

# Avalanche

REVIEW

VOLUME 30, NO. 4 • APRIL 2012

www.AmericanAvalancheAssociation.org

## RISK TOLERANCE



This HS-N-D3/R3-G/I, about 5' deep, failed on an early season facet layer during the January 18-20 cycle in the Tetons. This northeast-facing bowl in South Fall Creek, elevation approx 9700', is known as "New Years." Photo by Doug Workman see Teton stories starting on page 14

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Story by Charlie Ziskin

**Every time** an avalanche fatality hits the newswire, the skiing community tries to make some sense out of what happened. Some people want to know precisely what mistakes the victims made so they can avoid the same fate. Others want to know how anyone in their right mind could even conceive of backcountry skiing in Considerable conditions. As someone who often skis pretty big lines under a Considerable forecast, I find myself attempting to explain the process my partners and I employ when making decisions in avalanche terrain. It's not easy using words to express a constellation of cognitive skills as complex and integrative as the ones I have learned. But I try to add my perspective to the discussion because I have been doing just that for nearly 40 years. I wrote something like the following in an online discussion on telemarktips.com in the aftermath of the recent Stevens Pass avalanche that claimed the lives of three well-known and very experienced backcountry skiers.

See "Skiing in Considerable Hazard" continued on page 20 ➡

*...the probability of losing a single round of Russian Roulette is "only" 1/6. To last very long in the backcountry, the probability of an avalanche needs to be far lower.*

—Jonathan Shefftz, *Avalanche Lesson*, pg 34





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Please send submissions to:  
Lynne Wolfe — Editor  
PO Box 1135  
Driggs, Idaho 83422  
tel: (208) 709-4073  
lwolfe.avalanchereview@gmail.com

Advertising: Jazz Russell  
3695 Teewinot St  
Driggs, ID 83422  
tel: (208) 354-2524  
fax: (208) 354-6500  
jazz@FallLineDesign.com

Production: Fall Line Design  
76 N Main, Suite 208  
Driggs, ID 83422  
tel/fax: (208) 354-6500  
karen@FallLineDesign.com

Business and Subscription Office:  
Mark Mueller — AAA Executive Director  
PO Box 2831  
Pagosa Springs, CO 81147  
tel: (970) 946-0822 / fax: (970) 731-2486  
aaa@avalanche.org



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**The mission of the AAA is:**

- A. To provide information about snow and avalanches;
- B. To represent the professional interests of the United States avalanche community;
- C. To contribute toward high standards of professional competence and ethics for persons engaged in avalanche activities;
- D. To exchange technical information and maintain communications among persons engaged in avalanche activities;
- E. To provide direction for, promote, and support avalanche education in the US;
- F. To promote research and development in avalanche safety.

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**Contributions:** Please submit material eight weeks prior to publication date. Include address and telephone number. Please submit typed manuscripts by e-mail or disk (CD or DVD), using any popular word processing program. Submit any figures as an EPS (preferred), PDF, TIFF or JPG file (300 dpi resolution at 100%). We will return materials if you include a stamped, self-addressed envelope.

**Articles,** including editorials, appearing in *The Avalanche Review* reflect the individual views of the authors and not the official points of view adopted by AAA or the organizations with which the authors are affiliated unless otherwise stated.

**Layout & Design:** Karen Russell, Fall Line Design, (208) 354-6500, karen@FallLineDesign.com.

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## from the president

# AAA MEMBERSHIP: Help Define our Strategic Plan

### What's our vision and what's our strategy?

While these might seem like peculiar questions for the president to ask of the membership, the questions are honest and sensible. I hope you'll help us answer these questions.

The avalanche profession continues to be an evolving order and so too should be our association. Formally, we are a member-driven association because members can elect or remove members of the board. Also, in member-driven organizations members express their wants and needs and their push is to the board. However, for 25 years we have operated more as a member-supported organization where the board drives the organization and the members support the board. This approach worked because we were small and relied a high degree on volunteers (on whom we will still rely on in the future). As our numbers gradually grew we have employed executive directors. Currently Mark Mueller resolutely and ably directs our day-to-day operations.

Our association is ready to mature, especially as society – commercial, governmental and recreational – is now starting to recognize our profession and the importance of avalanche professionals. As a result (at least right now) our membership is growing and growing fast.

It's time to evaluate our progress and look forward. We need a vision to the future. To look to the future we have to decide what we want AAA to become and what

we want to achieve for AAA and our members. This is your chance to be heard. For an organization to support its members, the organization must be member-driven. We want you to get involved.

With your input we can better evaluate our progress, formulate goals, strengthen our services, and enhance our growth. For all our members this will increase the value and recognition of the American Avalanche Association and position us for a strong and bright future.

To this end, I invite you to take a short survey to help our strategic planning process. The survey will be available until the first of May. Your input is important to advance the avalanche profession:

[www.surveymonkey.com/s/AAA\\_survey\\_2012](http://www.surveymonkey.com/s/AAA_survey_2012)

At the May board meeting we will be working to define the association's vision and begin development of our strategic plan. The target is to complete and implement the strategic plan at the fall membership meeting.

Thank you for your support. We look forward to hearing from you.

—Dale Atkins, AAA president ❄️



## from the editor

# What's YOUR Level of Risk Tolerance, Personally & Professionally?



Bright colors spice up a grey Teton powder day up near the Plummer yurt. Photo by Jane Gallie

tipping point from the new CAC forecaster's blog. Pop over there and have a look at the range of writing where those folks expand from the space/time limitations of daily forecasts.

I also thought that, since everyone else was doing it, TAR should have an article about airbags. But I wanted the TAR perspective to take a longer-term view, utilizing critical thinking and real statistics, so I enlisted Jonathan Shefftz to do his trademark thorough job, which, sure enough, he did. See *Enhanced Avalanche Survival from Airbag Packs* on page 8.

You will also find a photo/essay montage from a late January avalanche cycle in the Tetons starting on page 14. Since I live in the Tetons I have ready access to great photos, and there is never a lack of drama here. A close personal brush with a big avalanche led to a set of reflections and some thoughts for the avalanche community at large. For balance please send me photos, stories, and reflections from your avalanche cycles as well – why should I claim the TAR bully pulpit all to myself? As always, letters to the editor are also welcome.

A few case studies, chosen for their relevance or important questions, some impressive photos and vignettes from a variety of venues, then a fiction piece from John Stimberis (with a wicked funny illustration courtesy of Matchstick Productions), round out this April TAR.

In his "From the President" column (*above*), Dale Atkins talks about updating the AAA mission statement. I'd like to underscore his words with a plea for your input. Write or call a board member with your concerns and ideas before our upcoming board meeting/visioning days, May 19-20.

Finally, the deadline for the fall TAR, 31-1, has been moved up to July 1 for this summer in order to have the first TAR out in time for ISSW, which will be in mid-September in Anchorage. Hope to see you there, and if you can't make it, as usual TAR will take note of what's new and important from theory to practice.

Have a great spring and summer.

Best, Lynne Wolfe ❄️

## submissions

### SUBMISSION DEADLINES Volume 31: Winter 2012/13

- Vol. 31, Issue 1 . . . . . 07/01/12\*
- Vol. 31, Issue 2 . . . . . 10/01/12
- Vol. 31, Issue 3 . . . . . 12/01/12
- Vol. 31, Issue 4 . . . . . 02/01/13

Lynne Wolfe, TAR editor  
PO Box 1135  
Driggs, Idaho 83422  
lwolfe.avalanchereview@gmail.com  
(208) 709-4073

*\*Please note early deadline for TAR 31-1 due to mid-Sept ISSW*



**aaa news****Thank You Donors**

AAA thanks the following members for contributing an additional donation in 2011 to further our efforts. Donations totaled \$14,043 and amounted to 24% of our total income in our fiscal year 2010/11.

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**what's new****ISSW Steering Committee Report**

Dates have been set for two future International Snow Science Workshops.

**ISSW 2013**, the second European ISSW, will be held in Grenoble, France, October 7-11, 2013. Currently plans include a one-day excursion to Chamonix.

**ISSW 2014** will be held in Banff, Canada, September 28 - October 3, 2014. ISSW was previously held in Banff in 1996, and the first meeting in a format similar to ISSW was held there in 1976.

The ISSW steering committee has been consolidating information about past and future ISSWs at a single Web site. All things ISSW should be accessible at or linked from [www.issw.net](http://www.issw.net). Thanks to Dan Judd for donating the [issw.net](http://www.issw.net) domain!

Currently, [www.issw.net](http://www.issw.net) has general information on ISSW and a summary of each of the meetings. In addition, abstracts and/or paper titles and authors are available from 1996 onward through their archived Web sites. However, at the moment there are only full papers from ISSWs 1996, 2008, and 2009.

The ISSW steering committee is currently engaged in making all of the Workshop Proceedings, including full papers, available – dating back to the early Canadian meetings in the 1970s. A searchable online database is being produced by Montana State University (MSU) in cooperation with the ISSW steering committee. Direct funding for this project is provided by CAA and AAA with substantial contributions of time and expertise by MSU. The proceedings should be available online by the end of March. Visit [www.issw.net](http://www.issw.net) for the latest updates.

—Rich Marriott, ISSW steering committee secretary ❄️



**ISSW 2012**  
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[issw2012.com](http://issw2012.com)

**AVALANCHE DIVAS**

FEMALE PROFESSIONALS ❄️ ❄️ ❄️

**Avalanche Divas Event Set for September 17 at ISSW**

The Avalanche Divas will again honor women in the avalanche field at the 2012 International Snow Science Workshop, which will be held September 17-21 at the Dena'ina Center in Anchorage, Alaska. Diva nominations can be emailed to Aleph Johnston-Bloom at [snowaleph@gmail.com](mailto:snowaleph@gmail.com). Ladies, save Monday night, September 17, to celebrate with the Divas in Anchorage! ❄️

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*I was a 16-year-old kid who knew very little about the backcountry. Two years ago a BCA Tracker saved my life. I was buried for eight minutes and I was dug up by friends whom I consider family today. My goal is to become a guide so that I will have the ability to protect people like my former self. Thanks to BCA for saving my life and giving me inspiration.*

— Randall Stacy, Ipswich, MA

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## Mammut Reports Air Cartridge Issues

Mammut recently announced problems with some of the air cartridges sold with their airbag systems. The oldest models have a long-term safety problem and are being recalled to replace the pressure valve. Some of the newer RAS cartridges have displayed a glitch during refilling, which is not a safety issue but can be remedied by sending cartridges back to Mammut or simply repairing them at home.

### SNOWPULSE INFLATION-SYSTEM 1.0 AIR CARTRIDGE RECALL

Mammut has just issued a recall for older Snowpulse "Inflation-System 1.0" air cartridges. The Snowpulse cartridges (also called cylinders) are equipped with a pressure gauge, also known as a manometer. Over time, some of these pressure gauges have developed a leak that leads to a drop in air pressure and sometimes to all the air escaping. This means that the airbag will inflate insufficiently or not at all. To completely rule out the possibility of this risk, Mammut Sports Group AG has decided to replace all first-generation (Inflation System 1.0) Snowpulse cartridges. Since the full cartridge in these older models could potentially leak at any time, this is a safety issue that needs to be resolved immediately.

This recall only affects older Snowpulse cartridges; it does not affect any of the RAS cartridges manufactured either by Snowpulse or by Mammut.

### Which cartridges are affected by the recall?

All first-generation Snowpulse cartridges that are compatible with Inflation System 1.0 are being recalled.

### How can I tell if my cartridge is part of the recall?

All cartridges with a valve like the ones pictured at right need a replacement pressure gauge. The new Snowpulse cartridges for Inflation System 2.0 as well as cartridges from the Mammut Ride Airbag RAS are not affected by the recall.



### What exactly is the problem with the old cartridge?

The cartridges are under enormous pressure, at 300 or 207 bar, which is measured with a pressure gauge on the cartridge neck. Some cartridges develop a leak over time, which leads to a drop in the air pressure and sometimes to all the air escaping from the cartridge. Even unused, stored cartridges can be affected by this loss in pressure. The cartridges can lose pressure at any arbitrary time.

According to investigations initiated by Snowpulse at the pressure gauge manufacturer, this has been traced back to a faulty testing procedure; during quality control, the pressure gauge was damaged by excessive pressure.

### Why are the new cartridges not affected?

During the production of cartridges for Inflation System 2.0, the manufacturer of the faulty pressure gauges modified the test procedure so that this problem cannot arise in the future.

### Is there any charge for replacing the cartridge?

No. Mammut will replace the pressure gauge on a defective cartridge 1.0 at no charge. In addition, mailing costs for returning it will be reimbursed.



### How do I return my cartridge?

- 1) Return only the empty cartridge (without the backpack).
- 2) If the cartridge is full, carry out a test deployment of the airbag in order to completely empty the cartridge. First, make sure that the burst zipper for the airbag pocket is completely closed before you pull the release handle. Afterward, follow the steps outlined in the User Manual to again stow the airbag correctly. If you can't find the manual, the instructions can be reviewed at [www.snowpulse.com](http://www.snowpulse.com).
- 3) Remove the cartridge from the backpack. In doing so, don't forget to re-attach the valve pin (see illustration) that remains on the end of the cable after deploying the airbag. The pin is necessary so that the cartridge can be properly refilled. You might need a pair of pliers to reattach it.
- 4) When sending in the cartridge, use the original packaging if it is available. If you no longer have the original packaging, pack the cartridge in a well-padded cardboard box so that it is protected from blows and impacts.
- 5) Include the recall form in the package so that the pressure gauge on the cartridge can be replaced. Visit [www.snowpulse.com](http://www.snowpulse.com) to download the required form.

### Where can cartridges be replaced in the US?

If you live in the US, affected cartridges should be sent directly to the Mammut service center in Vermont. Contact the office to get a UPS calltag before you

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send it back. Complete information about this precautionary recall of the Snowpulse cartridges, including return information for other countries, can be found at [www.snowpulse.com](http://www.snowpulse.com).

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**RAS CARTRIDGE REPAIR**

Some people have experienced problems with RAS cartridges (shown, at right) during filling. It is unclear how widespread the issue is – some retailers have had a significant percentage of their stock affected while others have had very few issues. Overall during this winter season, the problem has affected less than 2% of the cartridges we have shipped, but it is unclear if that's a reflection of sell-through, lack of use, a snowless winter, or if this is a relatively minor issue.

- This issue does not affect full cartridges, but it can prevent a cartridge from being re-filled or filled the first time. This is not a safety issue since this affects only the filling – not the actual use – of the cartridge.
- Mammut encourages anyone with an issue to contact them and return the cartridge so that it can be repaired by the manufacturer. If the timing is difficult, shops or consumers may elect to perform the repair themselves. The fix is quite easy and takes only a few minutes with a few simple tools.
- Because this it is not a safety issue, consumers who have a full cartridge may elect to send it in or repair it themselves AFTER the winter season.
- Mammut would like all retailers selling RAS packs to be familiar with the problem and able/equipped to perform the repair. It is worth a call to any shops that sell a lot of Mammut airbags, as well as popular refill locations, to let them know about the issue and how to resolve it.
- Replacement quick-disconnect fittings are currently unavailable. If they do become available, the protocol could change, so stay posted.



Those wishing to repair their RAS cartridges through Mammut's service center in the US should call 800-451-5127. In Canada, call Mountain Sports Distribution (the Snowpulse distributor) at 250-344-5060. ❄️



**Ortovox to Offer ABS Backpack in 2013**

ORTOVOX, manufacturers of snow safety products, has entered a licensing partnership for the use of the ABS-Inside System for backpacks. Beginning in 2013, ORTOVOX will be adding avalanche backpacks to their arsenal of avalanche emergency equipment. Since 1980, ORTOVOX has been constantly evolving its product line and snow safety system to include avalanche transceivers, shovels, probes, backpacks, and now backpacks with avalanche-specific safety technology.

ORTOVOX backpacks have been an industry leader in the winter sports scene for 27 years, and the company has built a reputation for quality, functional design and focus on safety. The new licensing agreement enables ORTOVOX to integrate the ABS system into their own backpacks, further developing safety concepts with an eye on comfort and fit.

In the event of an avalanche, the ABS system helps improve active avalanche safety through the activation of the deployment handle installed on the backpack carrier system. A pressurized cartridge is pierced and gas escapes, inflating two integrated airbags in a matter of seconds. Although the airbags cannot prevent victims from being swept along by the avalanche, they help keep them on top of the snow and preventing death by suffocation, the main cause of death in avalanche accidents. ❄️

**GNFAC Human Factor Seminar Online**

Videos from the Gallatin National Forest Avalanche Center Continuing Education Seminar on Human Factor on March 7, 2012, are now available on YouTube at [www.youtube.com/playlist?list=PLEFAE2148A0027DF6&feature=view\\_all](http://www.youtube.com/playlist?list=PLEFAE2148A0027DF6&feature=view_all) or search YouTube for AvalancheGuys. ❄️

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Amy Flygare  
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**snow science**



Installed at Alta Ski Area (far left), the three-pronged cameras of the MASC system capture images of snowflakes in free fall (right), allowing for detailed understanding of snow crystals and the layers they subsequently form.



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Story and photos by Kevin Hammonds

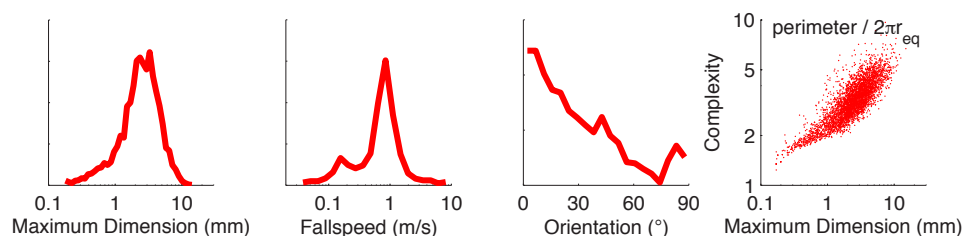
That’s right. “Alta is for Skiers” is no longer the area’s only calling card...and if you ask long-time Alta avalanche forecaster Daniel Howlett, better known as “Howie,” the area has been defined by more than just skiing for quite some time. In fact, one could surmise that snow science has been as integral to the community as bubbles are to beer since 1885, when a catastrophic avalanche nearly destroyed the entire mining township of Alta, Utah. Since the early days of Alf Engen, who founded Alta Ski Area in 1935, many a powderhound-turned-snow-scientist has gained his avalanche bearings within the steep recesses of Little Cottonwood Canyon. The list includes Edward LaChapelle, Ed Adams, and Ethan Greene, just to name a few.

Today, although avalanche-mitigation efforts in the canyon plod forward with one howitzer round after another, the underlying science behind the earth-snowpack-atmosphere system seems to have come to a bit of a plateau. At least until recently when an atmospheric scientist at the University of Utah began to, of all things, start taking pictures of snowflakes.

