

## **The Three Circle Method: A Standardized Approach For Avalanche Professionals**

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**Abstract:** Complex multiple burials occur rarely in the recreational setting. When they do happen, they can almost always be solved as a series of single burials. Occasionally, however, “special case” multiple burials occur in which a special technique could be applied to increase efficiency. These mainly involve cases in which the victims are buried in close proximity, a surplus of manpower is available for shoveling, and the victims’ beacons are not turned off as each is located. When teaching “special case” multiple-burial searching, a standardized approach should be used that is reliable across all beacon types. The most reliable and intuitive approach is the Three Circle Method. This method relies on signal strength analysis rather than signal timing analysis (“marking”) to isolate signals. Therefore it is not vulnerable to inadvertent and confusing signal losses when victims’ signals overlap.

The standardized Three Circle Method contains the following four steps: 1. Definition of the search area; 2. Search the entire debris field with a thorough and systematic primary search; 3. Apply the Three Circle Method for close-proximity multiple burials; and 4. Return to the “abandoned point” of the primary search pattern after each beacon or group of beacons is found.

“Special case” multiple burial techniques should only be taught to professionals. Recreational courses should focus on single burials, efficient excavation technique, and organizing the rescue.

### **1. INTRODUCTION**

In a survey given to 60 avalanche instructors of the CAA (Canadian Avalanche Association) and AIARE (American Institute for Avalanche Research and Education), the following questions were asked related to avalanche courses and beacon use:

1. What types of avalanche courses do you teach?
2. Do you teach multiple burial searching with an avalanche beacon in your courses?
3. If you answered yes to question #2, please explain your techniques in teaching multiple burials and give an example of a multiple burial scenario you may use to drill the students.
4. Do you feel you are adequate in using or teaching multiple burial searching with all the current models of avalanche beacons on the market? If not, what would help you?

All survey participants answered that they do teach multiple beacon searching—at least in professional-level courses. Many different techniques were described to explain how multiple burial searches were taught. However, 70 percent of the participants answered that they were not familiar with all current models of avalanche beacons and that their multiple-burial search

instruction was biased by the beacon with which they were most familiar. When responding to the second question of the survey, Rick Schroeder of the CAA summarized the problem of modern multiple burial instruction for avalanche educators: “This is becoming more of a challenge with changing technology and transceivers with different functions. With analog units I use search strips and the corkscrew method. With digital units it becomes a function of which units are being used.” A standardized approach for multiple burial searching that is “beacon neutral” is the best way to make ease of instruction and ease of learning multiple burials a reality for avalanche educators and their students.

### **2. ORIGINS**

The Deutschen Alpenverien (DAV) is the largest mountaineering organization in the world. Based in Munich, Germany, the club has over 700,000 members, many of whom ski tour or climb in avalanche terrain. In order to teach all of their members effective techniques in multiple burial searching, the Three Circle Method was developed by DAV researchers and IFMGA guides Dieter Stopper and Chris Semmel.<sup>2</sup> It was adopted quickly in Europe in 2004 and offers a much simpler alternative to another multiple-burial technique, the Micro Search Strip Method.<sup>3</sup>

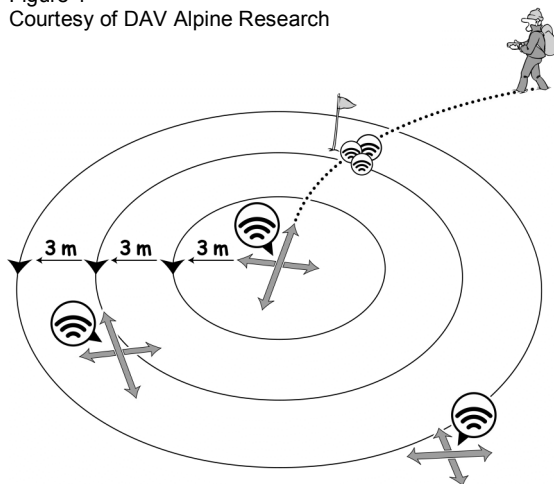
The Three Circle Method is a simple technique for solving multiple burials that occur within an 18- meter diameter, thus addressing close proximity or semi-close proximity multiple burials. It is important for avalanche educators to teach this method and make it the responsibility of the students to learn the multiple burial functions of their beacon. The Three Circle Method makes it possible to do multiple burials without using the complicated special functions available on most modern avalanche beacons.

