Gadget Fever

Do we rely on features to avoid practice?

by Craig Dostie

In recent years there has been an ever increasing emphasis on the importance of avalanche beacons for backcountry skiers. There is no doubt they have value, but perhaps we have all become enamored with the fancy features they can provide without actually considering the need for such features, or rather, for balancing the likelihood of using them.

Almost anyone can, as long as they can turn on and switch their beacon to receive mode, figure out that moving in the direction indicated will get them to the target. Compared to a decade ago, single victim search times have reduced dramatically. So it seems logical to consider the next step—multiple victims. Statistically the number of cases where more than one person is buried in an avalanche may be a minority, but if technology could help us with one, why not several?

It's compelling until one considers reality. First, there are the basic physical problems that ensue in any avalanche burial. If the victim isn't killed by trauma, then there is a 92% chance of survival if they are extricated within 15 minutes. This drops to only 30% after 35 minutes.

If a beacon can help you find a single victim in less than 3 minutes, and less than 10 minutes to find two or three, then multiple victim beacon features are an obvious improvement. Except that you're still on the surface of the snow. Simply identifying the location of a victim still doesn't mean they have been saved. You still have to dig them out, and that is the crux of the problem with multiple victim scenarios.

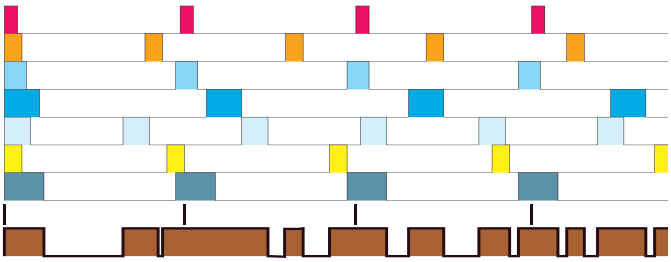
Once you've found one victim, do you immediately start digging for them, or do you search for another? If it takes another three minutes to find the other victim, was that the three minutes that would have made the difference between life or death of the first victim, or not? Which victim should you go for first? How much time should you spend making these decisions?

One of the popular features offered by some beacons for dealing with multiple victims is the ability to "flag" or "mask" beacons that have been found (but not yet unburied). When it works it's a really cool feature, but it doesn't always.

The way these fancy beacons identify their victims is by doing an analysis of the time signature of signals received. Every beacon sends out a pulsed signal, at a specific rate. In other words, it transmits a signal at 457 kHz for about a 1/10th of a second (average pulse width), about every second (average pulse rate).

If every beacon had the exact same pulse width and rate, it would be possible for multiple victims signals to be in synch. You would think that the likelihood of two beacons being exactly synchronized by turning them on at random times is small. Reality, however, shows otherwise.

To minimize the likelihood of beacons synching up, several things are done. First and foremost, every manufacturer uses a slightly different width pulse and rate than their competitors. Manufacturers even vary the pulse rates within the same model, since the worst possible scenario would then be if several members of the same skiing party had the same model with the same pulse rate. It doesn't eliminate the possibility of signals overlapping, but it does reduce the moments when they do.



The time signature of seven beacons on the market, and at the bottom (brown), the combined signal received. This exaggerates the complexity of distinguishing indivudual beacons, but also illustrates the problem.

Since all existing algorithms for identifying signals as unique are based the time signature, the ability to do this ***reliably*** requires that the signals not overlap. Except that, over time, they inevitably will. This can wreak havoc on the ability to reliably "mask" out known signals so the searcher can focus on determining the locations of unknown beacons. A signal can be detected, characterized, and then ignored, until a few minutes later when a second beacons time signature synchs up and overlaps the previous one. In that case, the "lock" on the first beacon is lost, and an inexperienced searcher may get confused.

There is another phenomenon at work. Older analog beacons, like Ortovox F1, the Pieps 457, and Survival on Snow's F1ND have an oscillator that is always on (the oscillator is the component that creates the 457 kHz signal). The pulse is created by a switch that connects, then disconnects the signal to the transmitting antenna. When connected, a strong signal is sent out. When disconnected, the 457 kHz signal essentially leaks out. It's a very low level, but one that can be detected when you are close enough to pinpoint the location of a victim, rendering the "masking" feature unreliable (at best).

This doesn't mean that the older beacons are defective. It means that the algorithm for identifying multiple victims doesn't account for all possible situations. Let's face it, it is a complex, confusing situation. The fact that beacons like Pieps DSP, the Barryvox Pulse, or the Ortovox S1 can, when the conditions are right, not only recognize multiple signals simultaneously, but even know how to ignore them on command, is pretty phenomenal.

However, we must be careful not to be sucked in by their promises and recognize the reality of a real avalanche accident. Having one person caught in an avalanche is serious enough. More than one and the situation has gone from dire, to deadly. In that case, I think multiple victim features are fine, if they work. But I don't want to rely on them only and then find out they won't work in the real situation. It's better to have a solid fall back plan that doesn't rely on the fancy features. For that I recommend you learn about and practice something like the 3-Circle Method, or the Micro-Grid Method. These are solid procedures that will allow you to find multiple victims—even with simpler analog beacons—in a short time, if you practice. Of course, avoidance is better still, but who wants to stay home?