With such a close proximity to the University of Utah and an annual mean snowfall accumulation of 500", Tim Garrett, professor of atmospheric science at the University of Utah, has made Alta his preferred location for studying various atmospheric phenomena related to boundary layer snowfall and mixed-phase clouds. Still in its infancy, Garrett is leading the Wasatch Hydrometeor Aggregation and Riming Experiment (WASHARX), an experiment funded by the National Science Foundation. As part of this experiment Garrett and his research team have deployed several unique instruments around Alta Ski Area, including a one-of-a-kind camera designed to capture images of individual snowflakes, still in free fall, by means of stereographic photography.

**Multi-Angle Snowflake Camera**

The camera, termed the Multi-Angle Snowflake Camera (MASC), actually consists of three cameras offset from one another by 36 degrees. This multi-angle approach allows for a stereographic view of the snowflake as it passes through an infrared sensor, simultaneously triggering the shutter and flash mechanisms for the three high-speed cameras mounted to the frame of the instrument. Invented by Garrett and former University of Utah graduate in mechanical engineering, Cale Fallgatter, the intent behind the MASC was to develop a better empirical understanding of cold-cloud microphysical processes as well as improve upon existing cold weather forecasting models. According to Garrett, “All cold weather forecasting models rely on having accurate observationally based parameterizations for the relationships between snowflake mass, diameter, and fall speed. Also, these models need to be able to faithfully describe the complex and rapid processes of snowflake aggregation and droplet riming.” Working in cooperation with Alta Ski Area and Howlett’s environmental monitoring and technology company, NoHow Inc., alternative interests in the MASC have quickly spread to the avalanche forecasting community.



**Applications to Snow Science**

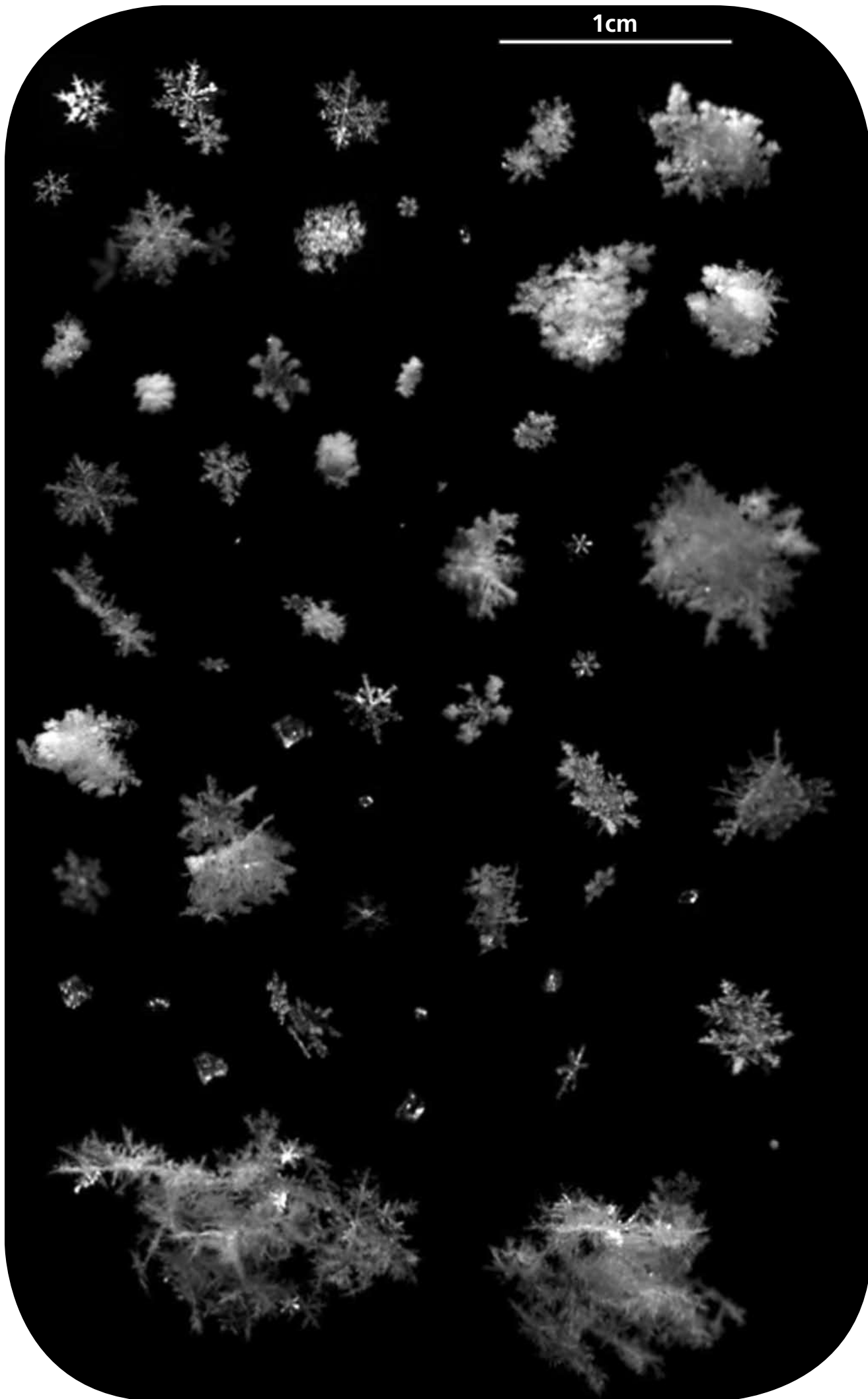
It is fairly well known that fundamental characteristics such as the size, shape, and extent of riming or aggregation of falling snowflakes can have a direct effect on the density and distribution of weak layers within a snowpack. But often, these variables cannot be identified until the storm board gets swept off or a snowpit excavated. Even then, because a snowflake’s metamorphism begins as soon as it hits the ground, not to mention the inherent human bias in the identification and measurement of crystal types, it can be difficult to acquire such basic characteristics with any kind

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Above: a few images from the MASC.

of accuracy or precision. With the advent of the MASC, there now exists both a systematic and automated method for deriving these most fundamental snowflake properties, all within their natural environment.

Thus far, the first to purchase a MASC unit specifically for avalanche-related research from the Garrett and Fallgatter spin-off company, Fallgatter Technologies, has been the US Army Corps of Engineers Cold Regions Research & Engineering Laboratory. Led by post-doctoral research scientist and former Mammoth Mountain pro patroller Ned Bair, currently of the Earth Research Institute in Santa Barbara, California, Bair is hoping to give a much more robust answer to some long-standing avalanche-related questions. Particularly, “Can snow crystals that cause in-storm avalanches be identified as they fall?” and “Are there quantitative measurements, such as volume, amount of rime, or fall speed that we can relate to snow stability?”

Using the MASC’s 20um resolution (soon to be 5um), it is thought that a rime-to-snowflake mass-fraction can be determined, which could then be used to identify potentially weak crystals and layers within the snowpack. Through Bair’s previous work, which suggests that this rime percentage affects snowpack

stability, Bair is hoping that the MASC data – coupled with snow accumulation, nearby avalanche occurrence records – and stability tests will help unlock some of the science behind both storm-snow avalanche cycles and weak-layer distributions within the snowpack.

#### Resources

To learn more about the MASC as well as the recent and anticipated research of Tim Garrett, Ned Bair, or Daniel “Howie” Howlett, visit:

- [www.inscc.utah.edu/~tgarrett/Snowflakes/Snowflakes.html](http://www.inscc.utah.edu/~tgarrett/Snowflakes/Snowflakes.html)
- [www.snow.ucsb.edu/cues/](http://www.snow.ucsb.edu/cues/)
- [www.nohowinc.com](http://www.nohowinc.com)

*A former avalanche professional, Kevin Hammonds is currently working on a graduate degree in the Department of Atmospheric Science at the University of Utah. Although his research focuses more on the micro-physics of snow in the atmosphere than snow on the ground, he can’t help but keep one eye turned in that direction.* ❄️



## The Tipping Point

Story by Karl Klassen

*This article first appeared in the Canadian Avalanche Centre (CAC) Forecaster’s Blog at [www.avalanche.ca/cac/bulletins/forecaster-blog](http://www.avalanche.ca/cac/bulletins/forecaster-blog) on February 19, 2012. Reprinted by permission of the author.*

After extended periods of no snow in winter, weak layers almost always develop on the surface of the snowpack. The extent and characteristics of these weak layers depend on the nature of the dry spell: temperatures, winds, humidity, etc., and the nature of the pre-existing snowpack before the dry spell started. Sometimes the weak layers are non-persistent (they react when loaded by new snow then settle and bond relatively quickly). Sometimes the weak layers become persistent and react not only when initially buried, but for weeks and sometimes months after.

Regardless of the weak layer characteristics, the how and when of avalanche activity on them is a not a matter of “if” but “when.” When activity will begin depends on a variety of factors. How weak is the weak layer? What is it sitting on top of? How much new snow accumulates, and how rapidly does it accumulate? How dense is the new snow when it falls, and how rapidly does it settle? How much wind and from what direction? What are the temperatures during and after the loading cycle, and does the sun come out after or not? You get the picture – it’s not always simple, and each weak layer/loading cycle and subsequent avalanche cycle is unique.

#### Critical Factors

When we are approaching the point where a significant change in stability from good to poor is expected, you will hear forecasters talking about “critical” factors such as load (how much weight has been added/is being added) and slab property (how stiff the layer of snow over the weak layer is). When the snowpack becomes unstable, we often say we have reached “criticality” or the “tipping point.” When a warm, windy storm rapidly dumps large amounts of new snow, the tipping point generally comes quickly – sometimes in a matter of hours. This scenario is usually obvious and relatively easy to forecast. When weak layers are incrementally loaded (small, cool, calm storms drop minor snowfalls) and the weak layers are complex mixes of different grain types, the tipping point arrives slowly, and it’s much harder to predict when and where criticality will be attained and how the avalanches associated with the tipping point will look.

The latter scenario I describe above should sound familiar; it’s what we are experiencing now. The recent dry spell left a complex sandwich of weak layers on the surface. I will not go into detail – read the recent and current forecasts for your region and other posts in this blog, and you’ll get an idea of what I mean. In the last week or so, these upper layers have been incrementally loaded by small snowfalls of low-density snow with little wind and cool temperatures. This new snow is now settling fairly rapidly and is very susceptible to transport by wind.

Looking at field data with a critical eye Friday, I could see a very gradual increase in avalanche activity – mostly human-triggered, mostly pretty small. In my opinion, as of Friday afternoon, the snowpack in most areas was in a state of

*Continued on page 11* ➤



# Enhanced Avalanche Survival from Airbag Packs: Why Can We Learn from the Data?

Story by Jonathan S. Shefftz

**EXHIBIT 1: ABS Statistics**

(1) Data set		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
		Euro ABS w/airbag inflation:			Non-ABS	Colorado	Swiss 1980-99		Swiss & Austrian (various yrs)
		Full Only	All ABS Incidents	Partial or None	Partners of ABS Users	Atkins Analysis	Reported	Estimated	
(2)	Caught skiers/riders	262	295	33	67	1224	2301		1469
(3)	Fatalities	7	17	10	17	109	523		278
(4)	Survival rate	97.3%	94.2%	69.7%	74.6%	91.1%	77.3%	87.0%	81.1%
(5)	Avoided fatalities	N/A		25	20	3	17	7	13
(6)	w/ABS out of 100:			81	77	35	75	56	70

**NOTES:**

- (1) Data sets are as follows:  
 a, b, c, d = Compiled by SLF (through August 2010) and published on ABS Web site.  
 e = Compilation by Dale Atkins from CAIC data (including 205 burials).  
 f, g = *Avalanche Rescue Systems in Switzerland: Experience and Limitations*, Tschirky et al (2000 ISSW).  
 h = *The Impact of Avalanche Rescue Devices on Survival*, Brugger et al (Resuscitation 2007), net of ABS users.
- (2) "Caught" as defined by data set (often not explicitly).
- (3) Fatalities either in the field or after evacuation.
- (4) Probability that a caught skier/rider will survive.  
 Fatalities that would have been avoided with ABS (at average deployment success, i.e., including both user & technical failures) out of 100:
- (5) ...caught skiers/riders.
- (6) ...dead skiers/riders.

**So when are you going to get an airbag pack?**

The question from my touring partner last season was not very surprising, and not only because he runs a company that makes such packs. Yet just a few short years ago, that question – especially in the US – would have been puzzling: only ABS made such airbag packs, and outside of a brief partnership with Dynafit, distribution in the US was somewhat obscure. But now for the current 2011/12 season and the upcoming 2012/13 season, airbag packs are available from four companies: ABS (with partners ARVA, Dynastar, EVOG, Millet, Ortovox, Rock Snake, Rossignol, Salewa, and The North Face), Snowpulse/Mammut, Backcountry Access, and WARY (with partner Mystery Ranch).

Airbag pack saves of avalanche victims, once relegated mainly to detailed data presentations on ABS’s Web site, are now publicized on major television network shows. The evidence is compelling that airbag packs work, whether via controlled tests with dummies, the underlying phenomenon on inverse segregation/grading, or the dramatic video footage.

**Cost Versus Benefit**

If that is good enough for you, then you can stop reading this article right here. But the economist in me is always comparing costs and benefits. In this context, the cost of an airbag pack is not its monetary price (which although significant is nevertheless not out of place given the financial value of all the other gear we take along on any ski tour), but instead the sizable (and immediately noticeable) weight penalty. For example, for the weight differential of an ABS pack, I could bring along an AED. Or a bigger first-aid kit, or a better rescue sled system, etc. The potential benefits of such items are difficult to quantify. But for airbag packs, we do have data that can help to quantify the potential benefits.

The ABS Web site for the 2011/12 season cites a 97% survival rate. But what is included in the underlying numerator and denominator? Since 1991, the Swiss Institute for Snow and Avalanche, or SLF (part of the Swiss Federal Institute for Forest, Snow and Landscape Research), has been compiling

data on ABS pack deployments. The most recent compilation is through August 2010, and the next update will be presented at the upcoming September 2012 ISSW in Anchorage.

The ABS dataset is almost entirely European: out of 249 total avalanches in the database, only 10 occurred in the United States and four in Canada. Since more avalanche incidents probably occur truly above treeline in the Alps than they do in the United States – where much of our backcountry skiing and hence avalanches are really \*at\* treeline and hence present the hazards for more trauma deaths – the ABS advantage might be mitigated by a higher trauma incidence. And ABS claims numerous survival advantages over its competitors. Therefore, the ABS track record in Europe might not be entirely applicable to the United States, or to its competitors’ designs. And both the past 2010/11 season and the current 2011/12 season have seen successful ABS saves as well as ABS fatalities, but augmenting the data set without the kind of complete picture provided by a comprehensive SLF update is probably inaccurate. So keep all those caveats in mind throughout the numbers that follow.

**Examining the Statistics**

Exhibit 1 provides a summary of the ABS data set in columns (a) through (d). Row (1) provides a description of the data set, row (2) lists the number of caught skiers/riders (however “caught” may be defined), and row (3) lists the number of fatalities. (Rows (4) and (5) will be explained in due course, as will the other data sets.)

As shown in column (a), row (4), and as stated on the ABS Web site – yet without much emphasis – the 97% survival rate is only for those 262 deployments in which ABS users successfully deployed the airbags with full inflation. The full number of attempted deployments in the ABS data set is actually 295, for an 88.8% successful deployment rate (as opposed to survival rate), i.e., 262 divided by 295. Of the 33 attempted deployments that resulted in either partial or no inflation of the airbags, four were users who did not properly prepare their packs beforehand, 18

were users who were unable to deploy during the avalanche, two were users who intentionally did not deploy the airbags, seven were technical malfunctions, and two were damaged by the avalanche.

Including the unsuccessful deployments, the actual survival rate is 94.2%, not 97.3% (which is rounded down to 97% on the ABS Web site). That certainly sounds very good – although still not perfect, as almost 6% of ABS users have died when caught in an avalanche. But how much better is it than skiers/riders without airbag packs?

Column (c) addresses that question using the “natural experiment” (as we social scientists like to call it) of ABS users whose airbags failed to inflate fully. Their survival rate was only 69.7%. Another natural experiment is the survival rate of non-ABS users accompanying ABS users who were caught in an avalanche: their survival rate was 74.6%.

These sample sizes though are very small: just 33 and 67 (respectively). Tests can be performed for statistical significance to determine the probability that the survival rate differentials are attributable to random chance, but that still would not address the likely limited representativeness of such a small data set. (And other studies have already verified the statistical significance of the ABS survival rate advantage, although their data sets typically reversed the ratios, i.e., focusing on the survival rate for a small number of ABS users within a much larger population of caught skiers/riders.)

To address the non-ABS survival rate with additional data, turning to column (e), Dale Atkins (the president of the American Avalanche Association, among other qualifications too numerous to list here) has compiled his own analysis of Colorado avalanches over a time span comparable to the ABS data set, but with over four times as many caught as in the ABS data set. Out of 1224 caught skiers/riders (with most likely only a trivial percentage using ABS), Dale calculates a 91.1% survival rate.

Columns (f) and (g) provide the data for a study of Swiss avalanche victims between 1980 and 1999. This study is notable both because of the 2301-person sample size, and also because the authors attempt to estimate

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**EXHIBIT 2: Automobile Statistics**

(1) Year	2009	1965
(2) Vehicle miles driven (millions)	2,953,501	718,763
(3) Fatalities	33,808	36,399
(4) Survival rate	98.9%	94.9%
(5) Avoided deaths w/2009	Million miles	4
(6) Auto safety out of 100:	Fatalities	77
(7) Total population	307,006,550	194,302,963
(8) Miles driven per capita	9,620	3,699
(9) Fatalities per million people	110	187

the survival rate across all avalanches – both reported and unreported – based on the premise that many avalanches with caught yet uninjured skiers/riders are never reported. As shown in row (4), the survival rate among reported avalanche incidents is 77.3%, but the authors estimate that the true survival rate is a much higher 87.0%. Note that this latter figure is roughly comparable to Dale Atkins' 91.1% figure.

Column (h) is from a study of Swiss and Austrian avalanches over a similar time frame, with a higher survival rate than for the exclusively Swiss study, although with no attempted estimate at all avalanches (i.e., both reported and unreported).

**The Bottom Line**

And now finally for the bottom line, in the form of rows (5) and (6). But first for an excerpt from a Powder Magazine interview with Dale Atkins, which has been widely quoted as well as misquoted:

*I posed the following question at the National Avalanche School: Say we had a group of 100 people killed in avalanches. If we were able to go back in time and equip each one with an airbag, how many of those lives would airbags save? The majority of people thought 30 to 50-plus lives would have been saved with airbags. This is a dangerous perception because airbags only give a slight edge to survive, but that is good enough for me. In fact, I have owned and used airbags since the mid-1990s.*

*When you're able to deploy an airbag it's really quite remarkable how well they do in preventing burials and reducing mortality, but there's still a significant number of people who get killed with airbags. The fact is that airbags are really only going to save three additional people out of 100. That's not really exciting news unless you're one of those three people. Then it's a really big and important deal!*

The question posed at the National Avalanche School (NAS) is answered in row (6), although the 3-out-of-100 figure is actually the answer to the question posed in row (5). In other words, for row (5), imagine a region in which 100 people have been caught in avalanches. Had they all been equipped with ABS packs (with their mainly European track record through August 2010), how many fatalities would instead get to live? According to Dale's data set, that is the 3-out-of-100 figure that he cites. Using the other data sets, the figure is as high as 25 people.

