

# BEACON SEARCHES WITH THE THREE-CIRCLE METHOD

## A baseline method for beacon searches with multiple burials

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- Original: DAV Panorama [www.alpenverein.de/panorama.html](http://www.alpenverein.de/panorama.html); authors Chris Semmel and Dieter Stopper (1/2004).
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  - Comments: text between [...] has been freely added by the translator for purpose of further clarification.
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*For a completely buried victim, every minute counts. If more than one victim buried, efficient pinpointing becomes more difficult. The instructor and safety research teams of the DAV (German Alpine Association) propagate therefore a baseline method that works the same with all beacon models.*

Until about ten years ago, manufacturers of avalanche beacons all used the same technology and search methods. All models were equipped with a single antenna only. The incoming signal was transformed into an audible sound. The louder the sound, the closer the rescuer was to the victim. Despite differences in respect to range and volume, the search method used with model A also applied to model B.

**Beacon technology and search methods develop**—During the past years, beacon technology saw dramatic developments. The microprocessing of a signal was introduced. Most of those “digital” beacons have more than one antenna, which point the rescuer in the right direction [with visual and acoustic clues]. With this, the beacon does not need to be rotated anymore. The microprocessor also automatically regulates the volume, and, when in proximity of one beacon, suppresses other [more distant] signals.

**Consequences for the education**—Today’s beacon models differ greatly from one another. This fact has an impact on how to use them for a search. Manufacturers develop their own search specific guidelines for their beacons, especially for dealing with multiple burials, which are fairly common. According to the SLF (Swiss Avalanche Research Institute) in Davos, Switzerland, more than half of completely buried persons are part of a multiple burial scenario. The increased number of search methods [with different beacon models] has made it very difficult for educators to efficiently teach the use of avalanche beacons. Indeed, who *really* is intimately familiar with *all* the various models and their search methods and special functions? And how should those different methods be taught during a course [where there naturally are several different models present]? The solution is a baseline search method that applies to all beacons used in “basic function mode”. After extensive theoretical think-tanks and much time and cost intensive field-testing on the Zugspitzplatt [in Germany], the “Three Circle Method” as the baseline method for multiple burial searches, applicable to all beacon models, is now being introduced.

**The essence of the “Three Circle Method”** —When several victims are buried within close range, their electromagnetic fields overlap in a veritable “flux line salad”.

Pinpointing is possible if the searcher enters the area near a victim. The signal of the closest beacon now dominates the “flux line salad”, and the victim can be located. With an analog beacon, distance indication is controlled with the volume button. The signal of the closest beacon is received while other more distant signals are barely or not at all received. In contrast, digital beacons automatically isolate the closest signal by suppressing the ones further away. The “Three Circle Method” takes advantage of this signal isolation. If there is a situation of multiple burials within close range, the “Three Circle Method” will lead the rescuer from the first found victim to near other victims. The victims thus can be located due to their dominating signal.

**This is how the “Three Circle Method” works**—If a rescuer notices other signals within close range when approaching a victim, the “Three Circle Method” is used. Initially, the first victim is located and while other rescuers are digging, the searcher circles around that victim at a 3m distance (3m ~ length of a probe). Then, at a circle of a 6m radius. The third and last circle has a radius of 9m. With analog beacons, the distance indication is controlled with the volume button (“acoustic signal isolation”). With digital beacons, the signal isolation happens automatically. If another strong signal is received on one of the circles, then that signal is followed to pinpoint the next victim. Are there additional victims buried within close range? If so, all of the three circles must be searched to ensure no victim has been missed.

**Why the fixed circles at a fixed radius?** —The burial of humans exposes the rescuers to extreme stress levels. Minutes decide over life and death. Additionally, if it is a multiple burial scenario, a simple method may produce the best results. Using the “Three Circle Method”, initially, only one decision has to be made (see Fig. 1): multiple burials with victims within close range, yes or no? If yes, then locate the first victim. Then circle; with fixed radius because those can be controlled even when under extreme stress. Furthermore, the searcher has the advantage of a [visual] point of orientation- the probe that marks the located victim, and the other rescuers who are digging. When all three circles searched, then the primary search pattern is continued. This primary search strip pattern (20m distance in between search strips) matches the 18m diameter of the third circle. That’s why the 20m search strip pattern must be applied consistently over the entire search area. With a wider search strip, or an incomplete primary search, the risk of missing a victim increases (see Fig. 2).

