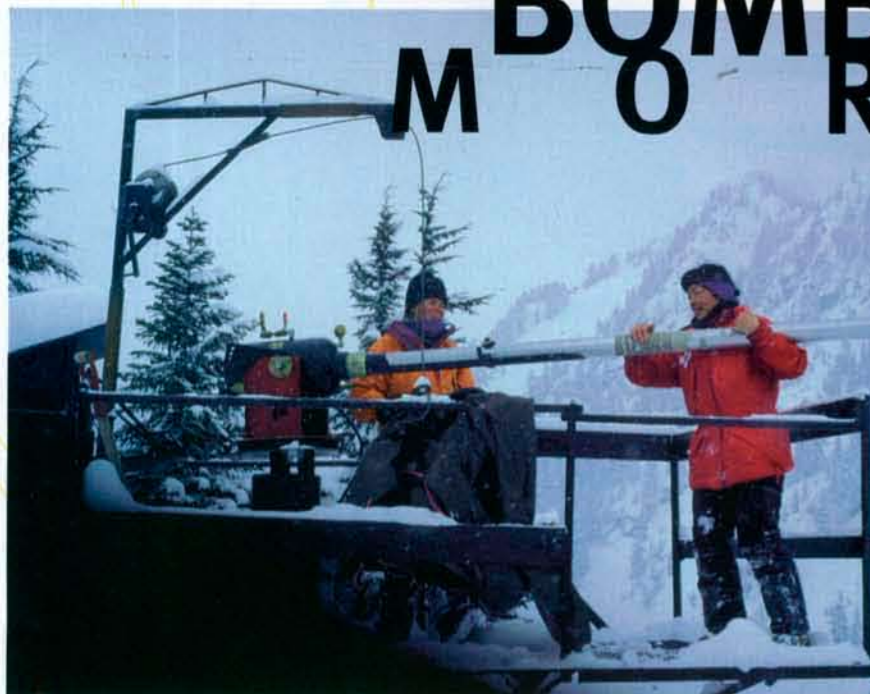


A TALE OF DEEP SNOW, PENTALITE AND THE AVALAUNCHER

M O R N I N G B O M B E R



While Kaisa prepares the rounds, Marge gives the avalauncher a careful once-over and does a dry shot to make sure it is in working order.
photo by Mary Catherine O'Connor

THE AVALAUNCHER IS A BIG NITROGEN-POWERED RECOILLESS GUN.

ITS PURPOSE IS TO GIVE A CLIFF OR A RIDGE A BIG BANG AND, HOPEFULLY, PRODUCE ENOUGH STRESS... TO CAUSE AN AVALANCHE...

BY MARY CATHERINE O'CONNOR

It's 6:30 a.m. and, despite the unthinkable hour, I'm completely coherent and anxious as I sneak into the Stevens' Pass patrol room, trying not to disturb the pre-control talk. Jon Andrews has been here

since 4:30 collecting the information that is now projected on a transparency about the ridges which border the ski area to the west, east and south. Scribbled on the screen are notes pertaining to trends in temperature and wind. Other numbers show the most recent amount of precipitation and the percentage of water present in the snow. Something like 4% would be Utah powder; here in the Cascades, it usually contains about 10-15% - producing what some lovingly call "Cascade Concrete".

As avalanche forecaster - one of the best in the country - Jon is responsible for making educated guesses about whether and where avalanches are likely to occur within the ski area boundaries. He and patrol director, Bill Williamson, then coordinate how the patrol can initiate any potential slides so that they won't be initiated by Mr. and Mrs. Snowslider and/or their children.

