

THE Beacon

Can it be mid-winter already? Time flies when you are having fun—or busy. And busy it has been with an avalanche season like we have not seen in years—at least in the southern half of the state. Several major snow storms have slammed southern and central Colorado, and in the first half of January we faced the biggest avalanche cycle to hit Colorado since February of 1986. With hundreds of 30-year avalanches and probably a handful of 100-year slides, it was something to write about, which we will do in the spring issue of *The Beacon*.

But first some news on new faces at the Colorado Avalanche Information Center (CAIC). There are two additions to the CAIC staff this winter. Spencer Logan (no relation that we know of to long-timer Nick Logan) is a new forecaster in our Boulder office. Spencer came to Colorado from Montana, and you can read more about him in an upcoming issue of *The Beacon*.

We also hired Mark Ridders in the Silverton Avalanche Office to replace the out-going Andy Gleason, who has transferred to a geological position within the Colorado Geological Survey. Mark worked as an intern with Andy and Jerry Roberts in Silverton for a couple of years. Mark has a great educational background for his new job. He received his BA from Prescott College in 1990 with a dual major in Spanish and Outdoor Education. He then earned a Masters Degree from the University of Colorado in 1997. His Masters Thesis was titled *Spatial Variability of Liquid Water in a Continental Alpine Snowpack*. Mark, welcome aboard, it's great to have you on the team.

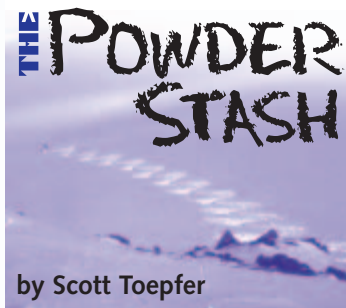
On a sad note, Reese Martin, a long-time Friend of the CAIC, died on July 9th while competing at a paragliding event in Washington. Reese was a climber and skier who grew up in Washington. He

lived near Aspen for a number of years. As well as being a member of our Friends program, he was also very active in the climbing community. He supported the American Alpine Club, The Access Fund, and the American Safe Climbing Association. His love of climbing took him to Canada, Nepal, Thailand, Peru, and Europe. Our outdoor community will miss him.

This is our mid-winter issue of *The Beacon*, and as of this writing in early January, we have already had one avalanche-warning episode that involved deep, hard-slab avalanches. Our lead article addresses this subject. Deep-slab instabilities are a problem we have almost every winter in Colorado. Just when we think the danger has subsided to a manageable level, BOOM—the entire winter's snowpack is sweeping you down the mountainside. We convinced Dale and Knox that they were the best people to construct this article, and for this I am deeply grateful. It was not an easy piece to write. It is very timely as many of our deep-slab problems peak from January through March.

I think one thing we learned from the *Amazing Dog Tales* in our fall issue is to be very careful when you have a dog around a cornice. Dogs are naturally inquisitive and want to look over the edge, just like a lot of us did as kids. Given the response we had to that column we are including a couple more amazing dog tails in this issue. One comes from Iceland. When Sigurbjörn Gunnarsson sent me a story last fall, I knew I would have to add a "Dog Tails Two" column to the next *The Beacon*. Two other great dog survival tales are also included. Our last piece is our occasional Q&A column.

Here's wishing you some memorable runs in great snow this winter. Hopefully it's close to the quality I had in Benchmark Bowl on the winter solstice. There's my stash for this issue. ❄





Deep Slab Instability

by Dale Atkins and Knox Williams

“Deep-slab instability still lurks...beware, these slabs may inspire false confidence luring backcountry travelers further out onto slopes before releasing large areas....”

As a user of the CAIC daily avalanche bulletins, you no doubt have read or heard us mention deep-slab instability and the potential for big avalanches. But just what is deep-slab instability? Why is it so difficult to assess? Why is it so deadly? And what can you do about it?

To answer these questions we put our heads together to compare experiences with different winters, weather patterns, and snowpacks; we reviewed past accidents for common themes; and we checked a few avalanche books, but not too surprisingly found there is very little information about deep-slab instability. In this short article we will summarize the facts of deep-slab instabilities, what you can look for, and what you can do about it.