But if the question is instead imagining 100 people who died in avalanches (as opposed to 100 people merely caught in avalanches, whatever the outcome), the range of 35 to 81 people actually matches up fairly well with the guessed range of "30 to 50-plus" by the NAS students.

**Risk Homeostasis & Other Factors**

Now for some additional caveats (as if all the preceding caveats weren't enough). Avalanche beacons over time have become both more prevalent and easier to use. (And yes, the available data and analyses do attribute a noticeable survival advantage to avalanche beacons, despite the occasional "corpse locator" derisive appellation.) Even more recently, shoveling strategies have also become better refined and publicized. All of that would be expected to increase the non-ABS survival rate – as compared to the historical track record reflected in the analyzed data sets – thereby narrowing the survival differential going into the future between non-ABS users (whose survival outside of trauma depends largely on speedy companion extrication) versus ABS users (whose advantage derives from not being buried in the first place, and hence whose survival would not be significantly improved by better beacon searching and shoveling).

Yet what about *risk homeostasis*? What about what? Perhaps in the past when ABS bags were more rare, their purchasers were more safety conscious. But in the future, as they become more commonplace, their use could encourage more risky behavior. All of this is obviously entirely speculative, but still, as I write this right now, on one airbag company's Web site, large letters proclaim, "GO BIG AND GO HOME."

**What Can Cars Teach Us?**

Proponents of the risk homeostasis thesis often advance an analogy with automobile safety: automobiles have become safer over time, but we negate that advantage by driving more dangerously. It is easy to claim that, no, just because my car now has all sorts of safety features that didn't exist when I first started driving, I do not drive any faster. But think about it in reverse: picture yourself in an unanticipated early season snowstorm without your winter tires on yet, as the ABS failure light suddenly appears in a not-so-wonderful coincidence. Would you drive any more slowly than you usually do? (Yes, I happen to know the actual answer to this, as that scenario is not merely hypothetical – though the skiing sure was great once we eventually arrived at our destination!)

However, just because individual behavior might become more risky in the presence of additional safety technology does not mean that the behavior is entirely offsetting. Returning to the automobile analogy, in Exhibit 2, rows (1) through (6) provide similar data as in Exhibit 1, but for US automobile safety in 1965 and 2009, as compiled by the Bureau of Transportation Statistics (within the US Department of Transportation's

Research and Innovative Technology Administration).

Instead of the figures for caught skiers/riders in Exhibit 1, row (2) in Exhibit 2 uses millions of vehicle miles driven. (Remember, advances in automobile safety prevent crashes in the first places, as opposed to airbag packs, which of course are unable to prevent an avalanche incident.) As shown in row (4), the probability of surviving a million vehicle miles has increased from 94.9% to 98.9%. Out of 100 million miles driven in 1965, that means four lives would have been saved with the 2009 survival rate. And for every 100 automobile deaths in 1965, the 2009 survival rate would have saved 77 lives. (Note the entirely coincidental similarity of the preceding four and 77 figures with many of those in Exhibit 1.) Out of all 36,339 automobile deaths in 1965, the 2009 survival rate would have saved 28,171 lives.

Perhaps some of this increased survival can be attributed to improved driver behavior in the form of increased awareness of the dangers of driving while intoxicated, but at the same time the dangers of driving while distracted have increased over this period. Another argument can be made that even if the survival rate has significantly improved, that improved rate just encourages us to drive more.

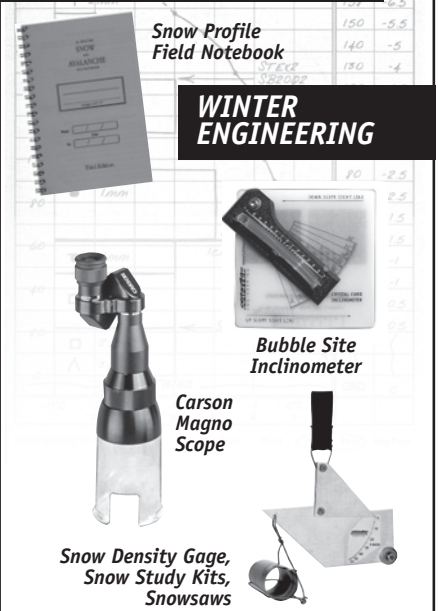
To address the issue of increased driving (whether more dangerously or otherwise), three additional rows augment the transportation data with population data and related calculations. Row (7) provides the total US population, allowing row (8) to calculate miles driven per capita, which in 2009 was 2.6 times the 1965 figure. Now certainly the dramatic increase in miles driven per capita is attributable to factors other than advances in automobile safety, but still, if automobile safety had not been improving so much over time, then perhaps a consequently rising death toll would have prompted further investments in inherently safer public transportation modes. Regardless, row (9) shows that automobile fatalities per million people in the US have dropped dramatically from 1965 to 2009, translating into a 41% decrease. Therefore, any risk-offsetting behavior (whether in the form of driving more dangerously or driving more miles) has been only partially offsetting, not fully.

So yes Virginia, even if Santa Claus might not really exist, technology can make us safer despite our unsafe impulses...although if I'm assigned to ski tour out to verify Santa's existence or non-existence in some snowy clime, I'm still not sure personally if I'll be wearing an airbag pack.

*Jonathan Shefftz is an AIARE-qualified instructor, NSP avalanche instructor, and AAA affiliate member. When he is not searching out elusive freshies in southern New England or trying to convince skiers to run up and down ski areas in the NE Rando Race Series, he works as a financial economics consultant and has been qualified as an expert witness in both federal and state courts. Although he owns many packs, his favorite carries his toddler daughter on his back while ski touring with his wife close to home in western Massachusetts. He can be reached at jshefftz@post.harvard.edu. ❄️*

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## Impressive Kootenay Surface Hoar

Story and photos by Chris Shelly

### Surface hoar: what it is, and how does it form?

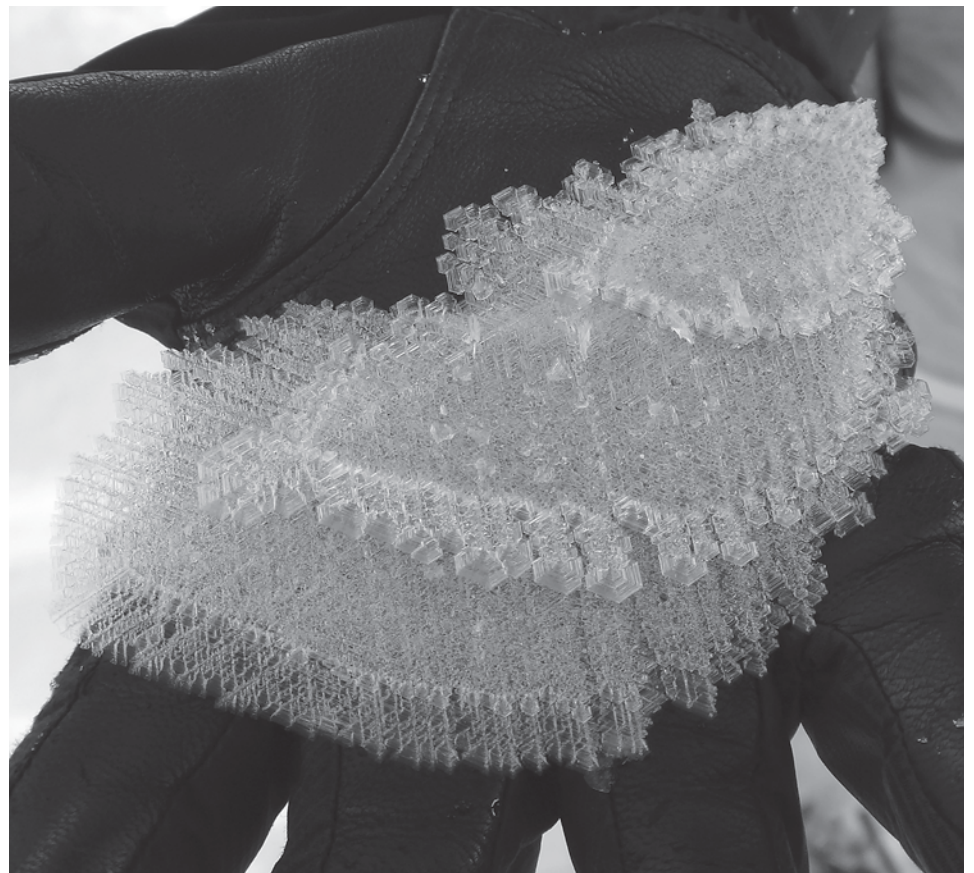
Simply put, surface hoar is the winter equivalent of dew. Water vapor condenses on the Earth's surface – typically grass in the summer (dew) and on the snow surface in the winter (surface hoar or frost). The dew point is the temperature at which air becomes saturated. The temperature must go below the dew point for condensation to occur. The ideal conditions for surface hoar to form are clear, calm (really very light winds such as a few mph), and cool nights. There must be moisture available such as an open body of water or water vapor (high humidity). The winter process of dew is deposition, where water vapor skips the liquid stage and goes right into a solid due to cold surface temperatures.

The photos on this page were taken in the southern Kootenay Mountains of British Columbia on February 7, 2011, near Wildhorse Pass. The elevation is about 5000', in a flat area that receives low-intensity sunlight for a few hours during the day. It hadn't snowed for a week, and each night was perfect for sh formation. We had beautiful sunny days with high temps at the freezing point, then clear, calm, cold nights (lows of -10°C) with barely a cloud in the sky.

Everywhere you looked there was sh of 5-15mm, and 30-50mm was also very common. This event was widespread to the Wildhorse Pass area and the Kootenay region. The surface hoar could be found on open slopes to the tightest of trees, regardless of elevation and aspect. The extremely large sh of up to 110mm was found in a flat, sheltered area that receives very little direct sunlight, both in intensity and duration for this time of year. There was a creek about 20m away that was open in a few spots, supplying moisture. You can really see the growth on the A, B, and C axis and multiple events on the crystal.

How will this surface hoar behave? Following 10 days of high pressure where the sh formed, we did receive 1mm of rain followed immediately by freezing rain, followed by 5cm of new snow the next day. The surface hoar was well preserved except for extreme solar aspects, and I fear that the freezing rain crust will only preserve it even more. There was no to very little wind during this time, definitely not enough to destroy any of the sh. Though it was only 5cm of new snow, steep slopes were sluffing fast and running long distances for such a small amount of new snow. Like anything, time and a keen eye will tell.

*Chris Shelly worked as the snow safety director at Moonlight Basin for a number of years as well as the patrol and snow safety director at Ohua, NZ. He currently works as a mechanized ski guide and as the forecaster for H2O Guides in Valdez. ❄️*



These layered platters of surface hoar were found in the perfect incubator, a flat sheltered area near a creekbed. They and their slightly smaller cousins in other locations posed travel problems in the Kootenays for weeks.



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You might actually be able to find this surface hoar once it is buried in your snowpack.

*Editor's note: at press time, the Kootenay forecast from the CAC told us:*

### Avalanche Summary

The recent cycle of widespread natural avalanches running on the Feb 08 surface hoar is probably over. Explosive control and human triggering continue to produce avalanches on this persistent weak layer (PWL). The light new snow that is falling on Friday may be enough to cause some more natural activity on the PWL in areas that did not recently slide and have enough wind to develop a heavy windslab load. The new snow and wind may develop a soft surface slab that does not cause the PWL to fail, but may be large enough on their own to injure or bury a person. Avalanches that release on the PWL that is buried down about 70 cm have the potential to be very destructive.

Also see "The Tipping Point," at right.

### THE TIPPING POINT

*continued from page 7*

precarious balance – the weak layers were holding on by a fingernail as accumulations of new snow gradually piled up on top of them.

Yesterday's data indicated this trend was continuing: a few more slides, a little bigger, still mostly human triggered. Preliminary reports are trickling in this morning, and it looks like some regions got significantly more snow than forecast in the last 24 hours. On the west side of the Monashees east of Vernon, for example, there's a report of 60cm of new snow – far more than was forecast. Places that got more snow and/or wind than was discussed in yesterday's forecasts are likely now over the tipping point, and local danger ratings in those areas are almost certainly higher than what was forecast yesterday in areas where this occurred.

#### Human Factors

I think there's also a human tipping point. After a long drought, people get frustrated and fed up with the poor riding conditions and eagerly await the arrival of new snow that will improve their backcountry experience. However, the arrival of new snow and the improvement in riding conditions in these situations is almost always associated with the arrival of the tipping point. The slower the tipping point comes, the more people get lulled into a sense of false security and the more they underestimate the potential consequences that result when the tipping point is reached.

For example, the current situation: complex weak layers + 10 cms new snow = great fun. + another 10 cms = great fun and a few small avalanches that get ignored. + another 10cms = surprise! avalanche incidents/accidents occur but everyone's too embarrassed to say anything, so others don't hear about it, and they get caught in larger avalanches until eventually there's a serious wreck.

This is what we are seeing in some areas now, notably the South Coast Mountains and the North Shore: people got surprised and caught, some lost gear, and were partially buried, and they all slunk away embarrassed and didn't

tell anyone. This is probably also occurring or about to occur in the west-central Monashees and any other areas that went over forecast for snow, temperatures, or winds yesterday – we're just not hearing about it.

Areas that have not gone over the tipping point yet will probably be there in the next few days when a bit more snow, wind, and/or warmer temperatures arrive. PLEASE: check with knowledgeable locals about what's happening, look at the avalanche forecasts for your region every day, critically examine the weather factors that are driving the danger ratings and avalanche problems, then constantly observe what's happening around you as you go into the mountains. If the avalanche forecaster rates danger Moderate in the Alpine – and that's based on a weather forecast of 10cm new snow, -5.0, and light SE winds while you are seeing 40cms of new, +1.0, and a SW wind – you have to adjust your trip plans and terrain choices, or you will get caught by surprise. If your personal tipping point isn't under control when the snowpack stability/avalanche activity tipping point arrives, you are just asking for trouble.

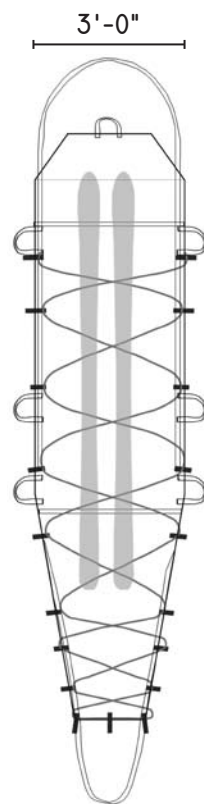
*Karl Klassen's bio includes 35 seasons in the avalanche biz including ski area avalanche control; consulting; heli/cat ski guiding; ski tour guiding; rec/pro avalanche course curriculum development and instruction; public avalanche forecasting; and mountain guiding in Canada, New Zealand, USA, Europe. He is currently all of these: Public Avalanche Warning Service manager at CAC, chief guide at Monashee Powder Snowcats, CAA Professional member, ACMG Active Professional member, IFMGA member, ACMG/IFMGA mountain guide, CAA Level 3, founding director and past technical director of AIARE, past president of ACMG, past executive director of ACMG. His wife Mary Clayton is the CAC communications director; his son Aleks is 10. Karl laments that they are both better skiers than he is. ❄️*



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PHOTO: ICE CREEK LODGE, BC



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BUILT FOR PERSON 5' TO 6.5' (135CM-200CM) TALL

DURABLE WATERPROOF MATERIAL THAT MOVES EASILY THROUGH SNOW

OCCUPANT AND SKIS FULLY SECURED INSIDE SLED FOR STABILITY AND SUPPORT

NYLON SNOW GUARD PROTECTS OCCUPANT FROM MOISTURE AND ROPE ABRASION

TOW STRAPS AT FEET AND HEAD

MULTIPLE HANDLES TO AID IN PATIENT TRANSFER

NYLON STUFF SACK

DESIGNED AND BUILT IN BC 🇨🇦



## crown profiles

# Close Call on Petes North

Turnagain Pass, AK  
February 11, 2012

Chugach National Forest  
Avalanche Center Report  
by Wendy Wagner

This remotely triggered avalanche caught, carried, and buried two skiers ascending an up-track on the westerly aspects of Petes North ridge near treeline. One partially buried (uninjured) and one fully buried (concussion).

**Avalanche details:** HS-ASr-R2-D2-I

**Type:** Wind slab. This was a 1-finger wind slab sitting on a thin layer (2" and less) of 4-finger low density powder over harder (pencil hardness) wind slab that acted as the bed surface.

**Size estimate:** 150' wide x 5-700' x 12-18" deep

**Trigger:** Remote from ~20-30' left from corner of the right flank and stauchwall.

**Weak Layer:** Broken precipitation particles/decomposing fragments

**Aspect:** WNW

**Angle:** 37-43 degrees

**Elevation:** 2500'

**Debris:** ~3-5' deep (fanned out to varying degrees)

**Weather:** Storm day.

*Friday, February 10*, the day before the avalanche, 8-12" of medium-density snow fell with 30mph east winds, gusting to 85mph. Temperatures near 30°F.

*Saturday, February 11*, the day of the avalanche, 3-5" of similar density snow fell with east winds averaging 40mph and gusting to 95mph. Temperatures near 30°F.