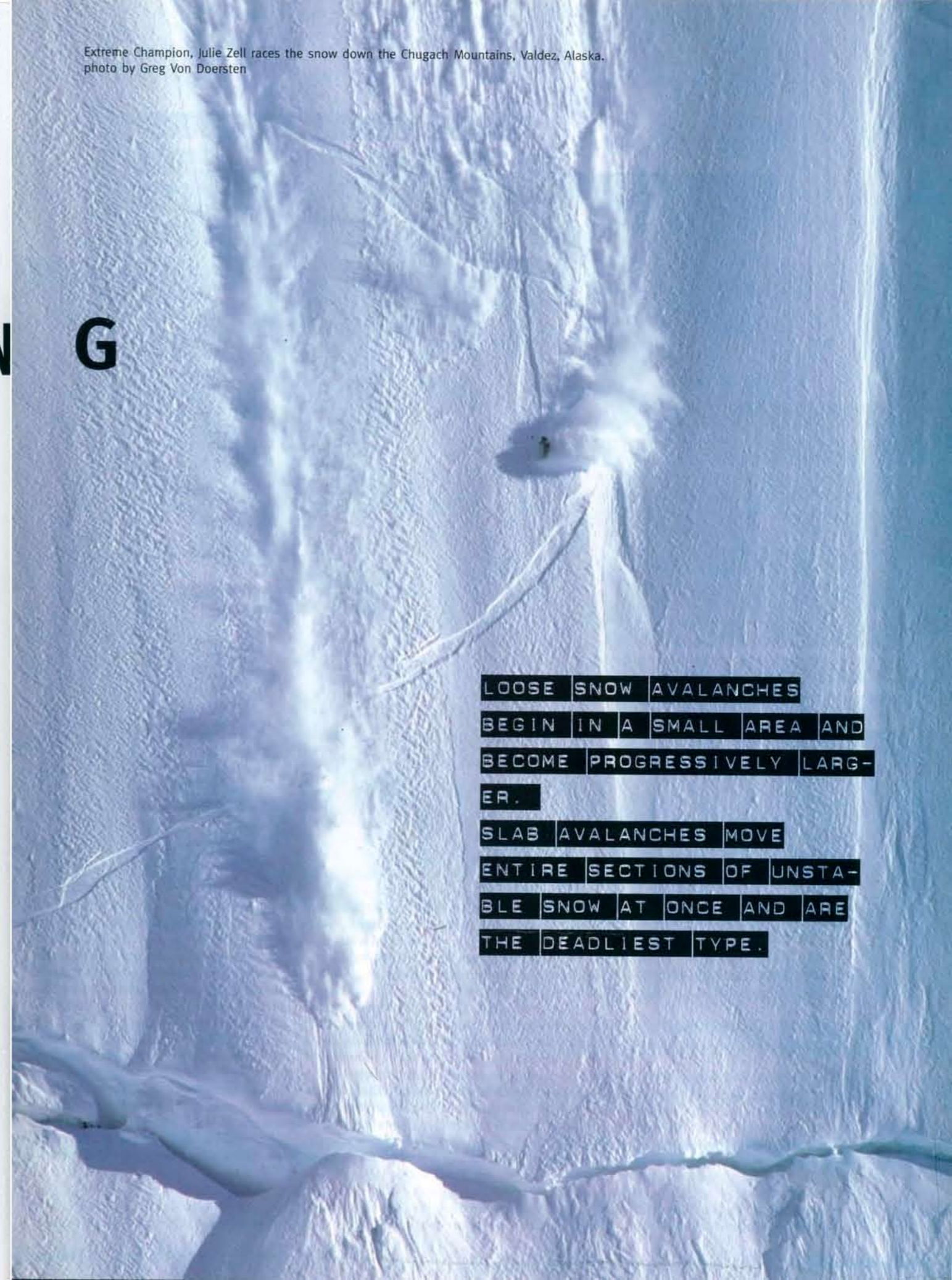
That is the purpose of avalanche control. The means vary from simply pushing to bombing the snow. But the equation remains the same: how much stress will be required to produce an avalanche for a certain amount of a certain type of snow in certain conditions? Avalanches are most frequent and dangerous in the Rockies, Cascades and the Sierra Nevada range. Most other parts of the country lack the terrain and snow levels necessary for big slides.

I follow everyone out the door and walk with my board as they skate in a single line towards the bomb cache where

Extreme Champion, Julie Zell races the snow down the Chugach Mountains, Valdez, Alaska.
photo by Greg Von Doersten

LOOSE SNOW AVALANCHES BEGIN IN A SMALL AREA AND BECOME PROGRESSIVELY LARGER.