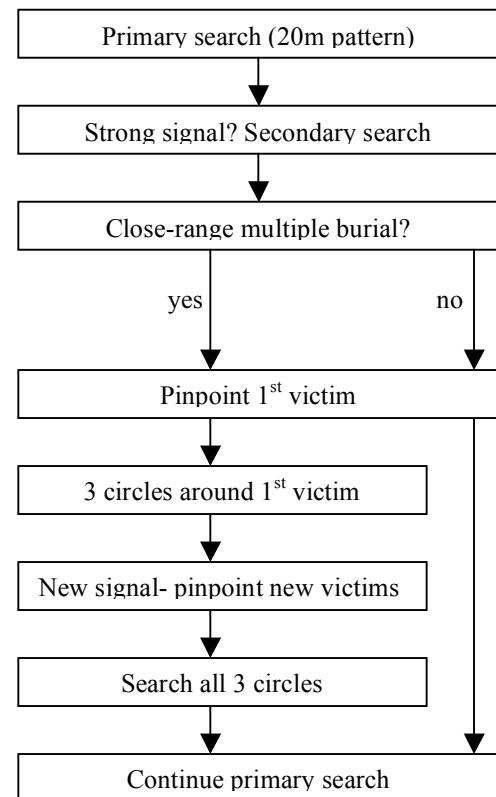


Fig. 1: “rescue procedure flow chart”

**Limitations of the “Three Circle Method”** —For really complex multiple burials scenarios, the “Three Circle Method” is inefficient. Complex is when victims are buried

very deeply (>2m), and/or one or more victims are buried very closely (<1m) and/or victims are buried directly above one another]. In these scenarios, a victim may fall through the cracks because the distance between circles is 3m, and while circling, only one strong signal is pursued. There are other search methods that are more successful in such special situations. However, such methods are much more complex and thus—according to the authors—not well suited as a baseline method. Furthermore, most digital beacons have one or more special function modes to be used in multiple burial scenarios. If one wishes to successfully locate a victim using the special function modes of a specific beacon model, then further familiarization and additional training with that model is necessary.

**What does it take to apply the “Three Circle Method”?** —The rescuer must be efficient at working single burials. This involves the ability to maintain search strips and circle diameters, follow a flux line, pinpoint via bracketing and probe systematically. Additionally, a close-range multiple burial situation must be recognized. Also, the rescuer must keep the overall situation in mind in order to switch between circling and primary search. All these skills can’t be learned by simply studying manuals and literature, but by practicing scenarios with multiple burials! For the first steps, a wide field serving as a search area is sufficient. Pinpointing with bracketing and probing should be done on snow, however. And by the way: we had a ton of fun practicing.

**A request to the manufacturers**—It would be a great advantage for recreational and professionals alike to include a standard baseline method in the beacon manual. The “Three Circle Method” can be used with all beacon models and is easy to teach. Certainly, each manufacturer should also include model-specific search methods [explaining the additional use of special mode functions].

**Final words**—Thanks to the DAV instructor team for their very important support, and to Manuel Genswein who greatly helped us refresh and complete our knowledge of beacon technology. Also, a big thanks to all with the Zugspitz transportation company for preparing the field-test areas with their snow cats.

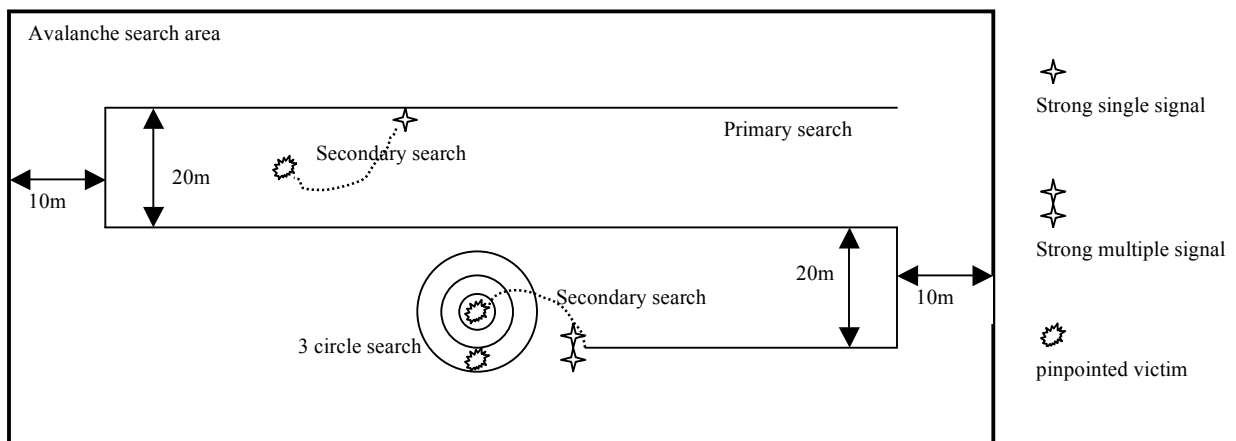


Fig. 2: The “Three Circle Method” within a multiple burial procedure is a baseline method to locate multiple victims within close range. It can be used with any beacon model.