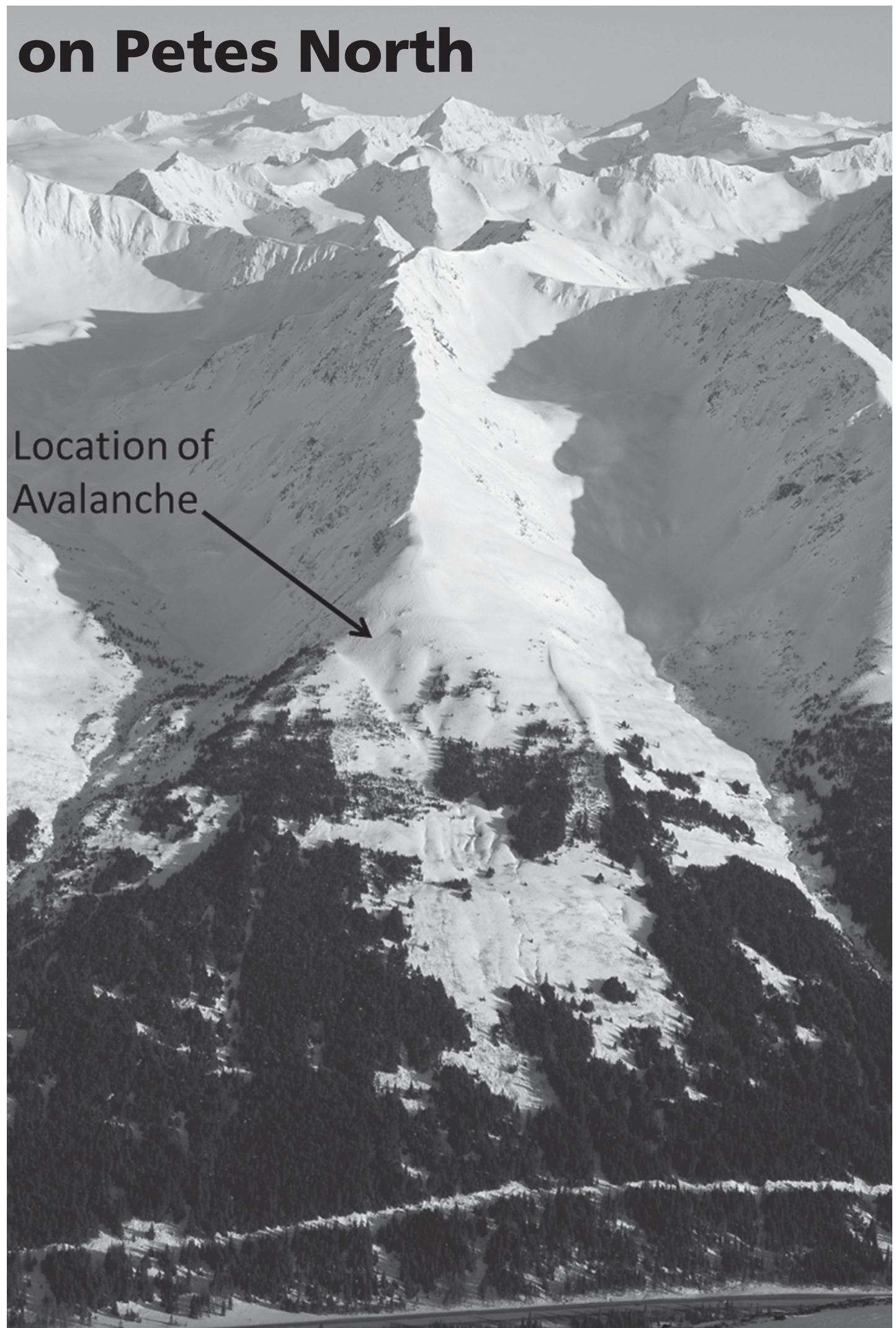
**Avalanche danger rating:**

Considerable with pockets of High.

### Events

Two parties of two skiers and one party of three were all skiing the low-angle sparse trees just below treeline under the western shoulder of the Petes North ridge. They were using caution, staying on low-angle slopes and aware of the avalanche danger. Right at treeline the slope steepens and looms ~500' above the low-angle trees. The skiers were on the looker's-left side of the shoulder and were descending from a safe flat area on the shoulder, right at treeline. The steeper slope above was to looker's right from where they were descending. They suspected the slope was wind loaded, however it was also assumed that if it slid, the debris would be funneled into a small gully off to looker's right and avoid the sparse trees where the skiers were recreating.

As five of the seven skiers had convened at the top of the treeline, the point they descended from earlier on their first run, two skiers (among the party of three) were out of view, still on their way up the skin track. At this point, one of the five walked away from



Petes North: the micro-ridge wasn't enough of a terrain feature to channel avalanche debris away from the treed apron. Another case of "know who is above/ below you."

*Petes North photo above and on next page and Turnagain Pass map courtesy of Chugach National Forest Avalanche Center*

the group when he felt a large collapse. Immediately the five skiers saw the slope above and to the side of them begin to fracture, and they began to yell, "Avalanche." The skier whose two partners were still on the up-track, out of sight, began to run downhill after the debris. The other four skiers followed. The avalanche came within ~20' of the group of five.

The five skiers convened where the debris stopped and saw one person buried to his waist struggling to remove himself. They quickly turned all beacons to receive and began a beacon search when someone noticed a hand near some small trees where the beacons were leading. They were able to dig out the back of the person and clear the airway quickly. Burial time was estimated at

three, but possibly more, minutes from the time of the burial to clearing the airway. The skier partially buried was able to dig most of himself out and help with the rescue of his partner. Both buried skiers were able to ski out on their own power.

### Note

The debris from this avalanche nicked one small 50' section in the zig-zag of the "relatively" safe up-track (where skiers were caught). A small section of the up-track was also covered with a very small amount (1' or less) of debris near the toe.

This was a close call that we all can take something away from. Some lessons learned:

- Extra caution is required when multiple groups are recreating on the same slope!
- Never underestimate where and what terrain features an avalanche can overrun.
- When visibility does not lend itself to seeing the whole picture clearly, placing a skin track even more conservatively than you may think necessary could save someone's life – and possibly the life of a person from a different party.
- Keep your rescue skills honed. KUDOS to these skiers for their excellent quick response!
- Always keep your beacon batteries fresh.

Wendy Wagner is a CNFAC forecaster. ❄️



From: Cody

Date: Mon, Feb 13, 2012 at 12:37 PM

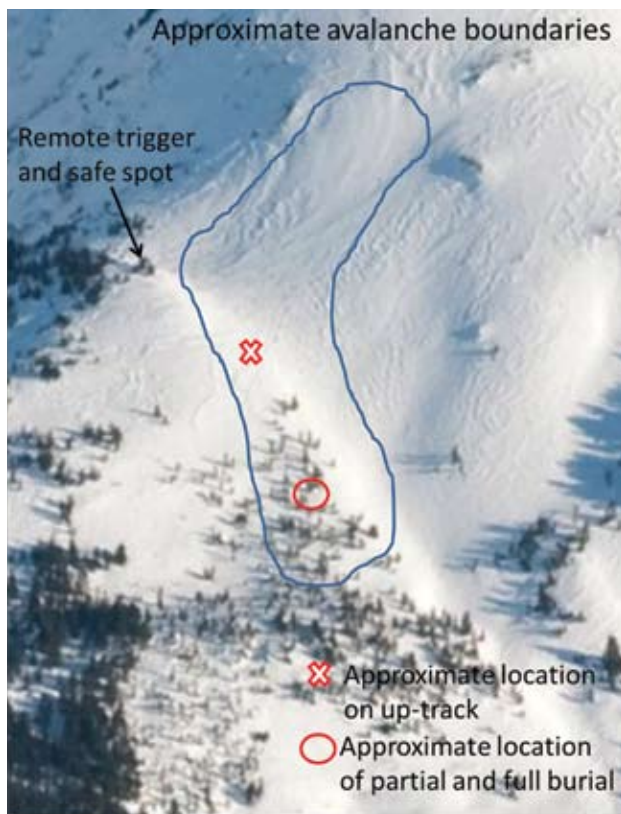
Subject: RE: Petes North write-up

To: Wendy Wagner, Chugach Avalanche Center

I think that is a good and accurate write-up.

After allowing some time to pass and talking to the other guys, I'll give you a narrative of what happened in my mind:

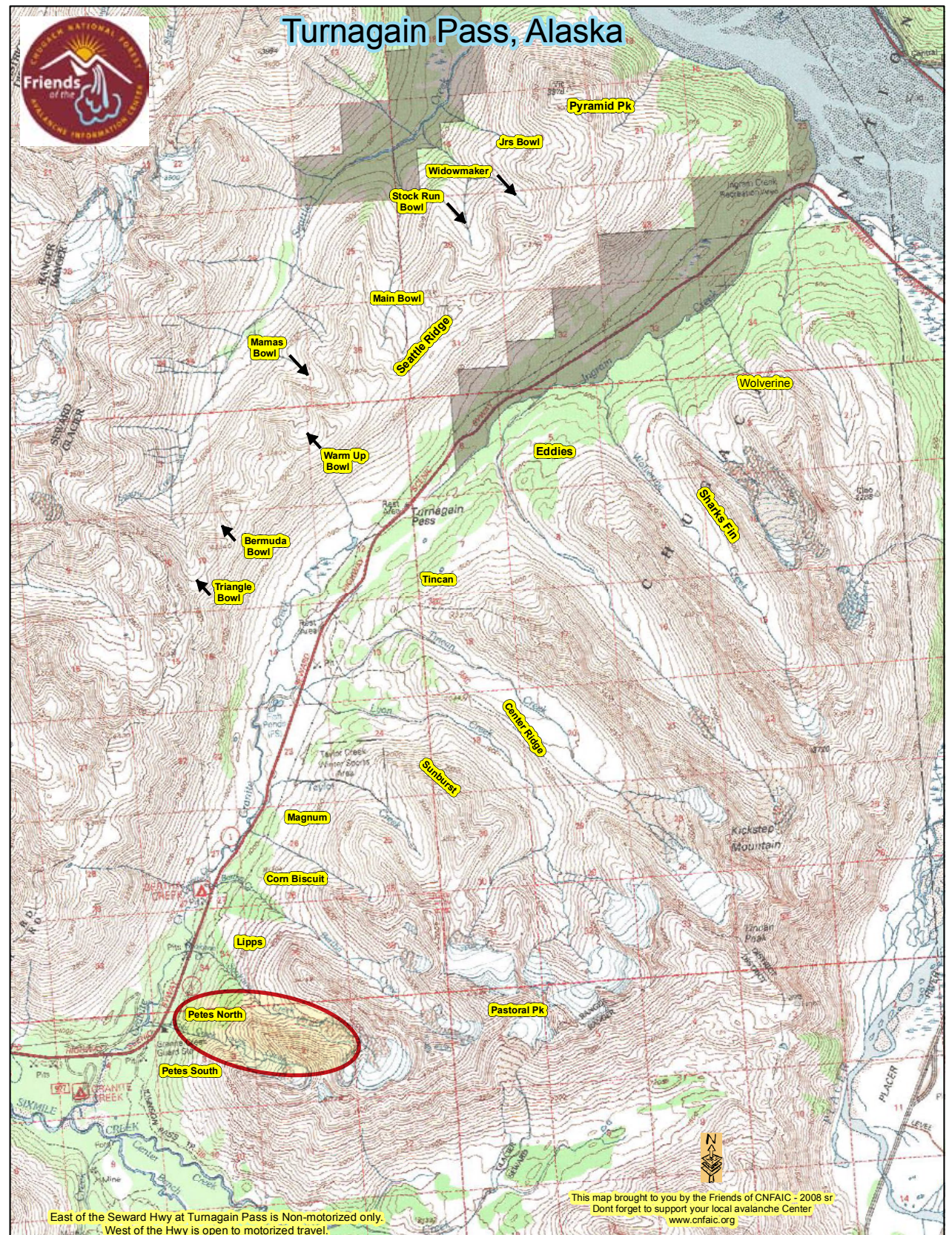
We left the parking lot at Johnson Pass on the heels of a group of two folks (let's call them A and B) who were also involved in the incident. We caught up to them where the up-track broke off from the powerline and went up through the forest. They were following an existing track that was mostly filled in from the previous 12 hours snow, so basically breaking trail. I took over breaking trail at that point and followed the existing route through the forest until we broke out in the glades, where the old trail was non-existent. I chose to put the track where I did to take advantage of the lower



angles and to keep the exposure to dangerous slopes above us at a minimum. A few hundred feet below the highpoint I stepped aside and one of the members of the group that we had passed earlier finished the track up to our high point. We had been in mostly still air, but as we ascended on to the flat part we were caught by moderate wind gusts out of the north.

We took one run basically fall line from our high point and slightly north of the skin track. While we were transitioning back to skins, A and B came up the skin track. I jumped in behind them and started up while C and D were still transitioning. I stopped a few times to decrease the distance between C and D and me, but I wanted to ask A some questions, and if you get too far behind those guys, you ain't gonna catch up. So I kind of drifted back and forth between C&D and A&B after we ran into you (Wendy) on the up-track, I was having a conversation in between gasps for breath with A and able to see C&D about 150 yards behind us when the angle kicked back for the final few feet before the high point and C&D went out of sight for me. I recall C being behind D on the skin track when I last saw them. We reached the high point to discover that the two folks we ran into on the first run were up there for a second run as well; we must have skied lower than them on the first run, because we never saw them on the way up.

I think seconds passed between the time that we hit the high point and the avalanche was triggered; we all were cued in to it and looked up to see the size of the fracture and immediately moved away from the flow. Our location was safe because there was a terrain feature, basically a gully that funneled the debris off of the fall line. But I think it concentrated the mass of the debris and allowed it to overtake the gully-like terrain feature, then take a straight fall line and hit the skin track. This is what we didn't think it would do; we even discussed it on the first run with the other group of two.



A started yelling "Avalanche!!!" over and over, and I turned and started kicking and gliding back downslope toward where I thought C&D would be.

I had good downslope momentum going with my heels unlocked and my skins on. As soon as the angle increased, my speed picked up even more, and I had a victim in sight partially buried from the waist down and completely caked with snow. It was D, and there was gear downslope of him. I approached him from uphill and recognized him and asked him where C was. He said he didn't know, and I asked him to put his beacon on search. He either said he was trying or he already had, I don't remember.

At that point I continued gliding downslope and while gliding removed the Tracker from my right pants pocket and felt the stretch from the lanyard that attached it to my zipper pull.

I usually don't put it in my pocket – actually feel pretty strongly that it belongs in its harness on my torso. (For more thoughts on this point, see page 36.)

I turned the beacon to search mode and immediately had a signal 40 meters away. I started following the Tracker, but it was taking me toward the toe of the avalanche, and my distance to signal was increasing. I stopped moving about the same time the beacon decided to recalculate, and the refreshed signal it acquired started curving me to my left and back up toward D. I had dropped my poles and was able to move easily across the debris, too fast in fact for my beacon as I had to force myself to slow down, because it kept dropping and reacquiring the signal. Once I adjusted my pace the curve I was tracking turned into more of a straight line and the distance was in the single digits and rapidly decreasing.

I remember passing by D who was still partially buried, and I started seeing other rescuers come into my peripheral vision as I was approaching pinpoint search range. My beacon started making that noise

it makes when it is time to probe, and I just dropped my beacon and my pack and started assembling my shovel while calling for a probe from B who was rapidly assembling his probe.

I remember hearing someone yell they saw a hand while the shovel and probe assembling was happening. B went right to the hand and found his head by removing snow with his hands and called that he had a clear airway. At that point I heard C groan. A approached below me and told me to get my skis and pack out of the way so we could dig from downhill. C was buried left side down with his chest and head pressed into the uphill side of the tree. I think A immediately realized that we had to get at him from uphill to get the pressure off of his chest, which in hindsight I may have increased by removing snow with my shovel from the downhill side of him. I briefly pulled downhill on the tree to try to help alleviate the pressure on his chest.

At that point I moved into a position to palpate his spine and was able to successfully palpate it cervical to lumbar. With C's lowered level of consciousness I realize a full neuro assessment couldn't be completed, but I was just going on what training I had – a WFR in 2005 with no recurrent training since the initial.

I think at that point, B diverted his attention toward confirming that there wasn't another buried victim, and he was focusing on his beacon which was picking up several signals. One was mine which had reverted to transmit mode either unintentionally or automatically, and the other was C's which was harnessed to his torso. I turned mine (which was still dangling its lanyard attached to my pants where I dropped it) off and located C's and turned his off.

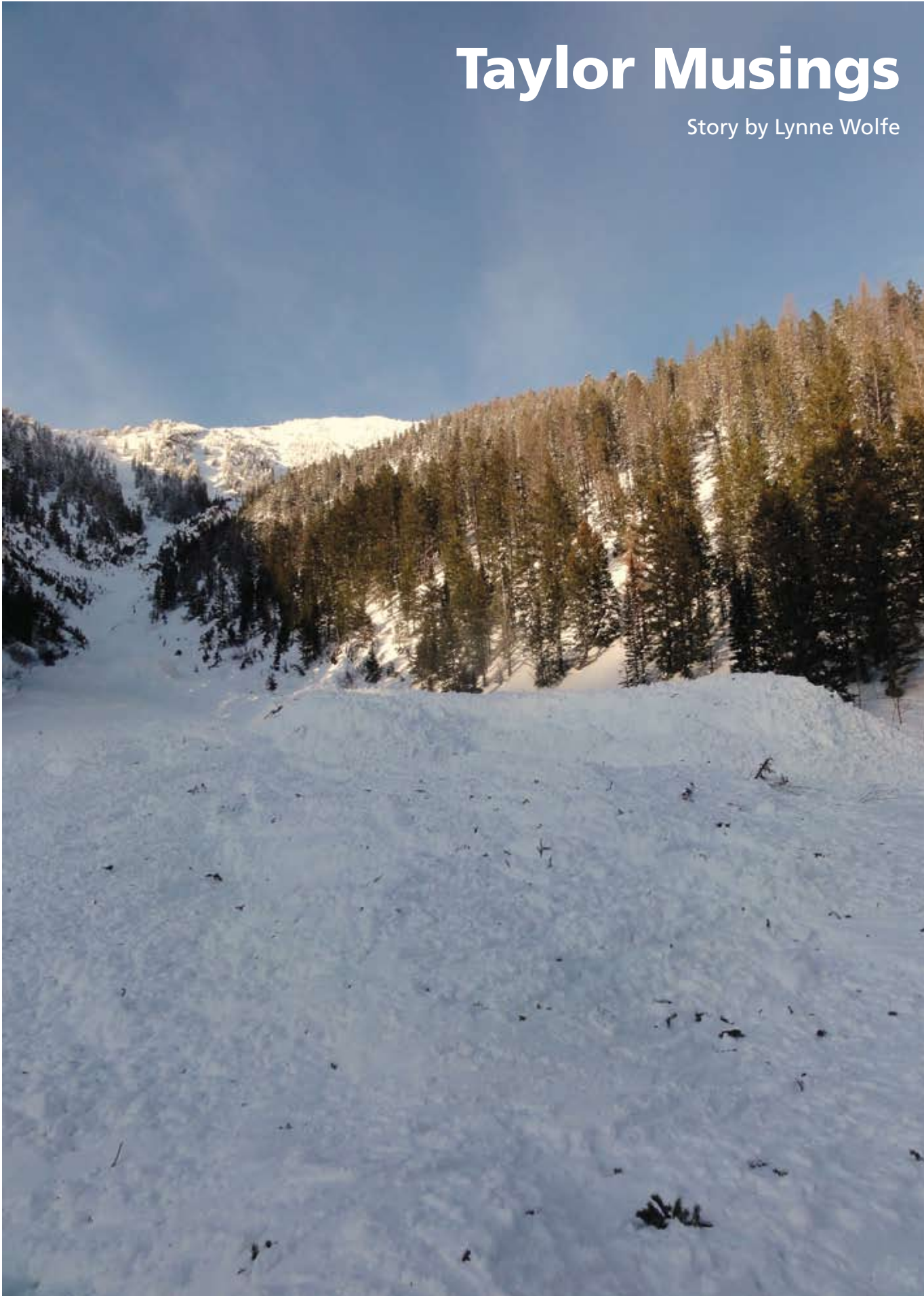
At that point, C stood up on his own, and I put my parka on him, then sat him down on a pack and did a

Continued on page 36 ▶



# Taylor Musings

Story by Lynne Wolfe



Looking up the south face poop chute on the afternoon of January 24. The drainage is filled with debris from the powder cloud.