SLAB AVALANCHES MOVE ENTIRE SECTIONS OF UNSTABLE SNOW AT ONCE AND ARE THE DEADLIEST TYPE.



avalanche fracture line.
photo by Mary Catherine O'Connor



TRENDS IN TEMPERATURE,
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DETERMINE WHICH TYPE
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the bombs are stored. I hear a beep, like an audible high-five, as each patroller passes Greg, who stands with arm outstretched, holding his transceiver on the receive mode. Transceivers, also known as avalanche beacons, are battery-operated devices which help locate bodies buried in a slide. In transmit mode, a signal is constantly emitted and can be traced by another transceiver on the receive mode. Greg's job is to make sure that each patroller is wearing her/his actively transmitting avalanche beacon.

Each patroller sets off on a particular task while I look inquisitively at Bill. "You're going up with Kaisa and Marge," he tells me, "to the avalauncher." There are about a dozen women on the 65-person patrol. There was a time when including women posed a challenge, but no longer; a progressive director made everyone equal.

Smiling, I hop on the snowmobile, feeling giddy and more than a little like Beavis (or maybe Butthead). 'Bombs, yeah, bombs are cool.' I giggle to myself devilishly, knowing that this is not just a great writing assignment. I will finally be a witness to the bombs that wake me on snowy mornings as I lie in my apartment, a mile downhill from the ski area. Most importantly, my friends on patrol will finally share with me the reverie of first turns on a deep-snow morning.

The avalauncher is a big nitrogen-powered recoilless gun. Its purpose is to give a cliff or a ridge a big bang and, hopefully, produce enough stress, through the impact of the bomb and the air blast that it produces, to cause an avalanche. This is pretty effective but it is limited in terms of exactness. If you really want to make a direct hit, throwing a fuse-lit hand charge into a specific area is better. Remember

those ACME bombs that Wily Coyote used to throw at the Road Runner? The patrollers use more or less the same thing: bombs with long fuses. One important difference - this is real life. Out here a patroller would not be able to walk away from a mistake.

I soon find myself on the lift with Marge and Kaisa. Marge holds a huge stiff pack filled with charges and Kaisa carries the tail assemblies. We head for the avalauncher. When I looked at it before with its cover on and barrel off, it resembled some relic from an old chairlift tucked away behind some trees. But once we climb up to the platform and ready it for use, it takes on the look of a missile. The barrel alone is a mammoth stretch of metal. I take a few steps back - as many as the platform will allow.

While Kaisa prepares the rounds, Marge gives the avalauncher a careful once-over and does a dry shot to make sure it is in working order. Marge sets the pressurized nitrogen to the desired level and Kaisa releases the safety. She fires and the top of the pine in front of us makes a quick and pronounced bend away from the barrel. I can't wait to see how far that blast of air will carry a bomb. I will soon find out.

I feel that Fourth of July anticipation as I stand and listen to the initial booms. Marge keeps strong radio contact with all the group leaders so that each bomb is directed toward an area free of other patrollers. We watch a few patrollers ski cutting the ridge to our left. This is one of

...A SLAB AVALANCHE... LITERALLY COMES OFF IN SLABS OF VARYING SIZES - BIG, BIGGER AND BIGGEST - AND HAS THE POTENTIAL TO MOW DOWN ANYTHING OR ANYONE IN ITS PATH.



Jane Mauser initiates a slide. Why? Because it's really damn steep. Alyeska, Alaska. photo by John Kelly

the basic and least time-consuming methods of control. A patroller literally cuts a line by skiing across the top of a chute or small bowl. If the snow is unstable, it will usually break along the cut, keeping the patroller safely above its path. This is done on a regular basis whenever new snow falls so that it will not accumulate to a dangerous level. But this method is not feasible on something like a large steep glade because it poses too great a threat to the patroller. In such terrain, blasting is the only way to really move the snow.

Once Steve and Chris complete the ski cuts and radio Marge that she is clear to

shoot, she sets the coordinates and slowly swings the avalauncher into place. The rounds that are used are initiated by impact and have two safeties. The first is a pin between the fin and the core of the bomb. As Kaisa loads the bomb, she removes the pin. The second safety keeps the shotgun primer from hitting the cap, which is what actually triggers the dynamite once the bomb hits. That pin comes off once the round is fired.