Deep instability simply refers to weaknesses in old snow layers, and deep-slab avalanches are those that break into old snow layers. We know from work done primarily by the Swiss Federal Institute of Snow and Avalanches in Davos, that the deeper the weak layer, the less stress a person exerts on the layer. In fact, a person's weight has little additional effect on weak layers buried deeper than about one meter. Knowing this, we decided to look at Colorado avalanche accidents involving deep releases. We defined a *deep release* as any slab avalanche with a fracture line greater than three feet. Conversely any release equal to three feet or less is a *shallow release*. We ended up with a sample of 239 human-triggered slab avalanches where we know the type of avalanche and the fracture-line (crown face) depth and width. On average, 25 percent of avalanche accidents involve deep releases in Colorado and other western states. Let's take a look at the facts of deep instabilities and deep-slab avalanches.

Fact 1: Deep instability often involves hard-slab avalanches.

Hard slab by definition is a cohesive slab layer having a density greater than 300 kg/m³. Skis barely cut into it. On the hand-hardness test, it is usually pencil hard. It is usually formed when strong winds redeposit snow. (See Figure 1)

Hard-slab avalanches are nasty and unpredictable beasts, and in Colorado our high elevations and strong winds mean widespread hard slab conditions. In fact in Colorado 59% of avalanches deeper than three feet involved hard slabs, whereas only 11 of 175 (6%) avalanches three feet or less were hard slabs.

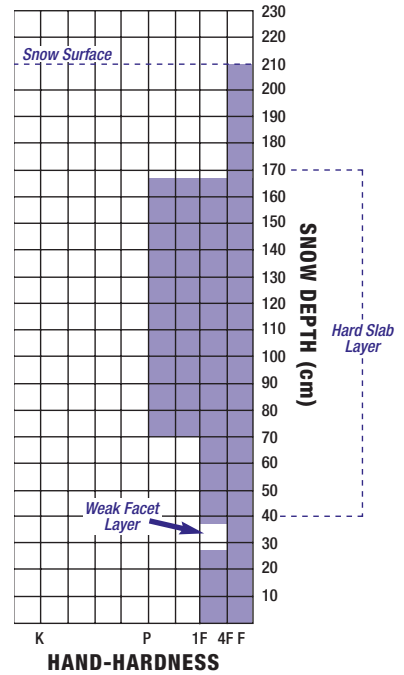


Figure 1: Cumberland Pass, Colorado, fatal avalanche fracture line profile, February 6, 1999

Fact 2: The snowpack appears to be very strong and able to withstand lots of weight.

There is no doubt that hard slab is strong snow-because of its high density that results from the close packing of very small grains. Generally speaking, the thicker the slab, the stiffer and stronger the slab. Thick hard slabs often conceal their trap from the unwary backcountry traveler with an illusion of stability, and it is stability, not strength, that is the important characteristic. These slabs can be very strong but are only as stable as the weak layer below. Failure and fracture start first in the weak layer, not the slab. In Colorado deep slab avalanches catch an average of two people per avalanche compared to 1.7 people for less deep avalanches. Why? See Fact 4.



Figure 2: Buried surface hoar layer near Wolf Creek Pass (Photo: Tom McKelvy)

Fact 3: The weak layer is days, weeks, or even months old.

Persistent weak layers are the usual problem layer in deep-slab avalanches. These layers are composed of relatively large and cohesionless grains that are slow to change shape or gain strength. These snow grains include depth hoar and facets, along with surface hoar crystals. These weak layers often form during a prolonged period of fair and mild weather when a strong temperature gradient dominates the snowpack. It is

often during these same periods when the three C's—clear, calm, and cold—create weak surface hoar on the snow surface. Additional snows eventually bury these weak layers (See Figure 2), and it is not uncommon for a persistent weak layer to produce avalanches a month or two later.

