

# Avalanche Hazards and the Extreme Skier and Big Mountain Climber

by Daniel T. Blumstein

Backcountry travel can be made relatively safe by using good route-finding techniques to avoid avalanche-prone areas. However, climbers on big mountains and extreme skiers knowingly expose themselves to avalanche risks. This article will discuss whether those who choose to climb big mountains or ski ultra-steep slopes can accurately assess and minimize the hazards which they are exposing themselves to or whether they are simply lucky.

Tony Daffern in his book, *Avalanche Safety for Skiers and Climbers*, says that "avalanches fall when the weight of accumulated snow on a slope exceeds the forces within the snowpack or between the snowpack and the ground which holds the snow in place." Skiers, climbers, or natural processes can provide the additional force required to trigger an avalanche.

Avalanches can be of the loose snow or slab variety. In the December 1985 issue of *Avalanche Review*, Betsy Armstrong noted that out of "150 fatal accidents that detailed the type of avalanche, 145 were slabs." Furthermore, "most killer avalanches are usually triggered by the victim, are of small to medium size, and usually result in one fatality."

If people trigger avalanches, how can they be predicted? A brief discussion of snow metamorphism is in order. Snow-loading on a slope can be caused by either direct precipitation or from snow blowing from one slope to another. Snow begins to change as soon as it hits the ground. The three major methods of snow metamorphism are: temperature-gradient metamorphism (TG); equi-temperature metamorphism (ET); and wet snow or melt-freeze metamorphism. TG metamorphism leads to the formation of weakly bonded "sugary" snow crystals — depth hoar — which can, and does, undermine slope stability. TG metamorphism is common in continental climates (e.g. Colorado) where early winter snows are not covered quickly with additional snow. A strong "temperature-gradient" is set up between the 0°C ground and the colder atmosphere. TG metamorphism is also common during periods without new snow accumulation. ET metamorphism is "good." ET snow is firmly bonded snow. If weaker layers do not exist between ET layers, it is frequently safe to ski.

Melt-freeze metamorphism is common in the spring and summer. It produces a strongly bonded snowpack which becomes weakened by daily melt-water. Usually, one assumes that it is safe to be on spring and summer snow, in temperate

climates, until noon. After noon, enough free water has developed to make the snowpack prone to avalanche. Naturally released slides are common around 4 P.M. With enough compaction, fairly steep slopes can be safe to ski or cross (this method is used by ski areas to make most slopes safe to ski). By digging snow pits, performing shovel-shear tests, probing the snow with a pole, studying the aspect of a slope, knowing the seasonal history of the snowpack, understanding past and future weather trends, and by being a little lucky, it is possible to have some idea of snowpack stability.

This brief discussion alone is an inadequate explanation of snow dynamics. For further information read *The Avalanche Handbook* and all other books mentioned in this article. Enroll in an avalanche course. Ignorance is not bliss; it's stupid!

When ascending big mountains, climbers expose themselves to areas of high avalanche hazard. Frequently, one must climb beneath or on large ice falls, ascend steep, snow-filled gullies, walk a fine line between a large cornice and a steep avalanche-prone slope, erect tents on large slopes or thousands of feet below icefalls,

etc. Practices to reduce the risks of more than one person being caught in a slide (traveling far apart) must be ignored if the terrain requires roping up. When roped together, without a bomb-proof anchor, the chance of both climbers getting caught in an avalanche triggered by one is great. With the increased popularity of winter ascents, exposure to avalanches is greater because new snow may not have had a chance to stabilize and/or long periods of bad weather may "force" one to take advantage of any and all good days regardless of the amount of new snow. Even good weather may normally include high winds which continuously redistribute snow. Good route-finding and an awareness of potential avalanche hazards can minimize risks.

Extreme skiers hurl themselves down steep avalanche chutes. Most descents are in the spring and summer when the snowpack has stabilized by becoming isothermal. Further precautions include climbing and skiing the slope before "predictable" afternoon slides begin to run. However, rules to increase survivability in case of an avalanche may be commonly ignored. (For example, wrist straps are kept tightly

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cinched when skiing with self-arrest grips, packs are also kept securely fastened to avoid bouncing which may lead to falls, there may be no safe spots to watch the other person descend, large cornices may overhang the couloirs in which one skis.)

Neophytes are not the only ones being killed. Analyses of avalanche accident data between 1950 and 1985 "show a relationship between experience level and avalanche fatalities: the greater the experience, the higher the number of fatalities," according to Betsy Armstrong writing in the *Avalanche Review*. She continued, "more victims will die than will live: a completely buried victim has only a 39% chance of survival, regardless of all other factors." These data tell us that real risks exist for those who choose to expose themselves to avalanche hazards.

When personally contacted, Armstrong explained these data by saying that more experienced skiers take more risks. "They develop a mind set — it's not going to happen to me — other people may get caught — but not me." Armstrong said that there is not enough information on experience level in standard avalanche forms and that there is virtually no information on extreme skiing incidents. "A lot of avalanches go unreported."

A rational decision maker is one who makes a decision based upon complete knowledge. Are we, as mountaineers and extreme skiers, rational decision makers? I think not.

Is complete knowledge about a snowpack available? No. One can dig snow pits and monitor weather continuously and still not be able to predict with 100% certainty if a slope will slide or hold. Remember, a snowpit really only tells you what the snow conditions are in the snowpit. Avalanche prediction is, at best, a numbers game.