Kaisa releases the safety and Marge covers her ears. I decide that I should probably do the same. Kaisa fires and the gun flings the bomb with a huge pop and a slight shudder. For the next few seconds I

stand in silent confusion, not knowing exactly where to direct my eyes. Then I see the impact and watch as snow slowly gives way and slides down a narrow chute. Marge happily exclaims, "It went over the bench!" Again, I return to a confused state before finally seeing the trickles coming out of the trees far below the chute. Success!

There are two main types of avalanches: slab and loose snow. Loose snow avalanches begin in a small area and become progressively larger. Slab avalanches move entire sections of unstable snow at once and are the deadliest type. Trends in temperature, wind and

WHAT LOOKED FROM THE LAUNCH PAD
LIKE A FEW INCHES OF FALLING
SNOW IS ACTUALLY A FEW FEET OF
DIRTY DEPOSITION...

erial view of an avalanche. Alyeska, Alaska.



a closer view of the same avalanche, a slab avalanche.



precipitation determine which type of avalanche a snowpack is set up to produce. As important as the amount of snow that falls is the type of weather experienced between snowfalls, because that is what determines the condition of the lower layers of the snowpack. Like the rings in a tree, the layers of a snowpack illustrate its life story.

A weak layer is produced by a high gradient in temperature during which cold weather grows long crystals without strong necks to bind them together. Conversely, warmer temperatures produce shorter crystals that round out and bind well with each other, thus creating a more stable layer. In other words, a storm that starts off with warm temperatures and grows steadily colder creates well-bound crystals, while one that starts cold and warms up is setting up a weak layer in the snowpack. If temperatures are too warm, however, the snow loses its cohesive strength.

Loose snow avalanches result from an unstable fresh layer of snow on the very top of the snowpack. They begin by carrying a small area of snow in a flow which becomes progressively larger so that at its completion, it resembles an inverted funnel. This type often occurs naturally but can also be initiated by people.

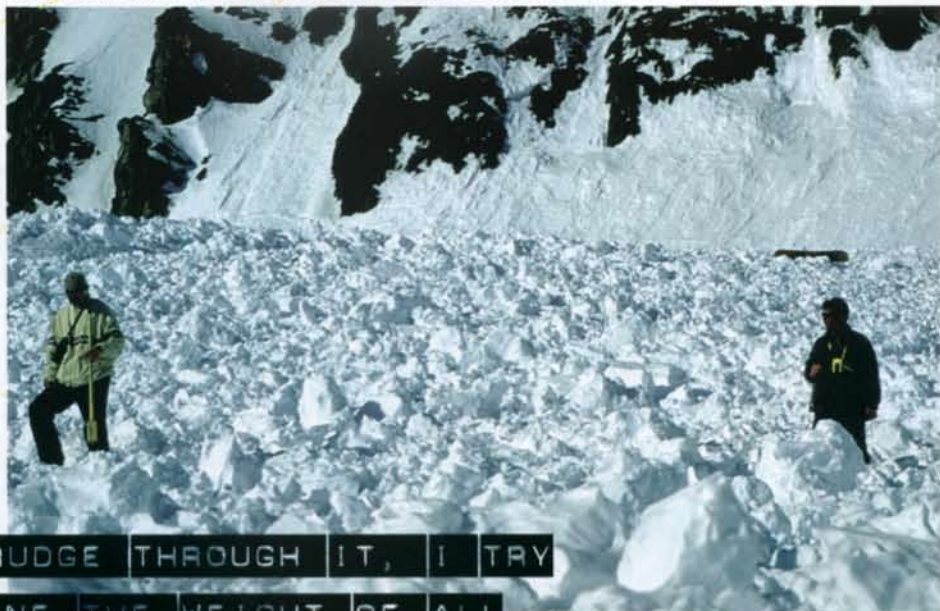
Slab avalanches are generally much bigger productions. Essentially, a slab avalanche is induced by a layer of weak snow losing hold of all the snow it supports. It literally comes off in slabs of varying sizes -

big, bigger and biggest - and has the potential to mow down anything or anyone in its path.

