

Navigation

Lines and Why Cave Divers Don't Get Lost





Page 109: Matt and Henry's cookies mark the exit side of a T-intersection. Each diver uses individual markers with their initials as identifiers.

Left: Ivo pushes the line away from his body to avoid an entanglement as he goes through a tight passage in the cave.

Center: System arrows which will be used to mark the exit direction of permanent line intersections we install in the cave. The label "PMK '21" will indicate that these arrows were installed by our project team (Proyecto Mayakoba) in the year 2021.

Right: Jump spools and the MNemo survey device.



A basic tenet of safe cave diving is to have a continuous guideline to the surface. Properly used, the guideline prevents two types of accidents that could keep a diver from reaching the exit of the cave: (i) getting lost through a navigational error, and (ii) not being able to see the passage to exit due to a loss of visibility caused by silt, or a rare failure of multiple lights.

Over the years, a robust and relatively uniform system for running guidelines (both temporary and permanent) and a related system for navigation has developed and been incorporated into cave diving. The navigational system allows the branching nature of caves to be negotiated through *T intersections* and *jumps*. A jump is made between two permanent lines that approach each other but aren't connected until the diver uses a temporary line from a *jump spool* to make a temporary intersection that can be navigated and marked to indicate the *exit side* of the newly formed intersection.

Guidelines are made from strong, thin nylon line and are secured in the cave using *tie-offs* and *placements* around cave formations that keep tension in the line to prevent entanglements and to make following the line with your hands possible.

While mindlessly following a guideline rather than maintaining situational awareness and a sense of direction is poor practice, the guideline and its associated directional markers *could* be used in good visibility to see the path to the exit of the cave and can also be navigated even in zero visibility and for very long distances by using your hand around the guideline and by feeling for navigational markers at each intersection.







Left: Much of our exploration diving at Mayakoba featured prolonged periods of poor visibility due to the extensive percolation of soft limestone. Ivo in turbid passage at Ma' Áayin.

Right: Henry exits from a tight and silty passage at Burrodromo.



Zero or limited visibility in the cave is a real risk since the floor of most caves is a vast expanse of silt or clay. Cave divers have extremely good buoyancy control and use refined propulsion techniques to avoid silting the water. But a momentary buoyancy issue or an errant fin kick can happen even in normal cave diving, and when conducting cave exploration, there can be periods of limited or no visibility due to percolation raining down from the ceiling of a cave that has never been disturbed before, or by squeezing through a small passage where disrupting the silt is unavoidable.

Cave divers can therefore encounter distances of limited or zero visibility and are prepared to exit the cave using the continuous guideline that is formed by the combination of permanent lines, Ts, and jumps. Normally, distances with limited visibility should be short; but water flow or a rare geological event could push the silt towards the exit, turning a localized zero visibility incident into something that spreads to the whole cave.

Sound technique and experience are important. Cave divers train for zero visibility exits with a blindfold—using *touch contact* with their buddy as they navigate hundreds of feet of cave to find the exit with no vision at all. This exercise is repeated with increasing amounts of equipment and other challenges as training progresses until one is blindfolded, sharing gas, and following a line by hand while swimming with double tanks, two stages, a primary scooter, and a tow scooter across a landscape that one can't see but that becomes quite comfortable as experience progresses.

With proper technique and care, the guideline and navigational system is a powerful technique to ensure that divers can't get lost due to a navigation error or due to zero visibility. In addition to this utility, the guideline also forms the basic building block for cave surveys and maps, covered in another chapter. ♦

Left: The visibility at Ma' Áayin was frequently obscured by a cloud of haze that floated up and down in the water column, making each dive a surprise. When this cloud was at the level of the extensive bedding planes in the cave, we would conduct most of our dive in murky visibility.

Right: Swimming into the halocline at Ma' Áayin.