If complete knowledge is unavailable, is digging a snowpit a waste of time? It depends on conditions and predicaments. If you are half way up a 49° gully in June during the ascent prior to a ski descent and the snow does not "feel" stable — it would be riskier to dig a pit than to simply GET OFF FAST. However, if you are on a large mountain for many days or weeks, snowpits may provide some additional information which allows better route selection. Still, there seems to be a large element of luck when living on a large mountain for several weeks with avalanches frequently sliding all around you.

Understanding that avalanche prediction is a numbers game allows us to play it. If we are to play it safely, we must be flexible. For instance, if a pit reveals a meter of depth hoar which is covered by four meters (three meters?...two meters?...one meter?) of fairly well bonded ET snow, is the slope safe to ski? The answer might be another question. What other options are available...can I descend/ascend another slope? The less rigid one's plans, the more flexible, and therefore, the safer one can be. Along the same lines of thought, if you are going to be outside, and not to climb a peak or ski a steep chute, more options, and therefore safer alternatives, are available.

A conversation with Paul Ramer and careful readings of his 1986 catalog revealed another view. Ramer believes that the more experienced you are, the higher the "level of integrity" you have. A high level of integrity means not breaking personal promises with yourself. For instance, Ramer used the example of always wearing a functional avalanche beacon when skiing in snow that could slide as a personal promise. Never breaking this promise indicates integrity. He also said that by being experienced, you understand potential risks. Ramer wrote in his catalog, "sports that incorporate extreme physical risk are truly suicidal without a very high level of integrity. These activities are based on a large number of agreements. Break the wrong one and you might get killed."

In the backcountry, if you are experienced, have integrity, and are responsible for your actions, changing plans and/or turning back is always an option.

Sometimes options, especially on big mountains, are not that stellar. For example, what if you are working (you have prior commitments to sponsors) and you hesitate before doing something. In a Panglossian world full of integrity the answer is clear — back off if you think it is called for.

Another problem is that if you are not the leader in a group and have a "gut feeling" that the snow is funny or that you are doing something that might be stupid, the option to turn back might not be readily available. Or, if you are paying a guide to take you on a big mountain, you might not even be able to assess the risks because you are unaware of them.

A brief story might illustrate the leader/guide dilemma. While off-piste skiing with two Austrian mountain guides (who spoke little English) and a German woman, we came upon a number of steep (30°-40°), unskied couloirs and slopes that in Colorado I would have dug a pit prior to skiing. (It snowed 15-20 cm two nights before and some *very* large slopes had slid the day before.) We did not have avalanche transceivers with us. None of the four of us had shovels. We all had been drinking for a few hours over a drawn-out lunch in a wild, mountain hut. ("Life in the mountains is difficult," the guides had repeated while forcing me to join them in yet another round of schnapps and song!) The three took off before I could say anything. They stopped together in the center of the slope waiting for me to ski. While not extreme, the slope was convex in parts. Large snowballs (or "jelly-rolls") formed and we released small sluffs as we skied. It

turned out to be an excellent descent. However, it could just as easily have turned into a nightmare. Communication was lacking. I was neither a leader nor really a partner. (I had met them all that day after one of the guides had invited me to join him.) Situations like this should be avoided if possible.

Knox Williams (of the Colorado Avalanche Information Center) said that he sees extreme skiers and big-mountain climbers pressing their limits. "They violate a lot of rules." Williams believes that they are willing to sacrifice things (toes, fingers, lives, etc.) in the pursuit of their goals.

Chauncey Starr, writing about risk assessment in the 19 September 1969 issue of *Science*, said that "the acceptability of risk appears to be crudely proportional to the third power of the benefits (real or imagined)." If the benefits (adrenaline, prestige, etc.) are great enough, the risks taken or sacrifices made may be immense. Since most of us have to work, prior commitments may lead to risk-taking. Thoughts like, "I have to ski the chute *this* weekend because next weekend I can't get off from work," may get you in trouble. As Daffern succinctly said, "Your boss would rather have you back to work on Tuesday than go to your funeral on Thursday."

It seems that more flexibility, and therefore safety from avalanches, exists for extreme skiers than for those ascending big mountains. A skier can usually descend quickly if the chute which he is climbing "doesn't feel right." Fewer people may be involved in an extreme skiing descent than in a big mountain expedition so honest communication pathways may exist. Problems exist when prompt action is not taken. The longer one spends "thinking" in an avalanche chute, the fewer options one has. A major peak expedition is a large financial and time commitment whose risks should be analyzed and lines of communication opened before it begins.

Chuck Nichols, a Summit County, Colorado ski and avalanche instructor, summarized risk assessment by posing three questions: "1) Will it probably slide? 2) What will happen if someone releases a slide? 3) What will we do then?" By considering these three questions you are increasing your integrity and therefore are increasing your personal safety.

I believe that extreme skiing and big mountain climbing can be safe if you have a lot of personal integrity and a little luck. A careful reading of *The Snowy Torrents*, a summary of avalanche accidents in the United States between 1972 and 1979 by Knox Williams and Betsy Armstrong (or any of the previous volumes), will show that experienced people get caught in avalanches. Some were just unlucky. Whether or not these people have/had high levels of integrity may have influenced their inclusion as examples in the books.

The risks will always exist because we are not rational decision makers. We never make decisions based on perfect knowledge. Part of your integrity is admitting that you are not a rational decision maker and therefore could be seriously injured or killed while defining your limits or deriving great benefits — on big mountains or in steep couloirs. Perhaps these risks are what make these activities fun.