Terrain also plays an important role in avalanches. Snow responds in accordance with the grade of the slope. The deadly angle is 38° . Accidents involving slides on this angle result in the most fatalities but anything between $30-45^{\circ}$ is dangerous terrain. Snow naturally falls from steeper angles and therefore never accumulates to a dangerous level. Terrain flatter than 30° is not likely to produce slides at all. Trees and large rocks will anchor the snow and can either prevent an avalanche from happening or decrease its power and speed.

Triggering an avalanche is as easy (or as difficult) as putting just enough stress on the snowpack. Of course, no patrol team can make a ski area utterly safe from slides, nor can they prevent skiers and snowboarders from hurting themselves. Signs and fences are often used to help communicate various dangers within the area. Lollipops - the technical word for those bright orange plastic circles on sticks - indicate hazards that are not always visible to someone coming down a run. One will be placed, for example, above a bare outcropping of rocks or maybe a small cliff. If those little circles could talk, they would say something like "Don't come here unless you'd like to hurt yourself." (Not "Hey, come here and try to jump this," as some people interpret them.) You might also see whole sections roped off. These usually contain exposed creek beds or

trudging through what could have been a deadly avalanche. photos by Alex Hammerline



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IN RED AND WHITE.

dangerously deep natural divots in the terrain.

Technically, the responsibilities of the ski patrol extend no further than the boundaries of the area. Go past the boundary signs and you are sort of forfeiting your right to rescue. Of course, if you do decide to brave the wilds and end up hurt or lost, someone will probably try to find you...for a fee. At Stevens' Pass, for example, it will cost you a minimum of \$500 if the patrol does an out-of bounds search. So be prepared to pay if you deviate.

Safety is a big concern, obviously, but it wasn't always such a priority. The first forms of avalanche control involved sending one skier up and having him ski down to see if any slides would result, while everyone else stood at the bottom and watched. Aside from being a major personnel problem, this technique did nothing to help people figure out exactly what causes avalanches. And although being out on the avalauncher involves a certain level of fun, it is plain to see that there's more to it than a silly

"if we blast it, it will come" mentality. Bombing is not a patrol's first reaction to heavy snowfall. It is used pro-actively, but only in reaction to significantly dangerous types and amounts of snow.

As soon as everyone is finished, Marge and I take a little tour of some of the blasted chutes. The smell of pentalite (a main ingredient in the dynamite used) impresses me nearly as much as the width and depth of the slides that the bombs induced. What looked from the launch pad like a few inches of falling snow is actually a few feet of dirty deposition. As I trudge through it, I try to imagine the weight of all this snow swooping down on me and carrying me away, and I suddenly feel a profound appreciation for our men and women in red and white. And while I understand that avalanche control will never absolutely prevent a slide, I do feel a measured confidence that the in-bounds riding I so enjoy will not end on a bad turn.

If you want to learn more about avalanches, check out *The Avalanche Handbook* by David McClung and Peter Schaerer (published by The Mountaineers, 1993). It is extremely thorough (although a bit on the technical side) and has some awesome photos.

Also check out *Mountaineering, The Freedom of the Hills* also published by The Mountaineers.

Many thanks to Jon Andrews for educating me on avalanches and avalaunchers and to Bill Williamson and the rest of the Stevens' Pass ski patrol for letting me come and watch.

EACH YEAR, OVER 100 PEOPLE
ARE CAUGHT IN AVALANCHES
AND, ON AVERAGE, 24 OF THEM
DO NOT SURVIVE.

That's a higher death toll than hurricanes or earthquakes inflict. And like any natural occurrence, Mother Nature decides the final outcome.

But there are a number of ways that we can behave like good children and try to avoid her wrath. Here are a few:

Be Properly Equipped

Get, rent, borrow, or somehow obtain appropriate gear, which includes an avalanche transceiver, a shovel, a first aid kit and a probe. Of course, equipment is absolutely useless if you don't know how to use it. An avalanche probe is a long skinny pole used for poking into the debris of a slide to locate victims. A shovel is used - go figure - to move snow. By emitting a constant signal, transceivers provide a link between the person buried in an avalanche and the rescue party. They are used to help pinpoint the victim's location. Transceivers come with different frequencies, so make sure everyone in your party uses compatible ones.