The Three Circle Method utilizes the ability of most digital beacons to isolate signals automatically by their signal strength. It also allows analog beacon owners to use the method by isolating signals with their sensitivity control, also based on signal strength. Signal strength continues to be the most reliable approach to isolating signals in multiple burials; newer “marking” features are based on signal timing analysis and are often unreliable when pulses are overlapping.<sup>4,5</sup>

### 3. THE THREE CIRCLE METHOD

The Three Circle Method is simple and intuitive: if the searcher suspects there is more than one signal in the area, he must first pinpoint the first signal. The searcher then walks three meters out from the first signal and walks a complete circle three meters away and around the signal. If no other victims are found along this circle, a second circle three meters out from the first needs to be completed looking for other victims. Lastly, a third circle three meters from the second needs to be completed (Figure 1).

Figure 1  
Courtesy of DAV Alpine Research



In this illustration, the searcher suspected multiple signals in proximity. After pinpointing the first victim, he located two more within a 20-meter radius. If more victims are missing, the primary search is resumed, using a standard 20-meter search strip width.

Figure 2

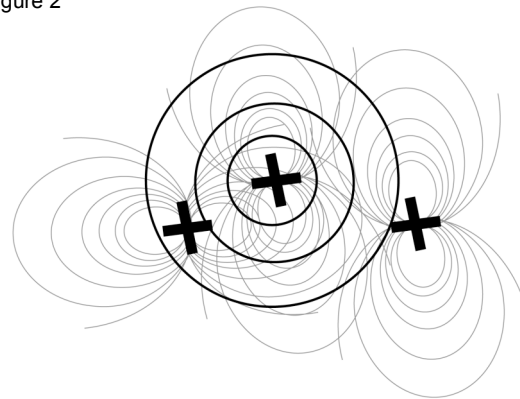


Figure 2 is a view of the Three Circle Method with beacon flux lines applied. This perspective makes it easier to understand how the searcher can walk upon the different transmitting signals while searching in a circle. DAV researchers Stopper and Semmel call this “flux line salad.”<sup>6</sup>

A few important points to teach students:

1. Like any multiple-burial search method, the Three Circle method should only be performed if there is enough human power for excavation of the first victim, allowing the best searcher to continue looking for other victims.

1. The first circle should be performed with the searching beacon as close as possible to the snow surface. This offers better resolution when the victims are in very close proximity to each other.

2. The method is not complete until the searcher has walked all three circles and pinpointed all signals within or near the 18-meter diameter.

3. Once the second victim is located and/or recovered, and others remain unfound, the searcher should complete the original series of circles around the first victim, rather than starting a new set after locating each one.

Now that we have an understanding of the Three Circle Method, we can apply it to a standardized approach for teaching multiple burials.

#### 4. DEFINITION OF THE SEARCH AREA

The first step in a standardized approach to teaching multiple burials is to define the search area for the students. This is a fundamental and important step but it is commonly taken for granted and neglected when teaching beacon searching skills. All avalanches contain the following information: a crown, left and right flanks, and a debris pile. Translating this to students is simple: “we know where the avalanche started, we know where it ends, and we know where the sides are, now we need to search that area.” There is no need for students to be searching random spots and chasing signals outside of a poorly defined search area.

