

## How common are multiple burial situations? Avalanche incidents in Tyrol, Austria, 1997-2003.

By Dieter Stopper and Jon Mullen



Avalanche professionals, beacon manufacturers, and alpine associations have often thought of complex multiple burial situations as a common occurrence for recreational mountain travelers. As co-innovator of the Three Circle Method (for multiple-victim searching), I have been prone to this type of thinking as well. The type of situation to which I am referring is this: an avalanche sweeps down from above and buries several recreationists in close proximity. All are wearing beacons but the signals overlap in a “flux line salad” resulting in a very difficult search. We have made many assumptions in the avalanche education field about these types of scenarios. As a result of these assumptions, the subject of close proximity multiple burials has made it to the forefront in educational discussions and trainings. But we need to ask ourselves a few realistic questions: how common are close proximity multiple burials? When close proximity multiple burials occur, are special methods and

technologies used? Are there other factors that complicate multiple burials?

### “SPECIAL CASE” MULTIPLE BURIALS

First, let’s define what we mean by a “special case” multiple burial: a burial in which a special technique or technology could be valuable. It’s clear that to accomplish a beacon search, the scenario must first involve a buried person without clues or body parts visible on the snow surface. If there are clues or body parts visible, the search can be done with the eyes! Both the searcher and the victim need to have a beacon. We assume that in this day and age all winter travelers in mountain terrain are carrying and using beacons. But the analysis of Tyrol avalanche accidents tells a much different story, which we will discuss in a few paragraphs.

A multiple burial rescue requires some additional factors to qualify as a “special case:” at least two people have to be buried completely under the snow surface

without any visible clues. They must both be wearing beacons and they must be buried close enough that the beacon of a searcher captures both signals at the same time. If the distance apart is big enough, the signals don't interfere in a relevant way. This can be solved as two single burial scenarios: when close to one beacon, the signal from the other is too weak to be picked up.

What about the rescuers? There have to be at least two rescuers to solve a special case multiple burial; otherwise it makes no sense. If there is just one rescuer the only option is to locate and excavate one victim after the other. In most cases it is a waste of time to figure out the positions of the other victims since a single rescuer is so limited in the ability to excavate. The standard technique for a single rescuer is to locate the closest victim, excavate, turn off the beacon, and then continue searching for other victims. If there is more than one rescuer, it might make sense to perform a special case multiple burial search since one rescuer can locate a victim and then resume the search as the other rescuer begins digging. Let's now take a look at real case studies.



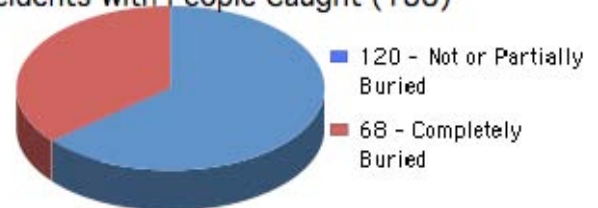
*A beacon search is necessary if a victim is completely buried.*

## DATA EVALUATION

To answer the questions above, the authors evaluated the data of avalanche incidents in the Tyrol region from the winters of 1997/98 to 2002/03. In these six winters there were 432 reported avalanches. Of these, 256 were somehow human related. And in 188 of the avalanches, people were caught and either transported or buried.

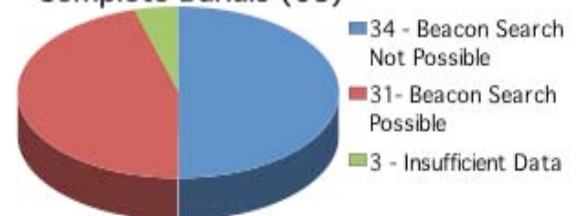
In 120 of the 188 avalanches, a beacon search was not necessary since victims had a body part or clue visible above the snow surface. In 68 avalanches, there was at least one person completely buried below the snow surface.

Incidents with People Caught (188)



In 34 of these 68 complete burials, a beacon search was not possible because the victim(s) or rescuer(s) were not wearing beacons (in three cases, the victims had beacons but the rescuers did not).

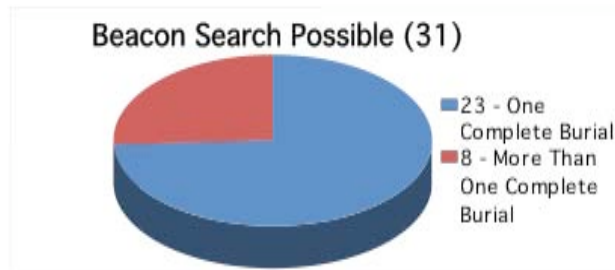
Complete Burials (68)



Therefore, in 31 of 188 avalanches where people were caught, a beacon search was possible and necessary. That's 16.5 percent.