Persistent weak layers are especially troublesome because even though they gain strength over time and sometimes can support considerable loads, when fractures do occur they can propagate long distances. A persistent weak layer is analogous to a line of closely spaced dominoes standing on end. Both are strong in compression and can support much weight; however, both are weak in shear. When one domino topples and falls into its neighbor it can trigger a cascade of toppling dominoes. Once a fracture starts in the weak layer, it may propagate long distances through the layer.

Fact 4: Deep slabs release above you.

Usually the stronger the slab, the farther fractures propagate, and therefore the bigger the avalanche. There is even more bad news: these avalanches fracture higher above or farther away from the trigger point—your position. (See Figure 3) The result is that deep-slab releases are harder to escape from. Soft and shallow slabs more often break at or near your feet, giving you a slightly better chance to escape (but any avalanche once set in motion is difficult to escape). In Colorado the width of the average fracture line for a shallow release is about 260 feet; however, the width for a deep release is about double that at 540 feet across.

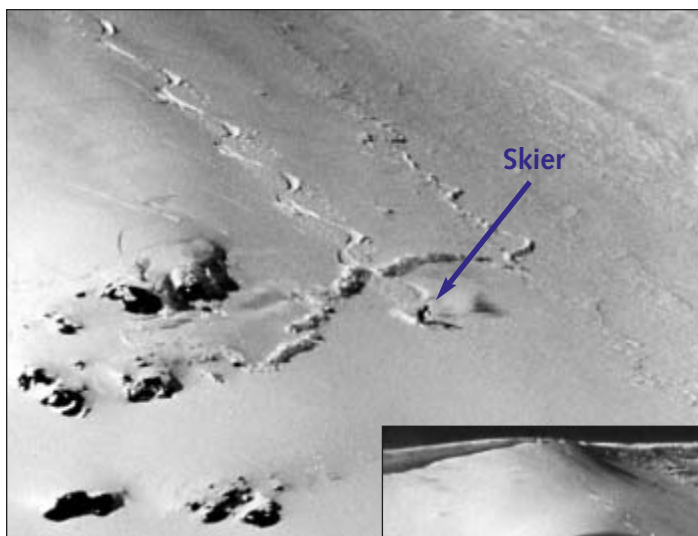


Figure 3: Skier triggering a deep slab when he hit an area of shallow, weak snow near a rock band. The final fracture was far above the trigger point. The dashed border represents the area shown in first photo. (Photos: Tom Fankhanel, February 1984)

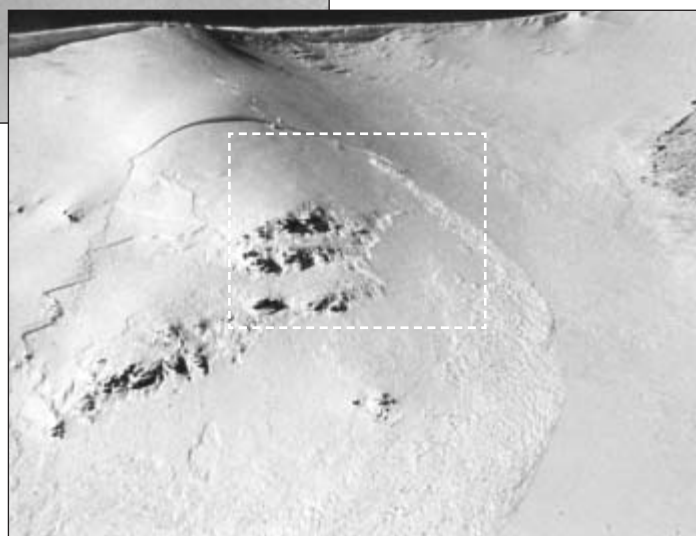


Figure 4: A large slab avalanche near Red Mountain Pass triggered by backcountry skiers while standing on the ridge far to the right of the avalanche. The skiers felt the shallow snow collapse beneath them and watched cracks shoot out and release the avalanche. The fracture line or crown face ranges from 2 to 8 feet deep. November 30, 2004. (Photo: Messmore Kendall)

Fact 5: Deep slabs are triggered where the slab is thin.