#### 5. THOROUGH AND SYSTEMATIC PRIMARY SEARCH PATH

The second step in a standardized approach to teaching multiple burial searching is for the searcher to walk a primary search path from the starting point (last seen point or crown) with a 20-meter search strip width. As this pattern is walked, signals will be encountered. The searcher should abandon the primary search path and enter the secondary search when a strong signal with a reading of 20 meters or less appears on the beacon screen (analog beacon users can turn down their volume and estimate 20 meters according to the range written on the volume knob). The reason we choose 20 meters or less is because it is a safe distance that will likely not miss signals that have drifted away from the 457 kHz frequency or are in an unfavorable transmit orientation. Drifted beacons or poorly oriented beacons can be difficult for some beacons to receive within their stated receive range.<sup>7</sup> As an example, if a searcher were to abandon a primary search path at a 40 meters reading, the searcher could possibly miss other beacons that are closer to the searcher but with signals that are weaker.

#### 6. RETURNING TO PRIMARY SEARCH PATH

After abandoning the primary search path for a signal, the searcher should pinpoint the signal. If it's determined that no other signals are in the vicinity, the searcher should return to the point where the primary search path was abandoned. But if it's determined that multiple signals are in the area, the Three Circle Method should be used. This is the third step in the standardized approach. After the multiple burial is solved, the searcher should return to the point where he abandoned the

primary search path. That's the final step in the standardized approach. Returning to the primary search path where it was originally abandoned is an important, strategic move that needs to be emphasized to students. It is common for the searcher to resume the search slightly below the signal or signals just found. This is a mistake and leaves gaps in the search area that are not covered by the searcher.

The flow of the standardized approach to multiple burial searching can be seen in figure 3.

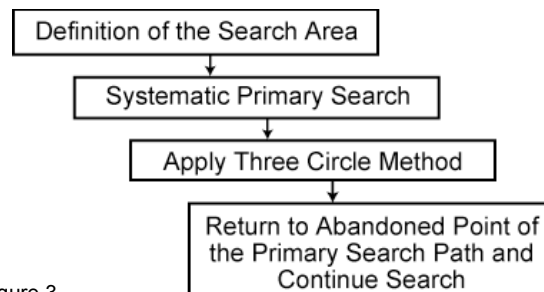


Figure 3

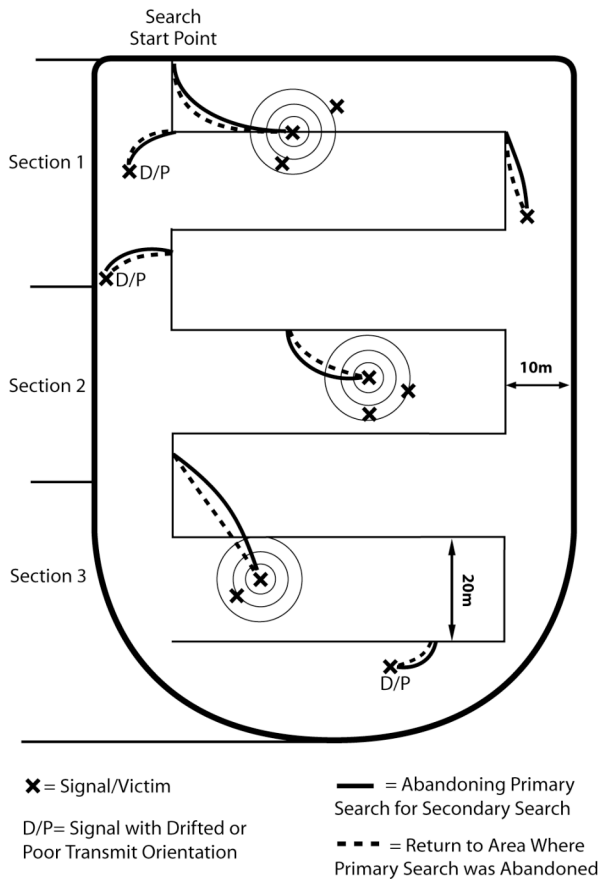
#### 7. HYPOTHETICAL NORTH AMERICAN HELICOPTER SCENARIO

