CCR Cave Formulas For Success

By Ken Sallot

Variables

- V = Volume
- SAC = SAC Rate in cubic feet per minute
- P = Average Depth in ATA
- SR = Swimming Rate (Speed)
- RMV = SAC x P
- Dist = Distance
- TTE = Time to exit; TTE = D ÷ SR
- SF = Safety Factor
    - 1.5 for CCR Only Team
    - 2.0 for Mixed Team
- T = Available time based on V, RMV and SF
    - T = V ÷ (RMV x SF)

Formula 1 – Volume needed to exit from a given distance

This formula is used to calculate how much gas you will need to exit from a certain spot in an overhead environment.

V = TTE x RMV x SF

- Step 1: Calculate P; P = (Depth ÷ 33) + 1
- Step 2: Calculate RMV; RMV = SAC x P
- Step 3: Calculate Exit Time; TTE = Dist ÷ SR
- Step 4: Calculate V; V = TTE x RMV x SF

Example: How much gas does a diver need to exit from the Florida Room in Little River in a mixed team. Assume a swimming speed of **40** feet per minute and a SAC rate of **0.9**. The Florida Room is **1000'** from the exit at an average depth of **95'**. Because it is a mixed team we will use a **2.0** Safety Factor.

1. P = (95 ÷ 33) + 1; **P = 3.9**
2. RMV = 0.9 x 3.9; **RMV = 3.5**
3. TTE = 1000 ÷ 40; **TTE = 25**
4. V = 25 x 3.5 x 2.0; **175 cubic feet**

The CCR diver would need **175** cubic feet of bailout to go to the Florida room in a mixed team if they have a SAC rate of **0.9 cubic feet** and an exit speed of **40** feet per minute.

Formula 2: Range Planning based on Gas Available

This formula is used to calculate how far you could go into an overhead with the gas on hand.

- Step 1: Calculate P; P = (Depth ÷ 33) + 1
- Step 2: Calculate RMV; RMV = SAC x P
- Step 3: Calculate Time your gas will last; T = V ÷ (RMV x SF). This is in minutes.
- Step 4: Calculate Range; Dist = T x SR

Example: How far can a diver go on the Peanut line in Peacock in a CCR only team if they are starting with **160** cubic feet of gas? The Peanut line has an average depth of **40'**. Assume a swim speed of **30** feet per minute and a SAC rate of **0.75** cubic feet per minute. Because it is a CCR only team we can use a Safety Factor of **1.5.**

1. P = (40 ÷ 33) + 1; **P = 2.2**
2. RMV = 0.75 x 2.2; **RMV = 1.7**
3. T = 160 ÷ (1.7 x 1.5); **T = 62 minutes**
4. Dist = 62 x 40; **Dist = 2480'**

A CCR diver that is starting a dive with **160 cubic feet** of gas and has a SAC rate of **0.75** cubic feet a minute and swims at **30** feet per minute would be able to swim approximately **2400'** in the Peanut line in Peacock while diving in a CCR only team.

Final thoughts

There are some factors that influence the range a diver can go and the amount of gas they need. They include how far the diver wants to go into the cave, the volume of gas the diver has available to them and whether they are in a mixed a team or not. But the most important factors are their swimming speed and their SAC rate. The swimming speed can be influenced by several elements, ranging from the strength of the flow in the cave to personal fitness. Flow rates in caves can vary drastically based on conditions; there are times when Little River has a strong flow and exiting at 70 feet per minute may be possible, there are times when Little River has almost no flow and a realistic exit speed is closer to 30 feet per minute. **The only way to know for sure what your exit speed will be in a given cave is to make accurate recordings in your dive log. The only way to know your SAC rate is to test it regularly.** When in doubt, go conservative and use a SAC rate of no less than 0.8 cubic feet a minute and a swim speed of no more than 30 feet per minute.