This fact is key to understanding human-triggered deep-slab avalanches. Though our records tell of human-triggered avalanches

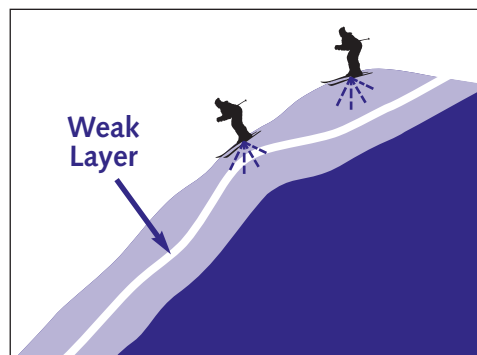


Figure 5. The additional stress of a skier can affect a weak layer where the slab is shallow.

up to 12 feet deep, it is essential to recognize that the fracture line did not occur underfoot. The victim triggered the avalanche from a thinner spot where their body weight could affect the weak layer. (Figures 4 & 5) Once fracture occurs, cracks are driven by high energy and quickly propagate into

the deep slab areas. A person exerts nearly two times the force on a layer one-half meter (50 cm) deep compared to the same layer buried one meter down, and nearly four times the force compared to the same layer buried two meters. It is not uncommon to see a skier or snowboarder cut across a large pillow of wind-drifted snow only to see the fractures shoot out as the rider reaches the edge or bottom of the drift. The same happens but

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Deep Slab Instability

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with all too often tragic results when a skier crosses the thin spot of a large slab and sets an entire slope into motion. The problem for all of us in the backcountry is, of course, that we do not know where the slab may be thin.

Fact 6: Snow pits and stability tests like the Rutschblock and Compression Test can be misleading.

Snowpits are a great way to learn about snow and avalanches, but snowpits can be deceptive because they only reveal information from one point in the snow cover. Snowpits can also be misleading when diggers interpret the wrong layers. Many backcountry travelers tend to focus on the strong snow layers instead of weak layers. Another common mistake is to dig in areas of deep deposition where the weak layer is far below the snow surface. When the weak layer is buried more than a meter down it is difficult to assess the weakness.

Stability tests can also be misleading when assessing deep-slab instability. Because the weak layer is deep and often old, stability tests often score in the moderate to high (stable) range for two reasons. First, because the weak layer is deep, the thick slab attenuates the applied stress, reducing its affect on the weak layers. Second, it is easy to unknowingly dig in the wrong spot, where the weak layer is deep or is strong. With time, the super-weak zones in the weak layer will get smaller and slopes become less sensitive to triggers. This explains why we tend to see more frequent but smaller avalanches during a storm. But as the days pass we see fewer but larger avalanches. As the super-weak zones shrink you are also less likely to dig in the right spot to encounter the weakest snow, so stability scores may be high. This can give false confidence and a perception the snow is more stable than it really is.

Fact 7: Deep-slab avalanches produce large forces and crushing weight.

The middle of a roiling and crushing avalanche is a bad place to be, and this is especially true of deep-slab avalanches. In nature when it comes to gravity-enhanced events, bigger and heavier is almost always faster and more powerful and this is especially true with deep-slab avalanches. Certainly a deep-slab avalanche implies more snow, but also the density of that slab will likely be greater, resulting in an even more massive avalanche. The power of a deep slab avalanche is best viewed from afar.

What Should You Be Alert To?

Deep-slab avalanches are ornery and unpredictable. These avalanches are not only deeper but also wider than shallow releases, and thus more dangerous. Even worse, while the first skier or snowmobiler might trigger it, it is more likely that the 5th, 10th, or even 20th traveler will hit the weakest spot and cause the avalanche. During times of deep-slab instability it is easy to be lulled onto steep slopes because they seem stable.