Figure 4 is a complex multiple burial with 12 signals to find. We call this the North American Helicopter Scenario and use scenarios similar to this for training purposes at Backcountry Access. A standardized approach to multiple burial searching is applied to this scenario and is broken into three sections for explanation:

Section 1: The searcher starts searching at the top of the slide path and immediately encounters a strong signal 20 meters or less. The primary search path is abandoned for that signal. It becomes apparent to the searcher that it is a multiple burial since there is more than one signal, so the Three Circle Method is applied. After the multiple burial is solved, the searcher must return to the point where the primary search path was abandoned (dashed line). Without returning to the primary search path it would be likely that the D/P signal (signal with drifted or poor transmit orientation) would be missed. And even after the D/P signal is found the searcher must return to the primary search path and continue. Note that six beacons are found within roughly 45 meters.

Section 2: A clean and simple example of the Three Circle Method. Notice that the searcher returns to the point where the primary search path was abandoned before continuing the search.

Figure 4



Section 3: The Three Circle Method for a double burial. In this section it's important for the searcher to return to the abandoned point to see if there may be any beacons along the far right of the search path (searcher's right). Once it's determined there are no other beacons in that area, the searcher continues and is rewarded with a single search at the end.

## 8. CONCLUSION

1. No two multiple burials are ever the same. There are an infinite number of scenarios that can occur. A standardized approach with a defined search area, systematic primary search, Three Circle Method for close-proximity multiple burials and returning to the point where the primary search was abandoned is the best approach to train for diverse multiple burial searches. A standardized approach is also the easiest to teach.

2. When teaching a standardized approach, it is important to mark the point where the primary

search path is abandoned and to mark each beacon found to simulate that shoveling is underway. It is important to teach students that this technique is only necessary if the victim's beacon cannot be turned off.

3. Different methods for multiple burial searching have been developed over the years and all of those are valid. However, from our experience, the most commonly used method is simply to "get away" from the influence of first beacon found—that is, if it cannot be turned off. The Three Circle Method is simply a more methodical approach to an already intuitive technique.

4. Multiple-burial accident statistics can be misleading and often overemphasized. Various agencies and manufacturers have reported that up to 50 percent of avalanche victims are involved in multiple burials. However, this data often includes incomplete burials, burials not involving transceivers, and burials in which the scenario was best treated as a series of single burials. More thorough reports have recently shown that less than one percent of avalanche incidents involve multiple burials in which a specialized transceiver search technique could have been applied.<sup>8,9</sup> For recreationists, it is more important to encourage the ownership of a transceiver and to practice single beacon searching, probing, shoveling and organizing a rescue. "Special case" multiple burial techniques should only be taught in professional-level courses.

5. It is unlikely a single searcher can save multiple lives in a multiple burial if they are in a remote area without helicopter assistance. This is because the majority of time spent on an avalanche rescue is spent excavating the victim. Without additional manpower, it is difficult for a single rescuer to make more than one live recovery.

## References:

- <sup>1</sup>Steve Christie, Backcountry Access, Inc. 2820 Wilderness Pl., Ste. H, Boulder, CO 80301 303.417.1345 steve@bcaccess.com
- <sup>2</sup>Semmel, C., Mittermeyr, H., and Sojer, G. Lawinen-Verschütteten-Suche, Munich, Germany: DAV, 2005.
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<sup>5</sup>Edgerly, B. and Lund, T., "Signal Strength versus Signal Timing: Achieving Reliability in Multiple Burial Searches." [www.backcountryaccess.com/research](http://www.backcountryaccess.com/research)

<sup>6</sup>Semmel, C. and Stopper, D., "Orten mit Methode," DAV Panorama, 2004. (English version)

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<sup>9</sup>Stopper, D. and Mullen, J., "How Common Are Multiple Burial Situations? Avalanche Incidents in Tyrol, Austria, 1997-2003." [www.backcountryaccess.com/research](http://www.backcountryaccess.com/research)

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