Photo by Aaron Diamond



In a show of delicate maneuvering, the Teton County SAR contract helicopter set down in the Coal Creek parking lot, where they connected the analog Long Range Receiver to hang below the ship in preparation for a signal search of the debris. Photo by Lynne Wolfe

## Some background

When you last heard from me, TAR readers, on January 23 I had just penned an editorial labeling myself as one of those people about whom I warn my classes, a human factor crucible, impatient for fresh powder. December drought had left the Tetons high and dry; two powerful storms stressed the weak snowpack and heightened powder fever. We submitted the February TAR, 30-3, to the printer the next morning, and I went skiing with two friends, also avalanche professionals who were intimately familiar with the intricacies and problems of the current Teton snowpack.

## The day

After 3.76" of SWE from January 19-22 caused a huge avalanche cycle (see photos these pages), we were pondering where to ski on January 24. Mid-elevation trees were rejected out of hand; one friend vividly recounted the pockets of sturdy 3-4mm surface hoar perched on a melt-freeze crust that were well-preserved down in those same trees. A late-December hearty inversion had perhaps helped to cook the surface hoar and some of the widespread depth hoar with warm temps up high. And those were just the indirect problems to consider. Overnight temperatures had dropped to 4°F with clearing skies; the first sunny day on a loaded snowpack. We opted to stick to the lower angle (33-34 degrees), skier's left side of the south face of Taylor Mountain, stay in the shade and scoot out of there as the January sun rolled around south.

All the way up the southeast ridge we bantered back and forth, discussing and debating the merits of our arguments: snowpack, weather, terrain were all dissected for data and desire. I also asked my compatriots for input on the theme for TAR 30-4; we emphatically declared that today's ski was just within our risk tolerance personally, but there were way too many unknowns to venture there professionally, on an avalanche course or with even the best ski clients. Charlie Ziskin's essay on decision-making (*see cover story*) articulates the process we were trying to use.

As we stripped skins on the southeast shoulder, we noted a party above and to the northwest of us, skiing further out into the south face; we all remarked how that part of the bowl was beyond our risk tolerance. We were on good behavior as we inched beyond the shoulder, one at a time, to a safe spot tucked in thick trees. The skiing was fabulous, but there was an undertone of "can't make any mistakes, this is serious terrain and conditions."

The second pitch brought us lower onto the face, but a slice back to the ridge eased the slope angle and exposure. One of our party and an add-on friend departed; my good friend and long-time backcountry partner Fitz and I continued up for another lap, noting that the sun was beginning to make its mark, conditions changing, so we agreed that our next run would be even closer to the ridgeline, in the step/bench terrain.

## The avalanche

We skied that second lap with no consequences, but noted that the previously light surface was starting to settle and moisten, acting more like a slab. We then descended glade to glade, garlanding back toward the up-track on the southeast ridge. We had stopped to look at a moose when we heard a loud "crack," like a rifle shot. I thought it might be a huge collapse; Fitz thinks it might have been air blast





The south face of Taylor Mountain is visible from much of the road down the west side of Teton Pass. The fracture line weaves in and out of the tops of the steep drainages along the south ridge, on the left side of the photo.  
Photo by Kevin Emery, [www.lifeisfly.com](http://www.lifeisfly.com)

noise, coupled with trees breaking. Shortly afterward, we saw waves of roiling powder cloud billow down the confined track, boiling up, sounding like a full-speed freight train. From our safe zone well out of the path our thoughts went to the other ski party who had been above us on the second lap; our shorter trip up the skin track put us ahead of them in the circuit.

As the cloud dissipated we sped to the valley bottom in time to see a drainage packed with snow; a final wave of slow-moving wet debris oozing toward us. We immediately began a signal search, our initial fears alleviated by the sight of one of the members of the upper team who told us none of them was involved, although he had indeed triggered the huge face by jumping on a rollover near a rock band. Attempting to release the recent wind slab, it went much bigger than he expected, down to the depth hoar/drought surface from December.

My partner and I went into “dealing” mode, thankful for years of training that helped us know what to do and how to stay cool in this situation. Worries were amplified by the fact that debris from the south face over-ran almost a half-mile of Coal Creek, one of the most popular out-tracks in the range. Luckily, our no-signal finding was corroborated by Teton County Search and Rescue, who deployed a helicopter with an analog Long-Range Receiver (LRR). (*see photo, at left*)

But the real fun was about to begin. The south face of Taylor is prominent from the west side of Teton Pass. Motorists and skiers had called 911, prompting the TCSAR call-out. Facebook and the blogs erupted with commentary; TetonAT went viral with a Taylor Mountain Avalanche post, currently with 258 comments. [www.tetonat.com/2012/01/24/taylor-mountain-avalanche/](http://www.tetonat.com/2012/01/24/taylor-mountain-avalanche/)

Fitz and I returned to Teton Valley, where we cracked much-needed beers and proceeded to debrief our day. When I teach an avalanche course I often extort my students to ask themselves, “Did we make the right call, or did we get away with it?” Certainly snow can often be a forgiving material, but I strongly believe that, especially as we gain experience, we know the difference between the two.

### Reflections

On January 24, we were granted a rare opportunity to review our actions in the light of the huge slide that swept the face where we were skiing. On close examination, our tracks were still intact; you can see them on the far looker’s right of the face. Did this mean that we made good decisions? Well, we thought so, but we also acknowledged that, in many ways, we got away with it that day. A quote from Karl Birkeland gave me some perspective:

*Sounds like you guys ended up on the right side of the line. However, it also sounds like you ended up pretty close to the line. My experience is that if you are too close to that line too often, sooner or later you’ll end up on the wrong side of the fracture. The older I get – and the more I learn what I don’t know – the further I like to be away from that line!*

Sometimes, however, in order to know where that line is, I must turn around and look, saying, “Oho there it is behind me – I have crossed it and now how do I escape this one gracefully?” Taylor Mountain allowed us all to escape without injuries or casualties, but now we are obligated to put that free ticket to use, to contemplate the lessons of the incident and of this winter of uncertainty.

### Don’t outsmart the instability

The first free lesson reminds me not to underestimate the deep slab problem; underneath it is really a human factor problem, a patience issue that doesn’t heal overnight or after one storm. We even stress in our courses not to outsmart the instability. Did we do that? Perhaps. But I believe that our terrain management (staying in the planar lower-angle part of the bowl), not our intimate snowpack knowledge, kept our tracks in place as the steeper and windloaded portion of the bowl widely telegraphed the failure around ridges and drainages.

### Instant media vs critical thinking

The second lesson reveals the immense power of modern instant media. Camera phones, Facebook, blog posts, Twitter; we rush to comment because we can. We say

*Continued on next page* ➡

## Frontcountry Safety Protocol

Story by Jay Pistono

The January 24 avalanche on Taylor Mountain’s east face into the Coal Creek drainage triggered another avalanche of discussion on proper snow and slope safety etiquette. At the heart of the conversation is the use of some active slope tests – ski/slope cutting or cornice chopping – sometimes considered appropriate protocol for testing a slope’s stability in the backcountry. This discussion has exposed that several areas in and around Jackson – and Teton Pass specifically – are now considered *frontcountry* by the Forest Service.

Frontcountry is a wild backcountry area that sees heavy use because of its proximity to populated areas and easy access. Frontcountry combines a high-risk, high-penalty alpine experience along with high use, and it’s important to adjust traditional backcountry thinking and activities to these unique dynamics. Here are some thoughts on frontcountry protocol with regard to active testing techniques on Teton Pass.

While active testing is definitely the sexiest of tests, consider all other resources at your disposal before cutting a slope, including:

- Study the Bridger Teton National Forest avalanche report.
- Take the extra 20 minutes to dig your own pit and get intimately familiar with the layers within the snowpack.
- Pay attention to results from any recent Gazex events.

Additionally, stay alert to the environment you are skiing in, including such factors as:

- Changes in the weather and acute temperature swings
- How quickly tracks are filling in
- A ski pole test to feel for layers
- How much snow is on and around trees
- Affects of wind events on the terrain

If you do decide to conduct an active test, first consider the following:

- Be absolutely certain that no one is below you.
- Make sure that there is a visible run-out path.
- Avoid testing on any slope when there is a road below. That’s WYDOT territory.
- Choose small testing areas (small slopes, small cornices) rather than big ones.
- Finally if you still feel like you have to test the slope, consider skiing another slope altogether.

Remember, slopes behave differently when they are tested than when they are skied. An upper-slope ski cut or cornice drop provides much more impact to a slope than a fall line ski track. Just because a slope has been skied doesn’t mean it won’t release with an active test.

*Jay Pistono is the Teton Pass Ambassador, also known as the Ampassador. He is a longtime local backcountry skier and guide whose diplomatic skills extend to the Snake River in the summer as well.*





## TAYLOR MUSINGS

*continued from previous page*

things anonymously that we'd never say to someone's face, but manners lubricate civilization. I'd like to make a plea for critical thinking, for the process of taking the time to gather information, considering it against facts and beliefs, then crafting an argument, being willing to change your mind, be convinced, listen and speak and write thoughtfully and civilly. Often our instant response is reactive, defensive, based on ego. Over time we can gain clarity, lose our initial defensiveness, then really figure out how to change our behavior, learn the lessons, act like the evolved apes we are supposed to be. Perhaps this evolution will cause us next time to save that comment as a draft, re-read and edit it before hitting send.

### Likelihood and consequence: taking it another step

One of the systems I use when making decisions at home or in the backcountry is analyzing likelihood and consequences. High likelihood leads me to attempt to minimize consequences, rope up on a glacier with thin soft snow over the crevasses.

With snow we talk about the size and distribution of the problem, factor in its sensitivity, then consequences point to the potential destructiveness of the avalanche against bodies or buildings. Ski patrollers test likelihood by use of explosives, jumping on rollovers, executing ski cuts; but a regulated environment ensures that human consequences are minimized, slopes are closed, and no one is below.

The backcountry these days certainly remains a place to test oneself, to find wilderness, to make good or bad decisions and take the brunt of their consequences. I posit, however, that often unsaid but equally important is the potential damage to the community: a rescue helicopter crashing in the inevitable storm can hold the deepest consequences for the rescuers. A mistake of assessment in heavily travelled terrain can affect casual passers-by; is that fair? For example, the recent loss of two energetic pioneers in our Teton backcountry community has affected more people than they may have ever imagined: blog readers, casual acquaintances, educators, family, friends, rescuers, co-workers – much more than just Man vs Nature alone in the wilderness. We need to consider the ripples of our actions beyond the slopes or the immediate decision. What obligations do we have to ourselves and to one another while in the backcountry?

The Teton Pass Ambassador, Jay Pistono, has some guidelines and reactions printed on this story's pages. As our backcountry becomes more traveled, we will need to surmount our competitive natures and communicate where we are going so we know who is above and below us, who we might affect directly or even indirectly.

### Call for leadership

I still treasure my collector's volumes of *The Snowy Torrents*; looking at accidents, not just the fatalities, is a fabulous learning tool. Before internet resources, I would photocopy case studies from the volumes and hand them out to students to help them develop their own critical thinking. Fatalities since 1998/99 are catalogued on avalanche.org, but the analyses are inconsistent, incomplete. Fatalities deserve in-depth investigation, insightful analysis. Accident case studies are crucial for education, not just for us to use in our classes, but for the public and the participants. I call upon my peers and mentors in the avalanche forecasting field to speak out formally in your forecasts, call out your constituency as did Dudley Improta of the Missoula Avalanche Forecast Center in this forecast:



**Monday February 20, 2012:**

### Sidecountry Ramblings

It's time for my mid-winter rant about backcountry (I should say sidecountry) behavior. I was inspired Saturday when I watch three people ski an avalanche chute just outside the Snowbowl boundary together...at the same time. This particular slope had a large skier-triggered avalanche on it this year. I doubt these three riders read the avalanche advisory, so I'm aiming my comments at Snowbowl parents who may have kids, teenagers or older, ducking the ropes or skiing out-of-bounds. Once you leave the ski area, you're on your own. The areas just outside the ropes are backcountry. There is no slope management or patrol. You should be prepared to deal with a burial or trauma. It would be a major operation to extract someone from the Rankin Lake basin just outside Snowbowl. Folks are treating this terrain as part of the ski area. It's not. Do you think people who would ski three at a time down an avalanche chute know when the snow is stable and when it isn't? Everyone wants to ski the gnarly terrain; the sidecountry is popular. Have you talked to your kids about drugs, avalanches, and skiing out-of-bounds?

I also call on us as a varied community of avalanche professionals to think critically and speak fairly in informal settings as well. Craft a post for a forum, a response to a blog. Talk to folks you might not otherwise at the trailhead, share conditions reports, reach out to help educate the ripper kids, take them on a tour with you. Step up as a leader in your community.

### Conclusion

So, after almost two months, did we make the right calls or did we get away with it? I think some of both, this time. But all of us make mistakes, enter crisis from time to time. Often the true test – the measure of character, individually and as a community – comes after the event. The real questions revolve around how we handled crisis and its aftermath. Have we assimilated the lessons into our practice, owned our actions, handled ourselves with grace?

*Lynne Wolfe has been skiing on and around Teton Pass since 1981. During the winters she teaches avalanche courses for AAI and other local course providers; ski guides for Rendezvous Ski Tours at their Teton yurt system, on the pass and Grand Teton National Park; and in her spare time is the editor of The Avalanche Review.* ❄️

In this photo you can see that the final two phases were characteristic of wet debris. The last wave carved a smooth trench in the preceding wall of quickly hardening snow. Here, Trevor Deighton and Maya explore the runout of the poop chute. The avalanche has been characterized as HS-AS-R4-D3.5-G1 *Photo by Kevin Emery, www.lifeisfly.com*

## Teton Pass Community

*The following was a letter to the editor of the Jackson Hole News & Guide from Jay Pistono, reprinted by permission of Jay and Friends of Pathways*

Since the avalanche on Taylor Mountain on January 24, I have been overloaded with comments about it while on the pass and from the community in general. If I thought the avalanche on Taylor was confined to affecting only that area or only that individual I could almost walk away from the discussion, but the issues reach far beyond Taylor, and some of the attitudes surrounding the incident deserve attention. My approach includes our freedoms and taking responsibility for our own actions. Living our lives while doing our best not to mess with others works in general, and I believe this idea relates to this incident.

If we cherish those freedoms, we have to govern ourselves or we will almost always put the decision regarding those choices in someone else's hands. Some people have said, "Nothing happened, so why talk about it?" Well something *did* happen, and now we have the chance to discuss it and deal with it on our terms – a different outcome might not allow us this chance.

I imagined the avalanche would humble us as a group and the majority of us, if not all of us, would walk away realizing that we were granted a stroke of luck and a chance to learn. In conversations in the days following I gathered some of that attitude but plenty of other points of view too. As Pass Ambassador I want you to be able to do what you want, but when it comes to endangering other people's experience I believe we need to draw a line.

Regarding the slide, it was admitted that it was a mistake. I don't want to speak for the specific people involved, but I believe it was a mistake that we can and should learn from.

I know this isn't a ski magazine, but some of what I've heard and the behaviors surrounding those conversations could affect people far outside the ski community. No reason allows one to ski or "test" a run that has a good chance of affecting someone below. Remember it is just skiing – we don't *need* to ski that line, and we don't have a *right* to ski that line. Sometimes we can guarantee that no one is below us. When we can't be sure, we should do our best, and if our best tells us that it's on the wrong side of certainty, then move on, there are other choices.

There are legalities of such decisions, but with so many variables I don't wish to argue the details. Suffice it to say that if one or more people were killed based on your decision, there would be legal trouble. But more importantly, how would you feel?

Let's review the numbers on Teton Pass. There are 60-70,000 backcountry runs made per year, many of those by locals. If the average skier is sporting \$4000 worth of gear, pass skiers are an important economic force in our community. Incidentally, those runs don't include those originating from the Coal Creek, Phillips, or Oliver parking lots, which would multiply the numbers.

Now, let's throw the road into the mix. Approximately 5000 vehicles travel over Teton Pass daily, and those drivers do not take into account that we could be skiing above them. Those people should never become victims of our ski day. Sure, slides happen on their own, but WYDOT does their absolute best to prevent that. Shouldn't we skiers demand the same of ourselves? ❄️



# January Teton Storm & Avalanche Cycle



Above and left: Natural avalanches on the Beaver slide, west side of Teton Pass, become big piles that dwarf the WYDOT road-clearing machines. *Photos by Jamie Yount, avalanche technician for WYDOT*

Below: "Lucky Dog" on Wolf Mountain. Interesting that the largest, steepest slide path on the hill stayed intact, even after getting its legs cut out from underneath it. *Photo by Doug Workman*

For more about this storm cycle, see story and snow chart on page 26.