To avoid this trap, here are some points of which to be aware:

- Avoid hard slabs on steep slopes. Hard slabs are notoriously unpredictable and best left alone. Hollow drum-like sounds are the most obvious clue to unstable conditions.
- Dig snow pits in spots of shallower snow and/or where the slab is thin. This makes it easier to test the weak layer because the applied force in a Rutschblock or compression test will easily reach the weak layer. Stability tests performed at the top of slopes are less reliable than tests done along the edge and lower on the slope. Of course this can create the interesting dilemma of how much risk you're willing to take to get good data. If you are concerned about the snow, but unwilling to take risks to collect that information, we suggest you find a different, less-steep route.
- In snowpits, look for and test persistent weak layers, such as a thick layer of depth hoar or a thin layer of buried surface hoar. A dangerous combination is a persistent weak layer sitting on top of a crust (e.g., melt-freeze, sun, or rain crust).
- On steep slopes, be leery of the edges of pillows on wind-drifted slopes. At the top of a pillow or drift the snow will be deep, and you will find lots of strong snow between you and the weak layer. Where the drift tapers lower on the slope, less slab separates you from the weak layer, and you could more easily trigger an avalanche.
- Generally winters with low snowfall or winters with periods of prolonged dry spells-and occasional periods of strong wind-are best known for creating persistent weak layers and deep-slab instabilities.

What Should You Do About It?

Uncertainty is the operative word when dealing with deep-slab instabilities, and the backcountry traveler who assumes stable conditions may be in for a rude and painful surprise. Your first task is to learn as much as you can about current conditions. On a broad scale, the CAIC hotlines and emails will relay information that we have received on hard slabs or deep-slab instability. On a small scale-like the slope you want to be on-it is up to you to get data through observations, snow pits, and stability tests. Use the tips listed above in "What Should You Be Alert To?"

Your second task is to apply the habits of safe backcountry travel to the max-habits such as one at a time, don't bunch up, travel the edge not the center of slopes, don't cross beneath steep slopes, etc. You know the drill.

These tasks are your "due diligence," and they will lessen your uncertainty. But there is an unavoidable bottom line: When deep-slab instabilities lurk the only way to stay safe is to avoid steep slopes. This answer might sound like a "cover-your-you-know-what"-type response, especially when you watch people rip turns on steep slopes, or listen to your friends tell of their latest powder adventure. However, if you tackle steep slopes with deep instabilities your safety does not rely on skill, technique, or equipment; it relies on luck. Luck is something we would prefer to rely on in the casinos and not in the mountains. ❄

Amazing Dog Tales II

Introduction by Scott Toepfer

I am well aware that most dogs must go skiing. Our dog, Koot, will have the most depressed look on his face if he is not invited along for a ski tour. I sometimes feel like I've abandoned a child while I listen to his howls of anguish while skiing away off the front deck. I really think skiing is one of his favorite activities, right up there with eating. We need to remember that no matter how much we want to take our dogs out, they will seldom have the snow smarts of their owners. So we need to pick our tours carefully when bringing Fido.

In our Fall issue of *Amazing Dog Tales*, we learned to keep dogs away from cornices. In this issue, a tough question comes up. Do we put avalanche beacons on our dogs if we are going into the backcountry? I saw in a recent article in my local paper (*Summit Daily News*) that we spend more money on our pets than we spend on candy and toys. I am intimately aware of how much love Americans shower on their pets.

Our policy at the CAIC is that we do not put beacons on our dogs when we are skiing with other people. (The only exception is if you and your dog are traveling alone, and you can check out our Q&A section to find out some options you may have.) The reason? You cannot take the time to find the signal from a buried beacon and dig it out, only to find that it is on your dog, not your other best friend.

Sometimes I tease my wife Andrea that she would rather find Koot first, then me, if we were buried in a slide. It's not something I want to put to the test.

A Miracle in Iceland

by Sigurbjörn Gunnarsson (Súlur Akureyri, Iceland)

While I was at A-Basin on a short ski patroller exchange in 2002, the weather back home in Iceland was at its worst. It had been snowing heavily, closing all traffic between towns for several days. Big storms are not unusual for us, but they rarely happen for long duration in Iceland. After the first few days of heavy snowfall a big avalanche came down a gully in Olafsfjordur, a small fjord on Iceland's north coast that has a town of around 1,000 inhabitants. The avalanche hit a family house on a farm that is a little further inland from town, so it can be quite difficult to get to. A small Search & Rescue team in Olafsfjordur (all volunteer, as is every SAR team in Iceland) responded. Eventually every SAR team from the nearby towns came to help as well, as did my SAR team from Akureyri, which is the biggest town in northern Iceland, roughly 60 km away from Olafsfjordur.