Of the 31 avalanches where a beacon search was possible and necessary, the

Tyrol data shows eight multiple burial situations with two or more victims equipped with beacons.



The authors investigated these eight cases to determine if they were “special case” multiple burials and if special techniques were, or could have been, applied.

#### MULTIPLE BURIAL CASES

Case 1: The avalanche report refers to four complete burials. The responsible searcher said there were only three burials. One of the three could excavate himself and the arm of the second person was sticking out from the snow surface. The third completely buried person had no beacon. *“We have done a primary search several times, but we could not find the victim, because he had no beacon on.”* This is not considered a special case multiple burial.

Case 2: Three people buried: one up to the chest and two completely. The first victim was excavated quickly with a few shovel strokes by two shovelers. Then one searcher located the first and the second victims. The searcher said that the two victims lay so far apart that the signals were well separated. *“I have located the first one ... at the following search I have received the signal from the other victim ... to locate the victims was fast, but to excavate them took very long, because the victims have been buried that deep (over two and four meters).”* This is not considered a special case multiple burial.

Case 3: An avalanche hit five people in a flat area and buried them in place completely. The distance from one victim to the next was about ten meters. *“The locating was no problem, because I have known the position of the burials quite well: all in one line with a distance of about 10 meters ... Then shoveling was hell!”* This is not considered a special case multiple burial. It would have been had the searchers not known the previous locations of the victims.

Case 4: Four people buried in an avalanche: three people total, one person partly. That person could excavate himself. *“In my case I was the only one ... who could do the search. Therefore that multiple burial scenario was more like a multiple single scenario ... I located the first burial, excavated her, provided first aid and an airway, switched off the beacon and then looked for the next signal and so on.”* This is not considered a special case multiple burial.

Case 5: 14 people completely buried, mostly in close proximity. Hence there were many interfering signals. The beacon search was performed by a guide, who was later assisted in shoveling by a rescue team. *“I went back and forth and attended to a loud signal and the lowest reading of the distance. Then I probed ... the locating was quite quick, the whole organization of the rescue was difficult ... in my opinion the excavation has taken about 90 percent of the time.”* This is an example of a special case multiple burial.

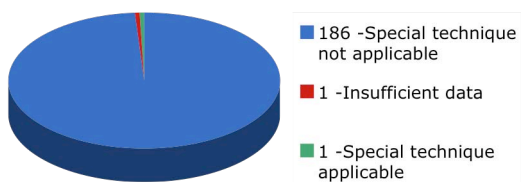
Case 6: 2 people completely buried within a distance of 5 to 6 meters. One was about 0.5 meters deep and the other 1.6 meters deep. *“After a short time we had the first victim. He was just a half-meter deep ... we then immediately turned off his beacon and searched for the second victim ... As we excavated the second*

victim, the helicopter came ... to excavate the second victim took very long, even though the snow was quite soft. But he was buried deep (1.6 meters). To locate the victims was not the problem, but the shoveling was.” This was a special case multiple burial. But a special technique or technology has not been used.

Case 7: The avalanche report refers to two complete burials. But, in fact, the ski of a victim stuck out of the snow surface. The two victims have been about 15 to 20 meters apart. “To locate the second victim was not the problem, but shoveling ... the shoveler was very strong, but he was totally beat after the excavation ... To excavate the victims is always underestimated.” This is not considered a special case multiple burial.

Case 8: Unfortunately the authors could not interview the searcher in this case. According to the data of the Tyrol avalanche forecast center, in case 8, four people were completely buried. Therefore, of 188 avalanches in Tyrol in which people were caught, just one incident fits the description of a “special case” multiple burial with victims in close proximity and where a special technique was used.

### Incidents with People Caught (188)



### CONCLUSION

In more than half of the avalanches where a person was completely buried, the victims had no beacon! Obviously the beacon is not accepted yet as a full standard. The conclusion is recreational

skiers are inadequately equipped for avalanche rescue. This means they are not carrying beacons, shovels and probes. The study refers to just one case where a special method to solve a multiple burial situation was applied. One thing is clear: A special case multiple burial situation that requires a special technique (or technology) is very rare. In the interviews, all responsible searchers in multiple burial situations pointed out that the excavation process was very time consuming! This same problem also applies to a single search and excavation. Avalanche rescue education should focus first on solving a single burial situation and second on teaching how to excavate a victim. A strategic shoveling technique will save time and increase the victim’s chances for survival.



Teaching strategic shoveling technique is more important in recreational avalanche courses than teaching special techniques for multiple burials.

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This research was commissioned and paid for by BCA. The authors wish to thank the searchers for providing their valuable comments.