# Parting Shots & Short Sto



SILVERTON: David Lovejoy triggered this cutbank when his ski tip touched the snow on the uphill side of the road. Things have simmered down some, but skier triggered slides are still likely on anything above 35 degrees. See story about this day on page 33. *Photo by Billy Mason, January 2012*

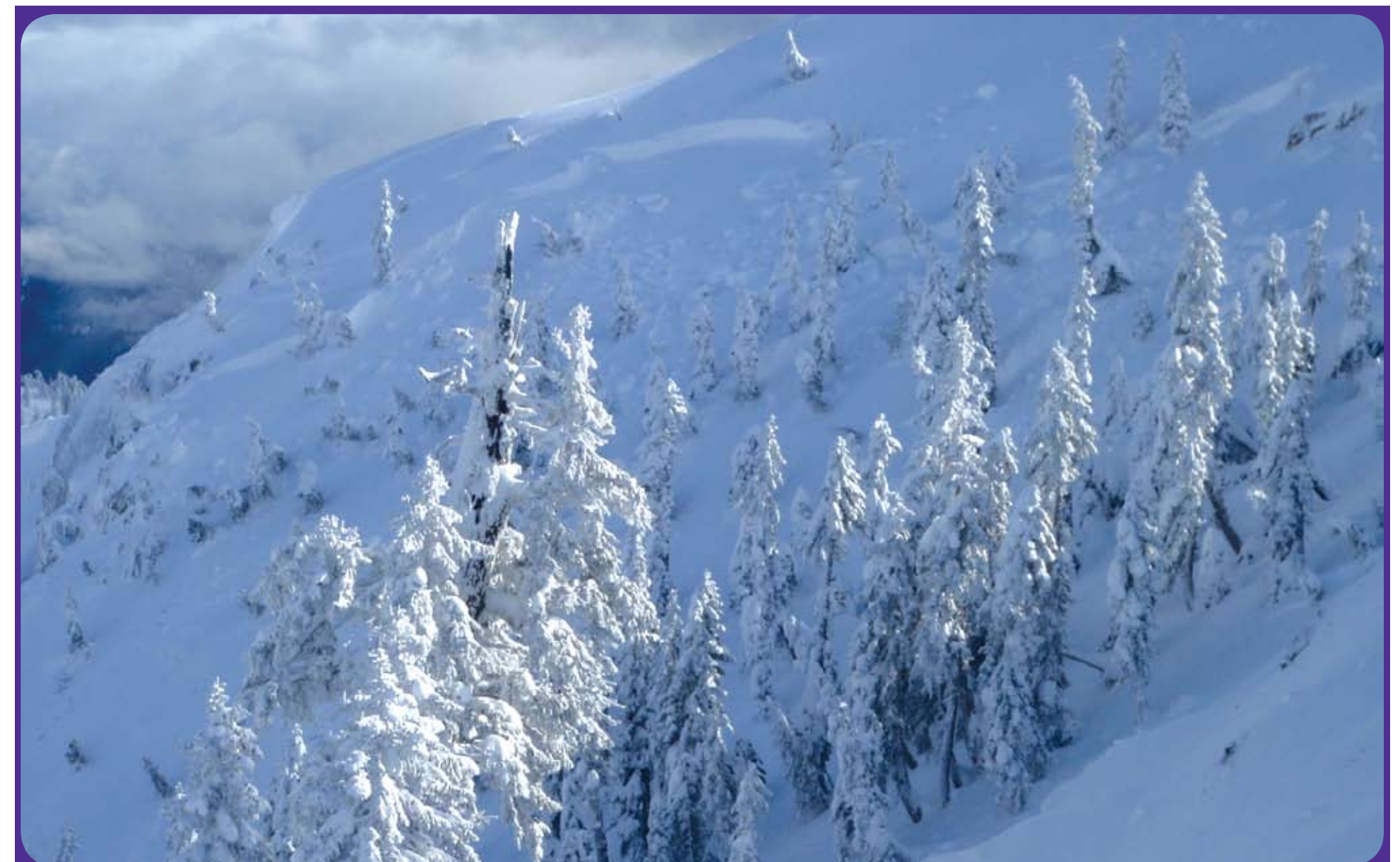




TELLURIDE: We remotely triggered this avalanche with a L2 class from .30mi away (at 11300', crown around 11800'). 20120211 1130 north aspect SS-ASr-R3-D3-O/G ~500"x500"x 2-4" crown. Initiated a major collapse on small test slope, with visible cracks that travelled around small lake, and up north-facing slope. The photo sequence captured it. Crazy. Everyone is pointing to the small convexity that failed from initial collapse nearby...with the big avalanche just getting rolling above, unnoticed for another few seconds. Too much hang fire to investigate crown. However, later in the day as the light changed, we could see a faint yellow/brown dust layer on patchy bed surface. After an afternoon of many test pits on the bulge in the middle of the basin with ZERO noteworthy results with ECTs, PSTs, RBs. On the way out, Peter Inglis and I stopped to dig a pit at the location where we originally initiated the collapse. We found extremely weak facets sized 5-6mm below a knife-hard faceting melt freeze crust, with hints of the yellow/brown dust layer, and 3-4mm striated facets above the crust. Performed several stability tests, CT, PST. Results with the CT were CT12 Q1 SC (sudden collapse). Results with the 2 PSTs performed were identical. PST 40/100 (End) just above that stout melt freeze crust.

*Photos by Ian Havlick*

## ories from Winter 2011/12



SHASTA from Nick Meyers: Multiple (three off middle peak, two on steep aspects and rollovers below Heart Lake) natural avalanches on NE aspect above Castle Lake occurred late in the storm. Size R2D2 or 3. Blocky and cohesive debris from a wind-affected slab. Crown depth 24-40" deep. Failure on facets located above the crust, about .5-1" of facets on an east-facing crown. Appear to have failed during the storm with strong windloading from the SW winds. At least one slide appeared triggered by a cornice collapse.

*Photo by Kai Allen, mid-January 2012*



## decision·making



Another view of the Snake River Range, Idaho/Wyoming border ski shot called "New Years." The slide on the left, HS-AE-D3/R3-G/I, was triggered with a 4# charge just after the January 18-20 natural avalanche cycle. The ski tracks in the photo trace a 30-degree ridge between the two paths (see related story on page 17). *Photo by Doug Workman*

### SKIING IN CONSIDERABLE HAZARD

story by *Charlie Ziskin, continued from cover*

#### The Process is the Point

The process is the point...and the process is the challenge. I challenge myself to learn something about the snow every time I am out, and I challenge myself to manage my own decisions and participate in group dynamics in such a way that we all come to agreement about decisions and work as a team to engage this process. It isn't about deciding on a goal and going out to ski it in a particular set of conditions. It's more about having an idea and finding out whether or not the conditions will support it. If conditions do support our idea, we might ski a particular line. And if they don't support it, we hope to be able to recognize that and choose to ski a different line with a lesser exposure to the danger. As Lynne Wolfe has said, it isn't about do we go or not, it's about where we go.

We pay close attention to the snowpack in every possible way every step of the way. We know our locales. Colorado might seem like a big place, and it is. But the places where we ski are not as many as some might expect. We gain an intimate knowledge of local conditions in these places as we return to them often. We not only follow the CAIC forecasts and reports, we also make our own detailed observations, which often add nuance and insight to the general nature of the forecasts. We parse this information through ongoing discussions throughout the tour. I want to communicate every little thing I observe, but I do balance and prioritize that so my partners don't have to decipher my non-stop stream of consciousness. If I really think it's important, I don't hesitate to mention it. Naturally, larger groups present greater communication and other challenges.

We've all heard the rhetorical question, "Would you go into a bar if you knew there was a considerable chance of getting shot?" Honestly, I don't think this question adds much value to my decision-making process. That's because if I do ascribe to that, I simply would never ski in Considerable conditions. My decision is already made at that point. It is my nature that I do want to go out, and I do poke around to see what will happen. I want to know about conditions even on slopes that I will not ski. If I can't get anything else, I want to know something of the character of the surface layers. I can often find a little bit of that something without even touching the snow directly just by tossing a few rocks around at the slope and watching what happens when they hit the snow. Do they bounce off and skip away down the slope? Do they punch in a little bit? Do they disappear without making the slightest disturbance? The answers to these kinds of tests and questions tell me something. Not everything, but they do provide useful information that I store and retrieve as if my brain were a relational database. All that I've ever experienced in the mountains and in the snow is available for

retrieval and analysis against new information. The experience of backcountry skiing is that vivid. I have skied a lot of days in my lifetime, and I remember them with surprising facility.

Likewise, poking around in the snow on different slope angles and aspects; ski cutting some; thinking about deposition patterns with respect to wind; looking at how the terrain interacts with the wind to create different patterns of deposition; feeling the texture of the snow at various depths with a pole, with my hands, with my skis – all these things give me information I can use in combination with other information I may get from digging a study pit, or just a hand pit. I register everything I experience against what I also know happens historically, not only in this season, but in seasons past. Yet I neither expect nor am I looking for 100% certainty in anything. I do want to know as much as I can about what I am dealing with so I can then make detailed tactical decisions within my overall strategy, which is to learn what I can and test my skills without taking what I decide are unreasonable risks for me and my partners. Again, I want our decision to be about where to go, not whether to go.

#### Defining Acceptable Risk

There is a lot of discussion after accidents about risk tolerance. So what is an acceptable versus an unacceptable risk? I long ago realized that a precise answer to this is beyond my reach. My behavior in the mountains is situational. I might ski a line today that I wouldn't ski tomorrow, even though the conditions may only be marginally different because I know that marginal difference can be highly significant. And the difference between this 38-degree northeast-facing slope and the adjacent 33-degree north-facing slope (just for example) is one I am intensely curious to know.

But it's a lot more than just the slope angles, of course. We talk in detail around exactly how and where we are going to put our tracks on a slope. I look for tiny terrain features that give me a clue about how and where an avalanche might break and run. I pick lines that stay clear of those slopes that are defined by objects near the surface where the slope angles increase. I pay close attention to subtle changes in the shape of the terrain. I tend to be pretty inclusive, allowing new people to join my groups. But I check people out first. Skiers who often fall on their first turn in steep terrain, or who can't visualize a line and then ski it, or who consistently make poor route-finding decisions will be coached gently but firmly that maybe they are not ready for this activity. We talk about all these things too. A big part of managing the risk is being in complete control at all times. A good decision doesn't mean much if you can't execute it accurately.

It does take a long time to learn not only what information to look for, but also how to integrate it all in a way that helps one to use all these details appropriately



# RISK TOLERANCE

## Margaret Wheeler Tackles Tough Questions

Story by Margaret Wheeler



Some risks are easier to perceive than others. Crossing Commonwealth Creek, Snoqualmie Pass, Washington. Photo by Margaret Wheeler

and not fall into heuristic traps or hubristic folly. It's a fine line. But I am comfortable walking it. I know a lot of other people who are as well. No two have exactly the same tolerance of the inherent uncertainties, but that's why we respect and communicate with each other. I will ask, "Is everybody comfortable with this decision?" And if somebody says no, we will discuss it further. But with respect for the individual, one thing we have to agree upon up front is that one person's discomfort may change the decision we make together about where we are going to ski.

### The Bottom Line

The bottom line is that uncertainty cuts both ways. The forecast is by necessity a generalization that incorporates variability across the region. The areas they cover are large and the patterns of snow deposition and evolution of a snowpack are minute. The CAIC Front Range forecast covers an area from Pikes Peak to the Wyoming state line. We find even more variability in a narrow strip from the Continental Divide in the west to generally much drier locations just a few miles east of there. Elevations range from 8,000' to over 14,000'. We observe the crazy effects wind has on both the deposition and erosion of snow. We always know what the forecast is. But we also know that within this region of extremes, there are places that may be more dangerous than the forecast and other places that are less so. The key – and it is not something you can learn in a Level I class but rather something that takes many years of paying close attention – is to learn how to recognize the patterns of instability, apply current and historical knowledge to those, and then decide precisely how we are going to interact with the terrain to learn and obtain the best skiing experience we can within the boundaries of uncertainty that the environment is providing us right now.

Charlie Ziskin is a backcountry skier and former avalanche researcher who works as an instructional designer. It has been 50 years since he made his first turns at age five under the watchful eyes of an ancient Austrian gentleman named Amos at a little ski area called Silver Bells at Wells. Charlie studied climate and oceanography at the University of Colorado in Boulder and was a Japan Ministry of Education Mombusho Scholar at Hokkaido University's Institute of Low Temperature Science. While studying the snow climates of Hokkaido, he worked with Eizi Akitaya, Mikio Abe, Yuichiro Miura, and the late Takuya Fukuzawa to found the first public avalanche education program in Hokkaido. He was an invited guest instructor at avalanche clinics in other parts of Japan. For the last 20 years, Charlie has been designing robust and transformative learning experiences for organizations around the globe. He is interested in how the skills we use for dealing with uncertainty in the mountain environment can help us as well when dealing with ambiguity in business and in life. ❄️



### What is your risk tolerance personally and institutionally?

#### Personally...Begin first with the general:

It seems to me that a discussion of risk tolerance has to include the ideas of perceived vs. actual risk exposure. Imagine a situation where someone's personal risk tolerance is low, and his or her perceived risk exposure is low – but his or her actual risk exposure is high. A low risk tolerance can be skewed by an offset in perceived risk so that a gap between perceived and actual risk means that this person's risk exposure is skewed higher than they realize.

Closing the gap between perceived and actual risk is one of the desired outcomes of avalanche education for both recreationists and professionals. This idea logically assumes that if people understand the amount of risk they are actually exposed to, they will make different decisions. Further, we have seen that one of the outcomes of the human factor (and human error) is that emotional reactions or desires can override the awareness of risk and consequence.

I think this situation probably applies to all of us in some degree or another. Do we truly "accept" the risks we are taking? I'm not so sure we do – rather, I think we have lapses in perception that disconnect us from understanding consequence. Perceived vs actual risk is related to the ideas of likelihood (What are the chances something will avalanche?) and consequence (What will happen if it does?), but most particularly the idea of consequence. Human factors and errors in perception – as well as our own desire NOT to see or think about what could happen – all work to blind us to consequence, and therefore to skew our risk perception.

#### From the general to the personal:

I have (I think) a conservative approach to risk in both my personal and my professional decision-making. My goal is to build in a buffer, a margin of safety, as a way to manage uncertainty. This is due to two convictions:

1. I have a general perception that when folks "hang it out there" in the mountains, they are most likely coming through unscathed due to luck and skill, but that luck figures in more prominently than they realize/acknowledge. Hence my increasing hesitation to hang it out there in my personal risk tolerance.
2. My current opinion is that we humans are not very accurate in our perception of risks. We can work very hard (and do, particularly in a professional context) to increase our accuracy of perceived vs. actual risks, but we have to accept that we will never fully know.

I use this idea of inaccuracy as one of my basic operating assumptions, and consequently build in a greater margin in my risk management. Engineers call it a safety factor: you double and triple check the calculations you make about how strong a piece of material or a widget will be, but in the end you multiply your results by some number to allow for unforeseen errors. The more complex the situation, the greater the uncertainty, the higher the consequence...the higher the number. As time goes by, and as my professional life shows me a longer and longer list of consequences, I can see and feel my safety factor number getting higher.

Consider the following example. As a ski bum in Chamonix I was the classic profile: enough skill to get myself into high-risk terrain, but without an accurate understanding of my own risk exposure. What kept me out of trouble was probably a combination of situational awareness and some level of risk aversion. For example, after a big storm I wasn't the one hanging it out there on the big lines – I would wait until other people had skied them first (!), give it some time to get the scoop on the conditions, and then decide. Further, I grew up skiing in NH and had very little experience with the high mountain environment. I was relying on the knowledge and experience of the people I was skiing with – which was pretty good. BUT, my risk perception of the environment we were skiing in was probably not very accurate, and I think this is where I was most exposed without knowing it. My safety factor was  $N = 1$ .

### Institutionally?

In the guiding context we have the built-in conflicting dynamic of a higher risk exposure and the need for a decreased risk tolerance. The higher risk exposure comes from the environment we work in, and the need for a decreased risk tolerance is because we take on a higher level of responsibility for our clients than we would in a non-guided group.

There are several other factors that figure into the landscape. For example, the nature of the trip and the environment can bring with it different levels of risk exposure – consider the inherent risks of an introductory rock climbing course at a sport crag vs. a guided trip to a Himalayan peak.

It is also important that clients understand that they themselves are taking on some risk. It is my professional obligation to manage and minimize risk, but also to inform them that I cannot control the environment, and I cannot remove all risk.

Yet at its core, I think that the professional guided context requires a safety factor greater than  $N = 1$ . This factor is our means to manage uncertainty in a high-risk environment where we have responsibility for other people.

As guides, we are continuously striking a balance between maximizing our clients' reward and managing risk. Teaching guides to manage these points is one of the central challenges of guides' education. It is also coming into focus as one of the most valuable forms of continuing professional development as guides build on more experience to the foundation of their training and certification.

There are loads of resources out there to build tools and techniques to deal with human desires and errors. Operational risk management, systems approaches... the aviation, medical, and financial sectors have a lot to offer. But I think that our mountain community has some real opportunity here as well.

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On a Level 3 AIARE course at Red Mountain Pass north of Silverton, CO, participants share observations and choose terrain appropriate for conditions. Story co-author Colin Zacharias leads the group (at left, pointing pole). Photo by Tom Murphy

## MANAGING RISK on Avalanche Courses: AIARE Perspective

Story by Tom Murphy and Colin Zacharias

Knowledge of avalanches, guiding, and teaching compose the foundation of a professional avalanche instructor. For both the person and the profession, this foundation is rooted in the practice of risk assessment and risk management.

Avalanche course providers and instructors embrace those elements and hopefully, encourage effective risk management methods that are recognized and practiced by both peer and profession.

The American Institute for Avalanche Research and Education (AIARE) provides course materials, instructor training, and continuing professional development (CPD) for avalanche course providers in the US. As part of the curriculum a risk management plan is promoted. During the AIARE Instructor Training Courses (ITCs) the risk management dialog begins with a discussion of personal vs. professional risk acceptance. Theoretically each individual operates within an acceptable risk band that contrasts risk and opportunity. If the risk is too low there is missed opportunity and lessened experience. And, if the risk is too high there is consequence including injury, disability, loss of career or loss of life. The person engaging in the activity, and often, his community of peers, defines the theoretical parameters of the personal risk acceptance model.

The professional circumstance is different by degree. The stakes are arguably higher, the transparency of process clearer by necessity, and the operational methods of risk assessment and mitigation well documented and transferable between industries (For example the fact that pilots use checklists to ensure hazard factors are discussed prior to action does apply to the instructor assessing avalanche hazard). The consequences of avalanches in professional circumstances may include the cost of life and limb, the cost to materials (highways, building, lifts), and the protracted cost of the liability for those elements at risk. All of a sudden the risk is transferable to beyond the person, his family and friends. The risk is transferable to the company the instructor works for; its legal, financial, and insuring agents.

During instructor training instructors are encouraged to philosophically review their personal risk acceptance and personal motivation for traveling in hazardous terrain. The struggle can be palpable and the self-induced pressures real. There is pressure to ensure a value added experience: to get a few good turns, to combine big mountain terrain travel with avalanche learning. Who among us doesn't want to do that and who doesn't want to show their course participants a good time in the backcountry?

It's old news that human factors and perception play a significant role in our ability to assess conditions, forecast hazard, and manage risk. Common mitigation themes include small team decision processes with clear rules of engagement and effective communication, structured training and education, and preparation and planning. Most "check and balance" solutions employ checklists to support field decisions and mitigate human factors that may negatively affect decisions. Risk Management practices are detailed in a risk management strategy.

- AIARE strongly recommends each provider detail their operational strategy in a written Risk Management Plan.

The successful plan can employ a simple terrain use strategy. One overarching theme is repeated: on instructional days where we travel through potential avalanche terrain, AIARE instructors look at proposed terrain through the student's eye.

- Don't take students into terrain they will not be able to manage (without an instructor) on their own, once the course is completed.

Many students will return with friends to the same course location and terrain. They often repeat the now familiar tour – and likely in different conditions. If you are taking students into terrain where the decisions requires your expertise, requires you to lead through the terrain, or requires you to "thread the needle," you may be doing your student's a disservice. While modeling is often the best instructional method, and the essence of all terrain instruction, the student benefit comes from the instructor modeling in "student-led terrain". Terrain that the students can also manage themselves-- with coaching from the instructor. The risk benefit includes safer terrain margins and likely safer post course student practice.