Roads remained closed to Olafsfjordur due to the continuing snow. When rescue teams finally arrived via over-snow vehicles they were greeted with a scene of complete devastation. Fortunately, it took only a few hours to find the victim, along with his dog, who were both deceased. However, a second dog that the victim had been looking after was not found.

A few days later the exchange with A-Basin ended, so I flew home to Akureyri. Eight days after the accident a clean-up operation was organized. I got involved and traveled to the

scene with the brother of the man who had been killed in the slide. His main goal was to help recover valuables. When we arrived we could see one corner of the house was still standing but the avalanche had hit the other corners, turning the house off its foundation and collapsing most of the walls, but the roof had floated atop the moving snow and was still intact.

What we had to do was to either tow the roof off what was left of the house or take it apart to get to the debris underneath. As we were clearing snow from atop the roof and away from the sides, I thought about trying to get underneath the roof in order to get a rope around the edge. I was digging with a shovel when I suddenly punched through into a hole and was quite startled when I saw a dog looking up at me! I helped him out and probably don't need to mention that the dog was quite happy to see light again!

Afterwards I took a closer look at the hole and noticed claw marks on the sides of the hole, which was roughly 1 meter in diameter and only about half that in height. So at the beginning it must have been a lot smaller. The hole was on the side of the house that got struck by the avalanche, so the dog must have been pushed along with the roof when the slide hit.

Two brothers owned the farmhouse, which had been vacant for a year. Avalanches had come down that gully before but none came near the house. The brother who was killed was taking care of the farm but didn't live there. He was only in the house to get a cup of coffee while working at feeding the sheep and clearing snow from the out buildings, and had brought the dogs with him. It was a moment of being in the wrong place at the wrong time. For one dog, it was a miraculous survival tale-eight days in a tiny, cold, dark snow tomb. We were grateful for his survival

A Quandary on Quandary

by Matthew Duffy (Reprinted courtesy of the *Summit Daily News* and Matthew Duffy)

It started out innocently enough. Just a quick little jaunt on a nearby mountain to get a few powder turns. On this particular day (November 29, 2004) I chose to skin up the lower north-east face of Quandary Peak (south of Breckenridge), and something awful happened. I won't ever look at that mountain the same way again. Someone please kick me, because I screwed up, really bad.

As I do almost every time I ski, I brought my best friend, Winter, along with me for her companionship. She's a lab mix with a passion for snow unequalled even by mine. We started our run with the snow blowing and powder whisking up my thighs. Euphoria was building, when something alarming appeared 50 feet below me. I saw snow curling up in the air and it quickly registered, AVALANCHE. Without a thought, I stopped turning and tucked to gain speed. I escaped the slide by angling to the side and took a look over my shoulder. I caught a glimpse of Winter swimming down a river of moving snow. I thought that she was going to make it. When I looked up again, however, the avalanche was slowing, but my little girl was gone. I stopped instantly.

I remember running back to the slide, even as it was still sliding toward me. It had pretty much stopped when I got near and I threw off my gloves. I began fumbling for my beacon on a post-holing sprint to the area I last saw her. She wears a trans-

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Amazing Dog Tales II

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mitter when it's just the two of us, duct-taped to her harness, and it was her only hope. My hands were shaking, but even so, my thumb depressed the red button long enough to switch my BCA Tracker to search mode. I remember giving out a desperate shriek of "Winter!" I was about to become frantic beyond logic when my beacon started to slowly beep. A flashing "32" appeared on the display (32 meters from the buried beacon). The lights on it flickered and I became fixated on the arrows.

I was right on top of her in a matter of seconds. After circling her twice, the closest I could get the display to register was "3.1" (indicating 3.1 meters away).