Know Your Equipment

Having these tools and knowing how to use them are two very different things. Like any life-saving technique, these skills need to be practiced and refined. Burying a transmitting beacon and then taking turns locating it is a good way to practice, but experimenting with these tools is a far cry from actually using them in an avalanche. Do not expect to master these devices quickly, and take a course at a reputable avalanche school for thorough and useful

instruction. It comes down to the fact that you must go out there to get real experience, but going on a serious backcountry expedition without the company of experienced friends or guides borders on lunacy.

Be Aware of the Terrain

Travel across ridge tops rather than untouched slopes, and be extra cautious of cornices that are formed when snow is deposited by wind as it comes up on one side of the slope and travels down the other. Sometimes these cornices extend well over the edge of the ridge or hill they sit on and will easily break off when trod upon. Also be aware that north-facing slopes are more dangerous during the middle winter months and south-facing slopes are most dangerous during the spring thaw. It is a good idea to scan the terrain and devise an escape route in the event of a slide. A big group of trees or boulders will act as strong snow anchors and could provide a safe haven - but they could also trap you.

Conduct Snowpack Tests

Before descending onto that wonderful white highway, conduct some snowpack tests. There are a number of different methods, but they all have the same objective: to locate and test the weak layers of the snowpack. A weak layer is one that contains lots of large crystals and will literally let go of the snow on top of it when it receives a certain amount of stress. The test results do not provide explicit instructions on whether an avalanche will occur because there are too many variables involved. They only show you the strength or weakness of the snow you test. The decision to take the run or back out is always up to you. Ninety-five percent of fatal avalanches are caused by the victims. The rutschblock and shovel shear are quick tests that can illustrate the strength or weakness of an entire slope by analyzing a sample area. These are not difficult tests, but they must be conducted carefully. The last thing you need is a false sense of security, which is just what an inaccurate test would provide. Consult the patrol at your local mountain or a professional guide to learn how to perform these tests

SNOWBOARDERS ARE AT A
SERIOUS DISADVANTAGE TO
SKIERS IN AN AVALANCHE.

Your single, wide board will only hinder your ability to maneuver yourself in a slide. This is just another reason to avoid an avalanche like the plague. But if you take every conceivable precaution (or even if you don't) and you find yourself being swept up by a slide, there are a few things you can do to help yourself:

1 • Try to get ride of your pack. It will only weight you down. (And if you are carrying a transceiver, don't put it in your pack.)

2 • Do your best to stay on top of the slide. Try swimming the breaststroke, pretending the snow is just heavy, cold surf.

3 • Move to the side or toward your predetermined escape route. The slide might spit you out to safety.

4 • As you feel the snow slowing down, try to punch out a breathing space in front of your face, and push a hand up towards whichever way you think is up. This could help rescuers find you.

And remember that if you get to the point where the above hints come in handy, you are already in serious trouble. So be a master of precaution. Learn as much as you can, and do not think reading these highly abbreviated safety tips will provide you with definitive instruction.

There is often a fine line between being extreme and being extremely stupid. Avoid the "No Fear" attitude and follow your intuition. If it doesn't feel safe, don't do it. And if that means remaining in-bounds or even in the lodge sipping hot cocoa, oh well. At least you know there will be other epic days, and you'll be around to ride them.

Where to call:

National Avalanche School
(303) 988-1111
133 S. Van Gordon St.
Lakewood, CO 82258
(Classes are held every other year and is next scheduled for Nov. 2-5, 1997)

National Avalanche Center
(208) 622-5371
Attn: Doug Abromeit
Ketchum Ranger District
PO Box 2356
Ketchum, ID 83340

American Avalanche Institute
(307) 733-3315
PO Box 308
Wilson, WY 83014

Sierra Ski Touring Winter Skills Series
(702) 782-3047
Box 176
Gardenville, NV 89410

Canadian Avalanche Training School
(916) 587-3653
PO Box 34004
Truckee, CA 96160