The big picture obviously includes a venue with terrain varied enough for daily terrain choices appropriate to conditions and the avalanche problem. As the devil is in the detail below are a few general recommendations to include in the Risk Management Plan:

### Course Operating Area

- Terrain options suitable for each day's activities determined prior to course start
- Terrain options are pre-viewed and discussed in pre-season staff training.
- Terrain photos and quality topographic maps available for pre-course trip discussions.
- Communications plan established

- Rescue plan created specific to course operating area and includes outside agency response options.

### Hazard Management and Course Operations

- Pre-course student logistics information that details expectations: the physical requirement, a time plan/agenda, and a skill/knowledge prerequisite.
- Pre-course Instructor Meeting. At least one day prior to the course start review:
  - Student resume and skill/experience
  - Instructor review and documentation of current and forecast wx, snow conditions, stability/hazard and avalanche conditions.
  - Each day's learning objectives and proposed terrain use.
  - Each instructor takes terrain options that have been previously agreed upon by all instructors during the pre-trip instructor meeting. Alternatively, chosen in the field during a face-to-face instructor meeting. Each student should have a "voice" and a "veto" on each day's terrain choice. This includes the skiing of "new" or previously unfamiliar terrain as chosen for course use.
- Instructors follow the same procedures for daily risk management that is taught and demonstrated to students. This includes a daily trip plan (use of the AIARE field book "Trip Plan" page) that is essentially a pre-trip risk forecast. This is one of the tools the student takes with them. After the course they can rely on it to continue the process for managing their risk in avalanche terrain.
- Rescue response briefing. Each student must participate in a rescue response briefing prior to the first field trip. This includes communication plan (radio, cell) with list of frequencies or phone numbers, and action response plan.

Of utmost consideration is the involvement of operations management/ownership during pre-course training, planning, and documentation. Those who steer the operation practices and purse strings need to be present to support the process of understanding, assessing and treating the daily avalanche risk. This ensures the intent to keep, not kibosh, best practices implemented by those most at risk.

### Summary

- While the complexities of risk assessment and risk management are profound – given the fickle nature

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# A CULTURE OF EXPLORATION

## Reflections on Risk Perception & Tolerance

Story by Jaime Musnicki

Sunshine greeted us as we crested the knife-edge north ridge of Mount Queen Bess deep in the heart of the Coast Range of British Columbia. We were two instructors and three students having an adventure, out exploring for the sake of seeing where we could go and using our skills in the mountains. The weather had been perfect for the past three weeks of our month-long mountaineering course. This is not a common occurrence up on the Homathko Icefield. Our entire group of 15 was thrilled with our luck and psyched to take advantage of the good weather to explore an even more remote corner of the range on a five-day mini-expedition to Mount Queen Bess, a hulking granite buttress surrounded by glaciers. This unanticipated exploratory mission was a cool opportunity for our students to use their newly developed skills to plan and execute a fun, rarely explored side loop from our route traversing the Homathko Icefield. After three weeks in the mountains our students had demonstrated sufficient competence that we felt comfortable allowing them to plan and largely lead this mini-expedition on their own, with instructors acting as advisors, coaches, and mentors as needed. On this particular day, due to the steep technical nature of the snow and rock climbing, we, as instructors, were leading our attempt on Mount Queen Bess.

Weather luck always runs out eventually. That afternoon saw our group of five bailing off the breathtaking north ridge as a storm bore down upon us from the west. Rappel from the ridge and descend a 50-degree snow slope with running protection. Snow/sleet/rain mixture stings our faces. Rappel the bergshroud to murky whiteness on the glacier below. Rope stuck with darkness seeping through the white-out storm conditions. Beeline through whiteness across the glacier toward the invisible rocky spine of the west ridge, knowing that it'll be better to bivvy there, in the rocks, for the night than out in the middle of the snowy glacier.

We reach the rocks just as darkness truly settles on us for the night. It's a chilly night in a "puppy pile" for warmth, but we have water, a little food, and high spirits from the epic adventure of the day. The choice to bivvy is an easy one when faced with the alternative of navigating the icefall and heavy crevassing of the final two miles of glacier travel that separate us from our comrades back at camp. A basic likelihood and consequence assessment has led us to the conclusion that we will wait this one out until daylight arrives or the whiteout disappears. Around 2am the clouds that engulfed us have descended in the cooling night air to reveal a nearly full moon that illuminates our path across the glacier. We rouse ourselves and proceed under the moonlight back to camp, arriving just after four in the morning, exhausted and thrilled by the day's adventure.

### Managing Risk

In many respects, my personal awareness of risk and my risk tolerance have evolved in close conjunction, intertwined really, with my development as a NOLS instructor. Managing risk is what we do on a NOLS course, whether I'm skiing in the northern Tetons, mountaineering in the Waddington Range of BC, or rock climbing in Cochise Stronghold. Through professional and personal time in the mountains I have honed specific skills to manage risk, gained experience, and developed judgment. The risk-assessment tools I most frequently use are quite simple: weighing likelihood and consequence, acknowledging the number of "less than ideal" factors building up, identifying a situation's human factors, maintaining open lines of communication with my colleagues/partners, paying attention to my own desires and ego. I have also learned to strike a balance between giving my students freedom to develop their own judgment through experience, perhaps by making mistakes, and choosing to draw the line and step in when the lesson is not worth the associated risk.

Through much of my career in the mountains over the past 10 years, occasionally reflecting on my personal

risk tolerance versus my risk tolerance with students, I've frequently found myself thinking, "Well, I'm not going to do something on my own that I wouldn't feel comfortable doing with my students." In more recent years, however, I've found myself making more conservative decisions with my students than I may have made if I were on my own personal time with a competent partner. I'm not sure what has shifted in me. Perhaps, I am just becoming more aware of subtle differences in my professional versus personal risk tolerance levels, the weight of responsibility for other people leading me to choose a more conservative option. Perhaps my competence and skills as a skier, climber, and manager of risk have progressed far enough beyond those of my typical students that the difference between my competence and their competence is playing a larger role in what I'm willing to do. At the end of the day, I'd say that I want the same thing for myself and for my students – to enjoy the beauty and adventure of the mountains and to come home healthy and happy to ski or climb another day.

### Culture of Exploration

Last winter, in my dual roles as NOLS winter instructor and program supervisor, I was involved in planning and executing a new 10-day winter route in the north end of Grand Teton National Park. This route was specifically for our Winter Instructor Seminar (WIS), a training opportunity for existing instructors to further develop winter camping and backcountry skiing skills. The ultimate goal of this annual seminar is to assess instructors as competent to work winter backcountry skiing courses for the school. One innate challenge on instructor seminars is finding a balance between providing opportunities for aspiring instructors to make decisions with real consequences and operating within/setting an example of acceptable levels of risk in an institutional setting. This new route development process involved great learning for me, especially in the realm of crossover between personal and institutional risk tolerance, and how institutional risk tolerance can vary between individuals within the same organization.

As I considered the fortuitous opportunity to pioneer a new seminar route in the northern Tetons, explore an area of the Park new to me, expand the terrain options of our winter program, and get paid all at the same time, I was excited. The set up seemed perfect. My experience, as a mountaineer for NOLS and personally, has allowed me copious opportunity to explore areas that are new and unknown to me – and sometimes areas that are just largely new and unknown, period. Exploration has become, without me consciously realizing it, a commonly accepted form of risk for me in both my professional and personal worlds. It is a piece of what I do and love about working for NOLS, this opportunity to take my technical and leadership skills and apply them in a completely new geographic region. I seek out exploratory routes and opportunities, embrace the thrill of the unknown, and trust that my skills will allow me to figure it out and manage risk appropriately as I go.

I soon met the reality that apparently not everyone saw the situation through the same lens. I was faced with questions of feasibility and appropriateness of this new route from my winter program colleagues. I was asked to do further research on exactly what



Jaime Musnicki on Mount Queen Bess in British Columbia. Photo courtesy Jaime Musnicki



Students on Mount Queen Bess. Photo by Jaime Musnicki

the terrain would look like where we were going. My approach of looking over the topo maps and getting a general impression that the route "looked fully doable" and "seemed to provide great variety of terrain and options" wasn't making the cut for approval of this new route.

My initial response to this questioning was to take it personally and a bit indignantly: "Didn't these people trust me, my experience, and my judgment? This is what I do at NOLS, I explore." (Clearly, I could write a whole different piece for TAR on the subtle and not-so-subtle interplay of my own ego and risk tolerance!) However, this reaction really didn't accomplish much, so with some gentle coaching and prodding from one of my colleagues, I went back to work gathering more information to support my case for this new route as a great opportunity for the NOLS winter program. I talked with local experts who had skied in the proposed area before. I looked at maps and GoogleEarth with current and former NOLS instructors who had been around NOLS and the winter world in the Tetons for much longer than I had. I read about the area in Tom Turiano's, *Teton Skiing: A History and Guide to the Teton Range*. I talked with park rangers. I went and personally scouted the crossing at the north end of Jackson Lake to access the route. I identified specific sections of the route that I thought would be cruxes and outlined different options for handling them (including turning back around). I sought to draw concrete comparisons between the terrain on my proposed route and the terrain on some of our know winter routes.

In the end everyone got onboard with this new route. I had done my homework and, for this reason, was even better prepared to work the seminar than I had been previously. Our WIS set off into the field and had a great 10 days of exploring and learning that proved to be an excellent and appropriate training opportunity for our aspiring winter instructors. The terrain surrounding Berry and Owl Creek drainages provided sections of tricky group management and "real" decision-making opportunities appropriate for challenging participants and seminar instructors alike in their risk assessment and management. In addition to growing my bank account of experience exploring and managing risk in new and relatively unknown terrain in the winter, I learned that even within the same organization, individuals can have vastly different risk tolerance levels based upon their varying professional and personal backgrounds. This is food for thought and good perspective as I continue in my various roles as NOLS field instructor, program supervisor, and personal adventurer.

*Jaime Musnicki has worked for NOLS for the past nine years and lives in Victor, ID. She is a field instructor who teaches backcountry skiing, avalanche, mountaineering, and rock climbing courses. For the past three winters she has helped run the NOLS winter program in Teton Valley. These days Jaime spends time mentoring and training staff in the mountaineering and winter programs. She likes skiing with her friends' dogs, especially the Goose.* ❄️



## AVY COURSE RISK

continued from page 22

of the avalanche phenomena – the solution begins with the choice of appropriate “teachable terrain.”

- The terrain in which the student learns best about avalanches and own limitations is terrain that they are able to manage. In this terrain the student can identify hazardous terrain, imagine consequence, create options, and importantly choose and act upon safer decisions.
- Quality learning often takes place in a low stress environment. During a student led activity, the worst modeling occurs when the instructor takes over the lead to reduce the likelihood of incident. The best modeling occurs in terrain where the student can see themselves, on their own, doing what the instructor is doing, and managing the same terrain. The instructor can model the student’s terrain choice with appropriate group management, travel techniques, and good communication.
- Each operation has a risk management plan that is reviewed and implemented by both management and employee. The plan includes pre-season instructor training and pre-course instructor meeting.
- All terrain choices are pre-discussed by the group of instructors. All terrain decisions are made using consensus. Everyone has a voice, and anyone has a veto.

These practices need not be onerous or impractical. The examples cited above are easy to execute and certainly can be expanded upon. These procedures should be transparent and shown to our students in an effort to show them the concern for group safety. After all, managing risk is a big part of what we’re teaching and what they’ll be expected to do for themselves after leaving the course.

Tom Murphy is the operations director for AIARE. He lived and worked in Alaska for 20 years building and operating the Hatcher Pass Lodge. He currently resides in Gunnison, CO. His claim to fame is having a letter to the editor in the first issue of TAR.



Colin Zacharias has worked in the avalanche and ski guiding industry since 1980 and is a certified ACMG Mountain Guide. His avalanche work included ski areas and highways before switching to full time ski guiding for CMH in the late '80s. After 10 years of heliskiing Colin transferred his focus to mountain guiding, avalanche education, guide training, and operational consulting and serving a post as the ACMG technical director. Currently, Colin is a CAA Professional Member and ITP Level 2 professional training program course leader. Since 2003 Colin has served as AIARE’s technical director, advising on curriculum development for both course content/materials and Instructor Training. As a mountain safety specialist a portion of each winter is dedicated to consulting for heli and snowcat operations in both Canada and the US. Outside of the avalanche world Colin still guides private clients in the mountains and is employed in mountain safety for the odd film and television project. In this employ, work has taken him to Argentina, New Zealand, Borneo, Fiji; and most recently a third trip to his favorite country Morocco. Colin frequently travels and works with his wife, Julia Taffe, who is every bit the adventurer as Colin, working as a stunt woman, aerial dancer, choreographer and founder of the contemporary and aerial dance group, Aeriosa Dance Society. ❄️



The last skin of the day on an AMGA Ski Guide Course, Snoqualmie Pass, WA.

Photo by Kris Erickson

## A GUIDE’S RISK TOLERANCE

continued from page 21

This past year I participated in – and then facilitated – several group sessions focused on risk management for guides and instructors. The result is a collection of factors that can skew decision-making in our professional lives. I am mid-project in developing this list of factors into a tool for reflection designed to identify patterns in our decision-making, and in linking this tool to some of the ideas offered by Daniel Kahneman in his book, *Thinking, Fast and Slow*. The exercise is called “Human Factors for Mountain Guides,” and the basic outline goes like this:

1. Reflect on days where you had a near miss, or finished the day with the perception that you were pushing it. Write down 1 - 3 of these; describe them in a few sentences.
2. Read through *Human Factors for Mountain Guides* (see next page).
3. Fill out the worksheet (a condensed summary of *Human Factors for Mountain Guides*, not included here) for each of your near-miss experiences, checking the boxes that enumerate factors you think might have applied on that day.
4. Use the worksheet to track your decision-making, with the goal of looking for patterns in your System 1 decision-making (see Kahneman).

### How do you manage students/clients and their desires in the field? Any tricks or tips?

It seems there are two types of groups: students, i.e., folks taking some kind of instructional class, and clients on a guided objective. Of these two, the instructional groups are often already focused on risk management as part of the course goals or curriculum, whether it is an AIARE L1 course or an introduction to backcountry skiing course. In this context it is easier to identify and manage people’s desires. Being in the mountain environment means that people are presented with actual hazards and potential rewards that drive decision-making. And a successful course environment makes it easier (and emotionally safer) for people to both express the emotions these hazards and rewards create, and to examine how they affect decision-making.

For guided objectives, managing people’s desires can be much harder – in fact, I see it as one of the central challenges of my job as mountain guide. At the root of the challenge are the contradictory forces of desire and risk, and as a guide I am charged with striking an appropriate balance between these. The decision-making is ongoing: navigation and route finding, managing people, evaluating weather and conditions...all these factors are woven into the complex issues of hazard assessment and management. The added pressure of managing desires is very often a powerful player, and the most difficult to control.

There are a myriad of ways to manage clients’ desires, but the bottom line driving my professional approach is this: *My clients are here (on this day, in these conditions) because they came here with me.* That means:

- It is my job to manage their risk better than they would have in the same place without me there.
- It is my responsibility to keep their risk exposure at a level that is acceptable to them AND to me.

To these ideas you can add the need for clear communication with clients of what the risks are for a given objective, and the ongoing assessment of my clients’ abilities and skills...on and on. And through it all, there is the clear and ongoing statement of goals for any given objective: “The goal is to get home safely.” It sounds obvious, but it is crucial to remind people whose emotions and desires may have internally overwritten this with, “The goal is to get to the top.”

### Yet, the issue is not all analytical...

A few years back I was watching the movie, *Steep*, with a group of friends and co-instructors at the AMGA. We watched Doug’s segment in silence, in awe of his skills and person, and in sadness. Folks who were sitting there who knew and loved and hung out with Doug had seen the movie before, and yet there we were...silenced in our daily bustle by the images of him discussing risk and consequences.

When the movie ended, I suddenly wondered if the people sitting in that room had somehow been marked. It seemed that they fully understood the risk and the potential for loss and consequence, and yet they went on living out their lives in the presence of this knowledge. I am still pondering if this is true: have we all been marked in this way? Or is that actually a more emotional way of expressing the basic idea: that we do not truly perceive the risks that we take?

### Resources

*The Black Swan: The Impact of the Highly Improbable*, Nassim Taleb, 2007  
*Heuristic Traps in Recreational Avalanche Accidents: Evidence and Implications*, Ian McCammon, 2004  
*The Better the Team, the Safer the World: Golden Rules for Group Interaction in High Risk Environment*, Gottlieb Daimler and Karl Benz Foundation, 2004  
*The Human Contribution*, James Reason, 2008  
*Safety at the Sharp End: A Guide to Non-technical Skills*, Rhona Flin, Paul O’Connor, Margaret Crichton, 2008  
*Mistakes were Made (But Not by Me)*, Carol Tavris & Elliot Aronson, 2008  
*Coaching the Alpha Male*, Kate Ludeman and Eddie Erlanson, *Harvard Business Review*  
*Influence: The Psychology of Persuasion*, Rober Cialdini, 2006  
*Predictably Irrational: The Hidden Forces that Shape Our Decisions*, Daniel Ariely, 2008  
*Thinking, Fast and Slow*, Daniel Kahneman, 2011  
*The Checklist Manifesto*, Atul Ghwande  
*Emotional Intelligence*, Daniel Goleman



Margaret Wheeler is a ski, alpine, and rock climbing guide who has led trips throughout Europe and North America. An active member of the guiding community, she is an instructor of guide training for the American Mountain Guides Association (AMGA) and serves

on its board of directors and as president of the organization. She is involved in avalanche education through her work as an AIARE (American Institute for Avalanche Research and Education) instructor and trainer. In the development of her ski mountaineering career, Margaret has been a member of several women’s expeditions pioneering first ski descents in India and the Altai Mountains of Mongolia. In 2006, she became the second woman in the United States to complete her international IFMGA/UIAGM guide certification. Margaret is co-author of the book, “Backcountry Skiing: Skills for Ski Touring and Ski Mountaineering.” She holds a bachelors degree in history from Dartmouth College and a masters in mechanical engineering from the University of Washington. ❄️



# HUMAN FACTORS FOR MOUNTAIN GUIDES

## Compiled from Clinics at the AMGA Annual Meeting Clinic, October 2011

Draft Summary by Margaret Wheeler

### Results of the Group Brainstorm

In groups of three or four, guides and instructors worked together as a group to generate answers to the following question: *What pressures have you experienced in your decision-making as a mountain guide?* Answers from two different group sessions were combined and reorganized from the original brainstorm list into the following multiple categories. Going forward, the goal is to use these categories to build a tool for near-miss analysis.

### Type 1: Pressures Created by our Relationships and Group Dynamics

#### Pressures created by dynamics outside of the group

1. *Influence of guided groups.* Pressure from other guided groups/parties. Competition between companies.
2. *Influence of non-guided groups.* Pressure from recreational parties: client says, "They went up, why didn't we?" Influence from recreational parties: "bad examples."
3. *Competition for resource.* Resource scarcity: "We gotta get to the climb first," rush to set up or take down ropes, first tracks, first to base of the route.