I threw my pack off, and flung its contents everywhere. I picked my probe out of the strewn mess of gear and assembled it; my hands were still shaking. Beep-beep-beep, beep-beep-beep, sounded my dangling beacon. Then there was another sound. It was the muffled sound of a dying dog, right next to me. The probe fell to the snow unused. The handle clicked into my shovel and I went to work. More crying, from both me and her. About two feet down, the blade of my shovel found her nose first and it was pointed straight up. I used my bare hands to uncover her face. Snow was caked into her eyes. I removed it and wept repeatedly, "Daddy's here!" Her mouth opened and closed, spat out some snow, and she began gagging and wheezing. It was a miracle. Only her head was sticking out of a wall of snow now, but at least she could breathe. I continued to dig frantically, and found that her body was twisted awkwardly. I remember worrying that her back might be broken. When I had her mostly uncovered, though, there was another miracle. She squirmed the rest of the way out on her own. She jumped up, shook herself off and then started licking away my tears. I'll stop the world and melt with you.



*Avalanche on
Quandary.
(Photo: Brad
Sawtell)*

About 45 minutes after our emotional reunion, a rescue helicopter was circling above us. I gave a thumbs-up sign, wrote the letters "OK" in the snow, and eventually it flew away.

I had a great conversation with Brad Sawtell that night. He runs the Summit County Avalanche Office in Breckenridge and was the first to say, "Any live recovery is a perfect 10. You did a great job." Then, he diplomatically educated me on my errors. My critical mistake was underestimating the slope angle. Anything above 25 degrees can slide, and I knew that, but I thought the pitch was lower. Kick me, now. When he told me the average pitch up there is 28 degrees, I wanted to bang my head against the wall. I made several other mistakes, such as having a dog as my only partner in avalanche terrain, but they all stemmed from my thinking that the slope was not steep enough to let loose.

Don't be like I was. Always carry the proper gear, including that which I used, and add an inclinometer to eliminate the guessing. I have. Practice with all of it to the point where it's automatic. It needs to be, because believe me, emotions disrupt logic in those situations. It could've easily turned out much worse, yet I still feel sick about it.

It was my entire fault. I'm so sorry, girl. Will you ever trust me again?

Kick me, now. String me up and beat me like a piñata. I deserve it.

A Little Saint Bernard

by Kip Jenkins

My dog Rudy is a stocky little Jack Russell terrier who seems to thrive in adverse conditions. On this trip, however, the conditions were not to Rudy's liking and he ended up struggling most of the day. It wasn't until I had fallen off a cliff and lay unconscious in a river that Rudy chose to "thrive" once again.

It was April of 2003 when Rudy and I were climbing Desert Peak in Utah's Stansbury Mountains. Our goal was to ski one of the north couloirs and enjoy some stable springtime snowpack. The weather was interesting that day and classically spring-like. It would hail, then snow, then hail, then be sunny, and then snow again.

By the time we reached the summit, it was hailing so hard that Rudy crawled inside my pack and hid as I assembled my split board. Great turns were had on the way down but the two feet of fresh "hail powder" were not favorable for Rudy. He was dog paddling through the fresh snow without a snorkel. There are no friends on a powder day, however, so I ripped the 1,300-foot couloir and then surrendered to his struggles and scooped him up for an easy ski back to the car.

It was still dumping hail as we entered a steep ravine. I put Rudy down to rest my arms and he raced ahead knowing just where we had to go. Suddenly he was caught in a sluff and heading straight for a small cliff band. I made a quick turn to pick him up and a second, larger sluff knocked me off my feet. In an instant, I was airborne and falling backwards with a Jack Russell tucked against my chest.

I woke up to Rudy licking my face and I noticed right away that he was soaking wet and shivering. I was lying in the middle of a small creek 20 feet below the cliff band we had both just fallen off. When I tried to move I passed out again. It would take me almost four hours to crawl, slide and roll myself a half-mile back to my truck. I kept passing out from the pain and every time I would be woken up by a shivering, icy and determined little dog licking my face!

We eventually made it to a hospital and discovered I had fractured my sacrum. Rudy came out of the ordeal unscathed and if anything, only slightly annoyed with all the leisure time the next few weeks brought us both. I sometimes wonder if that day in April would have turned out differently had Rudy not been there. Is he the reason I fell off the cliff or the reason I am alive to tell about it? I guess I really don't care either way. Rudy was "there" and he continues to be "here" every trip I take.

