tape - each indicating a specific distance) so the amount of deployed cable is known. The LCROV excursion distance is a function of umbilical length, water depth and vehicle power. Calculate the approximate ROV excursion distance using the Pythagorean Theorem formula in the drawing below.

The ***sonar's range selection*** is based on the ***minimum*** size target that needs to be resolved and the sonar beamwidth. The target MUST be larger than the beamwidth at the outer end of the selected range. Using the 1.4° beam angle at 800 kHz, and assuming an adult male with a shoulder width of 0.62m (2') across the shoulders, the selected range should not exceed 20m (65.6').

Star Pattern

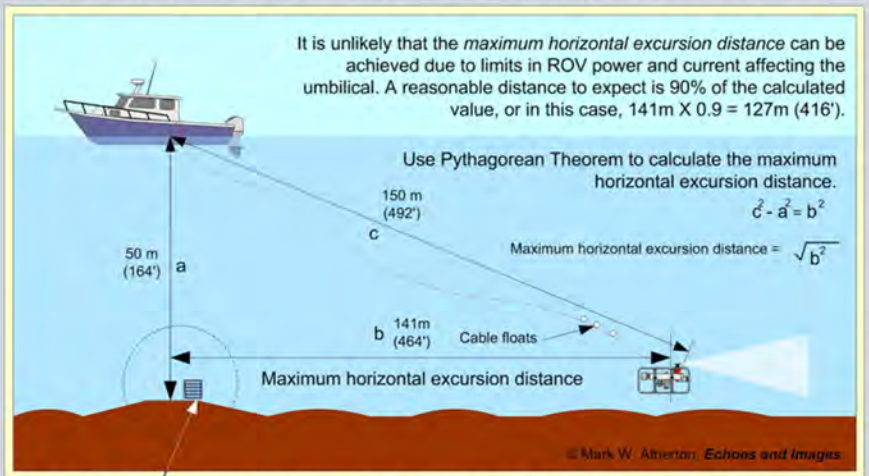




Combined Star Pattern

Spacing between center drop location (arrow ends) dependent upon selected range.

Deploy the ROV to bottom and run straight lines on cardinal points at every 45° using the LCROV's compass. Unless a target of interest is observed, hold that heading to the end of the umbilical. Recover the LCROV to surface, pull it back to the support vessel and repeat the process on a new heading. This method minimizes umbilical fouling, and when methodically conducted, it virtually guarantees 100% sonar coverage. Complete the entire star pattern, move to the next adjacent position and repeat. The combined star pattern shows the amount of overlapping coverage. Record the position of the center of the star pattern with GPS; in the MS 1000 "Trackplotter" place a target marker on this position.



Use a cinder block or other weight to mark the centre position of the search pattern; start line runs from the marker.

Use Differential GPS to mark each location. Deploy a weighted marker with a surface float at each location when the star pattern is completed. Plot each location onto a chart. Tape measurement markers in metres or feet on the ROV umbilical so that the length of deployed cable is known for each excursion. Knowing this allows the distance of each horizontal excursion and total area coverage to be plotted.

When a target of interest is observed, use the sonar to guide the LCROV to its position. If it is not what is being searched for, recover the vehicle to the surface and begin the same line run from its beginning.

Avoid the temptation of turning the LCROV at the end of line and heading along the bottom to the start position. This is ineffective, both from knowing the location of scan coverage and *it significantly increases the chance of umbilical fouling.*

Minimize umbilical drag across the seabed by attaching small non-compressable cable floats (as shown).

Drawing © ***Echoes and Images, The Encyclopedia of Side-Scan and Scanning Sonar Operations***

THE FULL PICTURE