In June of 2004 a car hit Rudy. He was thrown almost 30 feet and presumed dead by everyone who witnessed it. Twenty-four hours later he was limping around the yard wondering why no one would play fetch with him. ❁



You've got questions? We've got answers.

by Scott Toepfer

Q: I've been shopping for a beacon, which made me wonder what I should do as far as putting a beacon on my dog? Does anyone make a beacon that I can put on my dog?

— B. Dofer, Denver, CO

A: Over the years people have asked us about putting a beacon on a dog. This is a hard question to answer. Consider the following example. You are skiing with a group of friends in the backcountry; someone is caught in a slide, as is a dog, which is wearing a beacon. You are now faced with a life or death problem: can you face the reality that you may dig the dog out alive, but the person dies because you found and dug the dog out first? The CAIC cannot recommend equipping a dog with a beacon, unless you and your dog are traveling alone.

Here are a couple options that avoid the problem in the example above. First, the Canadian company SOS makes a beacon called the SB (for Snow Bug) that could work. The Snow Bug was originally designed to put on a snowmobile. If the snowmobile is buried, you can use your SOS SB beacon to find it. It is also a great idea for dogs, a backcountry cache, or whatever else you might bury in the snow. You just switch your SOS beacon to an alternate search channel which makes a clicking sound to distinguish from normal search mode, and voila, you're digging out your dog, cache, or sled. After you've rescued your friend of course. For more information about the Snow Bug, go to www.sos-find.com.

A second option is to find an old frequency beacon (2.275 Khz), like a Skadi or Pieps. Attach this to your dog in a harness of some kind. You will need to get a second 2.275 Khz frequency beacon that you leave in your pack. If your dog gets buried along with a person, find the person with your own 457 Khz beacon. Then get your 2.275 Khz beacon out and search for your dog.

Lastly, you could consider an avalanche cord. This is a thin bright-red cord attached to your dog that you spool out before

entering avalanche terrain. The idea is that at least some portion of the red cord will be at the surface if your dog is buried. The downside, of course, is that the cord could get tangled in trees or rocks.

Q: Is there a difference between settlement and collapse? I seem to hear the words used interchangeably all the time.

— Scott, Golden, CO

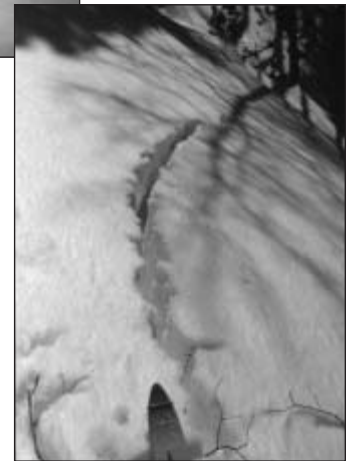
A: Yes, there is a big difference between settlement and collapse. Settlement is the slow deformation of the snowpack under the influence of gravity, over a time period of hours to days. As the snowpack settles in depth, it becomes denser,

stronger, and less likely to avalanche if given enough time. Snow cones around posts and trees are a good sign that the snowpack has settled and gained strength.



Settlement cones around trees...

On the other hand, collapse is the sudden "whoomp" that occurs when the weak layer beneath a slab layer fractures and collapses, sometimes with shooting cracks. We can often hear it, see it and feel it when it happens. The snowpack is not strong, and the people who trigger a collapse should be very wary: Avalanches are strong possibilities.



and shooting cracks
(Photos: Knox Williams & Scott Toepfer)

In a nutshell, settlement is slow and usually good, while collapse is sudden and bad. ❄

Renewal Notice (or recruit a Friend)

Yes, I will join the Friends of the Avalanche Center. Enclosed is my donation of:

- \$30*, which gives me a CAIC window decal (if I am a new Friend), *The Beacon* newsletter, the *Avalanche Wise* booklet, and a morning forecast by e-mail.
- \$45*, which gives me all the stuff above, plus an afternoon forecast sent by e-mail.
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