#### Pressures created by dynamics within the group

1. *Diverging client expectations.* Diverging expectations within the group of clients.
2. *Diverging client abilities/fitness.* Diverging physical or technical abilities within the group of clients.
3. *Client-client pressures.* Guests put pressure on each other based on differing abilities and agendas. Differences in client skill sets when they know each other: "She'll be fine," "He's OK, it's good for him."
4. *Problems with age or gender differences* – guide/client, guide/guide, client/client.
5. *Guide-guide communication breakdown.* Lack of communication with other guides. The expert halo limits inter-guide communication (guides don't speak up because they don't want to offend peers/other professional). Or a fellow guide is a rock star/has a high reputation. Hesitation to take the lead results in a leaderless group.

#### Pressures from our clients' abilities (physical and technical)

1. *Clients push themselves too far.* Client is tired/exhausted, and we're far from home. Client is physically pushing it: exhausted, or hasn't had enough food/water. We are guiding clients while they are not feeling well.
2. *Client is not fit for the objective* – does not have the fitness or technical ability needed. Skill set of clients is not adequate, but group is already committed, already on a route/mountain.
3. *Lack of proper equipment.* Client is not prepared with proper equipment – you arrive at a climb/trailhead, and client does not have the appropriate gear.

#### Pressures from clients' mental/emotional dynamic

1. *Client lack of self awareness* – technical, physical, emotional
  - Pressure from clients who want to "bite off more than they can chew."
  - Client expectations are unreasonable given their skill set.
  - Client pushes guide for harder routes vs what the client really needs or is able to do.
  - Client doesn't actually know what he/she wants from the trip
2. *Lack of respect for guide.* Clients lack respect for the judgment of guides. Client thinks they "don't need a guide." Clients will not follow guides directions for technical, movement, or self-care.
3. *Poor personal skills.* Clients are aggressive or unpleasant. Clients are poor communicators.

#### Pressures created by our clients' expectations

1. *Client responsibility vs guide responsibility.* Clients misunderstand the role and reason for hiring a guide. Lack of awareness or clarification by the office (or the guide). Client wants to see the guide climb at his or her limit.
2. *Personal vs professional.* Clients fail to see the line/distinction between the personal and the professional relationship with their guide. Clients are always on vacation; guides are always working.
3. *Misunderstanding of financial obligations.* Unhappy client wants a refund if they don't achieve their objective. "I'm paying you to get me to the top." –Client, 2006.
4. *Limited window of possibility.* Client is going home tomorrow and therefore wants a particular objective regardless of existing conditions.

#### Pressures created by the guide

1. *Guide's desires overtake obligation to client.* Guide fails to remember that it's about the client, not about the guide.
2. *Guide's desire to deliver client reward.* Guide wants to give client reward. Guide wants to "push on" and finish the route for client in the face of weather/darkness coming on.
3. *Incorrect evaluation of client's abilities.* Guide's expectations of clients' performance are unreasonable or incorrect.

### Type 2: Pressures Created by Context – Social, Economic, Temporal

#### Pressures created by weather and conditions

1. *Limited weather window.* "Today is our weather window and we have to make the most of it."
2. *Dangerous or difficult conditions.* Weather and snow stability create conditions that make it difficult/dangerous to achieve objective.

#### Pressures created by financial exchange of hiring a guide

1. *Financial pressures direct technical/risk management.* Your decisions cost the company/your employer money. A trip has a higher ratio then it should because of the balance between running the trip and making money.
2. *Clients have committed money and/or time.* Commitment because of opportunity costs: clients have traveled long distance, paid a lot of money. Big summits or objectives mean more money has been paid. Greater expense = greater expectations.
3. *Client screening compromised by finances.* Client screening (by the office or the guide) is compromised by the desire to fill the trip/make money.
4. *Office pressure to deliver the product.* Guide feels pressure from the office to deliver the product.
5. *Financial/work scarcity creates burnout.* Guide takes work even though they are tired or burnt out. Guide takes too much work in busy season.
6. *Fear of competition.* Need to create repeat business: "If I don't get 'em to the top they will use a different guide next time."
7. *Tips are better with successful trips.*

#### Pressures created by trip structure

1. *Solo guiding.* Guide is working alone – has no backup if something goes wrong; no opinions from other sources.
2. *Lack of alternatives.* Guide has no alternative options – lack of a Plan B or an unsatisfactory Plan B.
3. *Language or cultural barriers.* Barriere Linguistic – language barrier makes communication more difficult.

#### Pressures created by our professional community

1. *Local ethics, protocols, or techniques.* "We do it this way," "You Americans and your safety."
2. *Value judgment based on technical level.* In our mountain cultures, climbing the big objective is often valued more than the quality of experience.
3. *Operational pressures* – must satisfy owner/employer
4. *Pressures from our peers.* Guide wants to have a good answer for, "What did you do today?" Desire to impress other guides. Pressure for consensus, or conflict with other guides.
5. *Pressures of time* – finishing in a reasonable time and conditions.

### Type 3: Pressures created internally, by the guide him/herself

#### Pressures created by the guide's physical, mental, emotional state

1. *Pressures from our home lives.* Guide feels responsibility to maintain home life and "bring home the bacon." Guide feels guilt at being gone a lot.
  - a. Guide is often away from home.
  - b. Financial pressures to support family.
  - c. Emotional pressures from family and relationships.
2. *Guide is hurting and clients are not.* Example: altitude sickness.
3. *Guides don't get sick days.* Guiding while not feeling great – pressure to perform physically and mentally despite your personal condition. "I am having an 'off day,' but I need to carry on anyway because I am the guide."
4. *Fatigue.* Guide is physically pushing it – not enough food or water, it's late in the day – guide is fatigued.

#### Pressures created by our ideas of self-worth

1. *Personal goals* – guide wants to summit or do first guided ascent.

2. *Ego/pride connected to day's outcome:* we want to "out guide" others. Desire for a perfect record/season (12 for 12 on the summit!).
3. *Seeking acceptance by peers and/or clients.* Trying to impress them.
4. *Competitiveness: guide wants to go fast* – be early back at camp or back at the hut. Fast for the sake of fast.
5. *Scarcity.* Want to get first tracks or be the first on a route.
6. *Errors.* Guide doesn't want to "look bad" – made an error and is trying to hide it.
7. *Guide fear of missing out.* Other guides are taking their clients to the top, so I don't want to miss out.
8. *Performance pressure and fear of failure.* "Self pressure." Guide feeling inadequate for the task; pressure to perform.
9. *Pressure to be professional.* "I'm supposed to know the answer."

#### Pressures from our own insecurities:

1. *Gender* – female guide/male clients; wanting to prove you are as strong a guide as your male peers.
2. *Age* – "I'm getting older, I need to do this now. I should be able to do x or y..."
3. *Being the greenhorn* – guide needs to prove him or herself. Pressure to move to quickly (as a guide) from learning to doing!
4. *Locality or culture* – "I'm not from here."

#### Pressures created by our guide-client relationship

1. *Pressure of good/return clients.* They have been out with you before. You want to provide "the goods" for a good group.
2. *Need to build/maintain reputation.* Pressure to provide great experience – to ensure reputation and repeat business.
3. *Difficulty saying no to clients.* Guide aims to please – fear of turning people down, fear of telling someone "no." Fear of client defeat.
4. *Feeling financially obligated to deliver.* Guide feels responsible because the client paid money to deliver the product!
5. *Desire for variety.* Guide wants to get a client into new terrain (even if client doesn't care either way).
6. *Desire for client progression.* Pressure to take clients (too) quickly through the transition from learning to doing. Pressure to assist client in achieving the guide-recommend goal.
7. *Multiple attempts on the same objective.* Client returning for the third time to the same objective.
8. *Emotional investment in clients.* Guide becomes emotionally invested in the client's experience.
9. *Guide burnout plus client scarcity.* "I need a rest day, but client only has today."
10. *Tips.* Working for the tip can create negative pressure!

#### "Reverse" Pressures

1. *Overconfidence/familiarity.*
2. *Routine – repeat objectives.*
3. *Over-reliance in equipment.* "Storm is coming but it's OK, I have a GPS" complacency (a reverse pressure?).

### Converging Factors: Multiple Challenges Ramp Up Pressure; Convergence of Challenges and/or Stresses

Concept: Taken alone, any one of the above factors may not be enough to derail a guide's good decision-making. But when there are more than one of these factors/pressures, convergence can occur. This is concurrent with our thinking about risk management and accident analysis.

- *Example 1:* Weather is deteriorating, but if we bail the clients will be unhappy and might ask for money back, especially if we get home early. But if we stick it out the consequences start going up.
- *Example 2:* As a business owner, weather and conditions lead to shutdown (example, day four of a heli-skiing week, and no one has skied yet).

Can you find a pattern? Use the above list as a tool to review and analyze near misses that you have seen or had.

Margaret Wheeler facilitated a presentation on Human Factor as part of AMGA Professional Development Clinics in October 2011. The above is a summary of results of the workshop sessions.

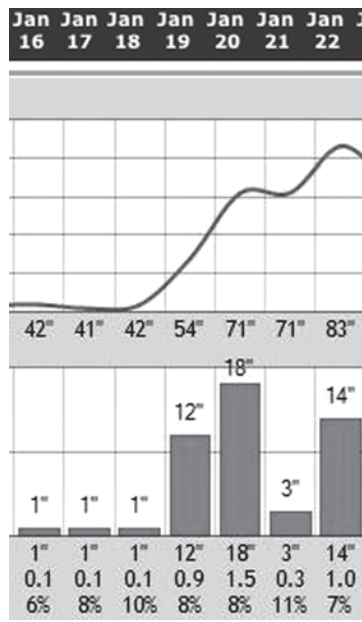




# A GIFT

Story by Robby ReChord

To work in the NOLS winter program, instructors from other course types must go through our in-house five-day professional level 1 avalanche course (30/70 classroom/field) and complete our 11-field day winter instructor seminar. Our goal is to take these folks from varied levels of touring experience from “unaware incompetence” to a state of proficiency or “deliberate competence.” This winter I’ve had the pleasure of working both of these courses in addition to my responsibilities as a winter program supervisor. We run two of the avalanche courses each season, one in December and one in January. Our December snowpack consisted of 70cm of facets topped by surface hoar up to 4cm on all aspects at low and mid elevations. The January course coincided with “The Perfect Storm.” I’ll let the chart speak for itself. The curved line represents snow height.



After the two classroom days these folks could barely make it out of the driveway, and even when they did, natural and explosively triggered avalanches on Teton Pass denied the group access to our classroom. Once they did get out, trail breaking was a monster! When the clouds lifted, the pass resembled a war zone with crowns and debris scarring even treed slopes that would fit the classic definition of “too tight to ski enjoyably.” (see photos of storm cycle on page 17)

Fast forward to February 1, day eight of the winter instructor seminar. We were in the northern reaches of Grand Teton National Park. We could see the signs of the mid-January storm and avalanche cycle, but other than a few ridgetop collapses we found a generally stable snowpack. The early season dragons were still lurking about 120cm deep in a 170cm snowpack giving us four out of five lemons. “Deep-slab instability” was my mantra as I recorded my observations each day. On the morning we were to descend from a high pass to the Owl Creek drainage, we started the day with a class on human factors. Ashley Wise, the NOLS AK program manager presented a class from the NOLS *Risk Management For Outdoor Leaders* notebook looking at behaviors and attitudes toward risk and the formula where human factors + environmental factors = an incident. These incidents are also the areas where we as individuals grow. We looked at this chart of human factors and discussed their applicability to traveling through avalanche terrain with the goal of keeping ourselves on the positive side, underlining that negative factors play into incidents where positive factors help us avoid them:

**NEGATIVE**

- Complacency
- Overconfidence
- Distraction
- Differing Perceptions of Risk
- Risk Homeostasis
- Expectations & Peer Pressures
- Schedules & Goal Pressure
- Fatigue, Stress & Performance

**POSITIVE**

- Situational Awareness
- Watchfulness
- Self-Awareness
- Role Modeling
- Tolerance for adversity & uncertainty

Before heading out for the day we had a route briefing and identified the point three-quarters of the way through our descent where we would have to put on our thinking caps to negotiate the steep terrain to reach the valley floor. We travelled well down the ridge with full packs and sleds. My co-instructor Jesse Quillian was up front with a student leader. I was tailing with the other student leader leaving eight active followers.

As the other tail and I came upon the decision point, I overheard one student say something to the effect of, “Should I go for it?” to which another replied, “Sure.” The student then took off on a downward traverse, reached the bench below, and announced, “It’s good.” I looked around, noticing that Jesse and the other student were not in view. I was informed that they were examining another potential route down. I asked if anyone had measured the angle on the slope that had just been descended. Blank stares. I asked if any had done any stability tests. A couple of folks bent over and started brushing the snow with gloved hands. OK, at least give me some

pertinent negatives. Again nothing. I railed, “Never, ever, ever enter red light terrain in an institutional context without acknowledging that you are doing so. Our protocols say that you must document any time you enter yellow or red light terrain.”

We measured the slope at 28 to 40 degrees with multiple obvious convexities and there were the tips of shrubs poking out, indicating potential sour spots. Two test pits revealed HS was 180 to 150 and the ground was a boulder field, CTMQ1+↓ 120 to 130. I got an ECTX however on the 31st tap, a Q1 propagation again down 130, theoretically deeper than our pressure bulb. We discussed and split

the group with half skiing the slope we investigated and half booting down a short, 50+ degree slope that Jesse had checked out. People apologized and I swallowed my frustrations, managing to say that I wasn’t upset but believed we had received a gift, a lesson that would be learned best experientially and that in this case we had a no-consequence incident. I added that we would debrief at camp that evening, using the morning’s class as a debrief tool.

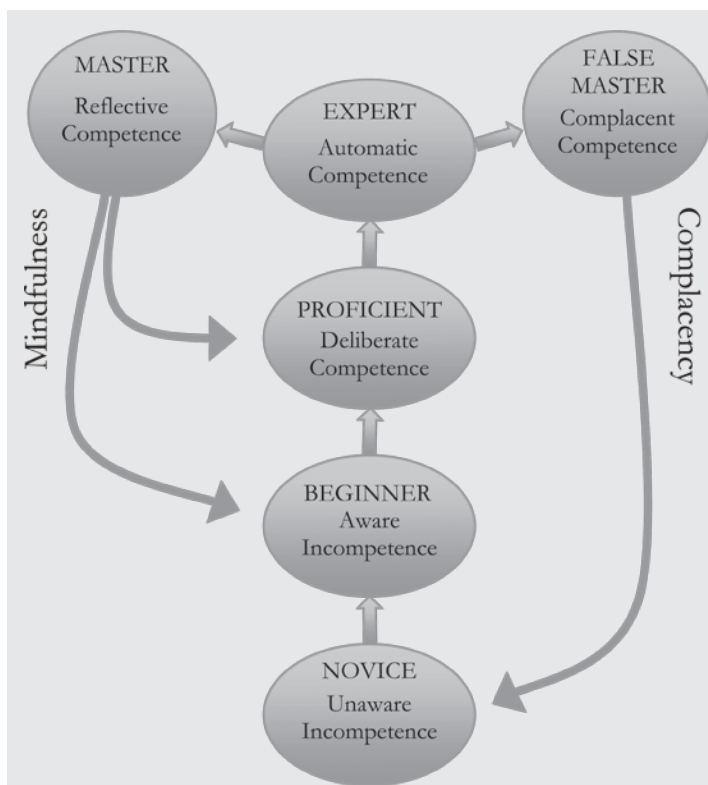
As we reviewed the human factors chart, the students could identify each of the negative factors at play as we descended. Specifically, they were distracted by a binding failure and repair just prior to getting to the crux; they perceived some schedule/goal pressure; and finally fatigue, stress, and performance played a role as we had been out in the field for more than a week with long days of travel. We then discussed my role and could identify all of the positive traits.

As Lynne and I talked about this incident we attributed the first three positive factors (situational awareness, watchfulness, self-awareness) to what Lynne likes to refer to as intuition, also known as reflective competence (see sidebar below) or subtle pattern recognition, developed over many years of backcountry winter travel. In my capacity as an educator I role modeled the proper way. And I had to flex my tolerance muscle, as it was my binding that had failed. Even after the quick repair, my students were more interested in the failure than the terrain; I declared a moratorium on binding questions.

So what? Well, I truly do believe this incident was a gift. Any time these folks enter similar terrain, visions of me squawking at them to pay attention, document, and discuss will pop into their heads – thinking, “What would Robby do here?” similar to the visions I have of Lynne and Heavy D (Don Sharaf) any time I enter avalanche terrain. These mentors and forebears in the NOLS winter program come to mind as I ritually perform a post-mortem test. I hear them challenging my route selection, test pit accuracy and efficiency, and pushing me to communicate succinctly.

I’m wondering if we need to somehow modify our training if this happens on day 13 of a 15-day training, or was it simply a fluke? Regardless, I know what I’ll be emphasizing next year, and inevitably something else will come up, demanding vigilant watchfulness on the part of trainers as we groom a new crop of winter professionals.

Robby makes his home in Victor, Idaho, where he works at NOLS Teton Valley as a winter program supervisor, thinking about how people think.



## LEVELS OF EXPERTISE MATRIX

Article for the NOLS Staff Newsletter Nov 2010 by Gates Richards & Tod Schimelpfenig

We watched several different presentations at the recent Wilderness Risk Managers Conference use the matrix of levels of expertise – unconsciously incompetent to unconsciously competent. NOLS presents this model twice in the Leadership Education Notebook, and it’s used in NOLS’ field curriculum. We’re naturally skeptical of models, fearing that in their good intent to organize information and present concepts they can convey misinformation, or take a life of their own. This seems to be the case with this model.

We bristle every time we see this model presented with the implication that the subconscious competent is the highest level of expertise. Our concern about this model is the message it conveys regarding how an expert should act. It invokes Klein’s seductive Recognition Primed Decision model and a tantalizing image of an expert armed with multiple heuristics and a basket of experience, who doesn’t need to think. Some have likened the expert brain to a computer running in the background of the decision-making process. This supercomputer processes information at a subconscious level and the “expert” acts without thought. This may be helpful if it’s a trained automatic response to a

recognized pattern: the kayak roll, self arrest, seeing the flaw in the climbing anchor. It may be harmful if the expert is unaware of the reasons for their actions and falls prey to the causality fallacy – the assumption that their actions produced the positive results.

More specifically, our concern is that the linear model takes us to an end, where we can “exercise good judgment without much thought about it.” We worry that, like Malcolm Gladwell in the flawed *Blink: The Power of Thinking Without Thinking*, NOLS staff emphasize subconscious competence as the hallmark of an expert, and neglect teaching the traps that expertise can present:

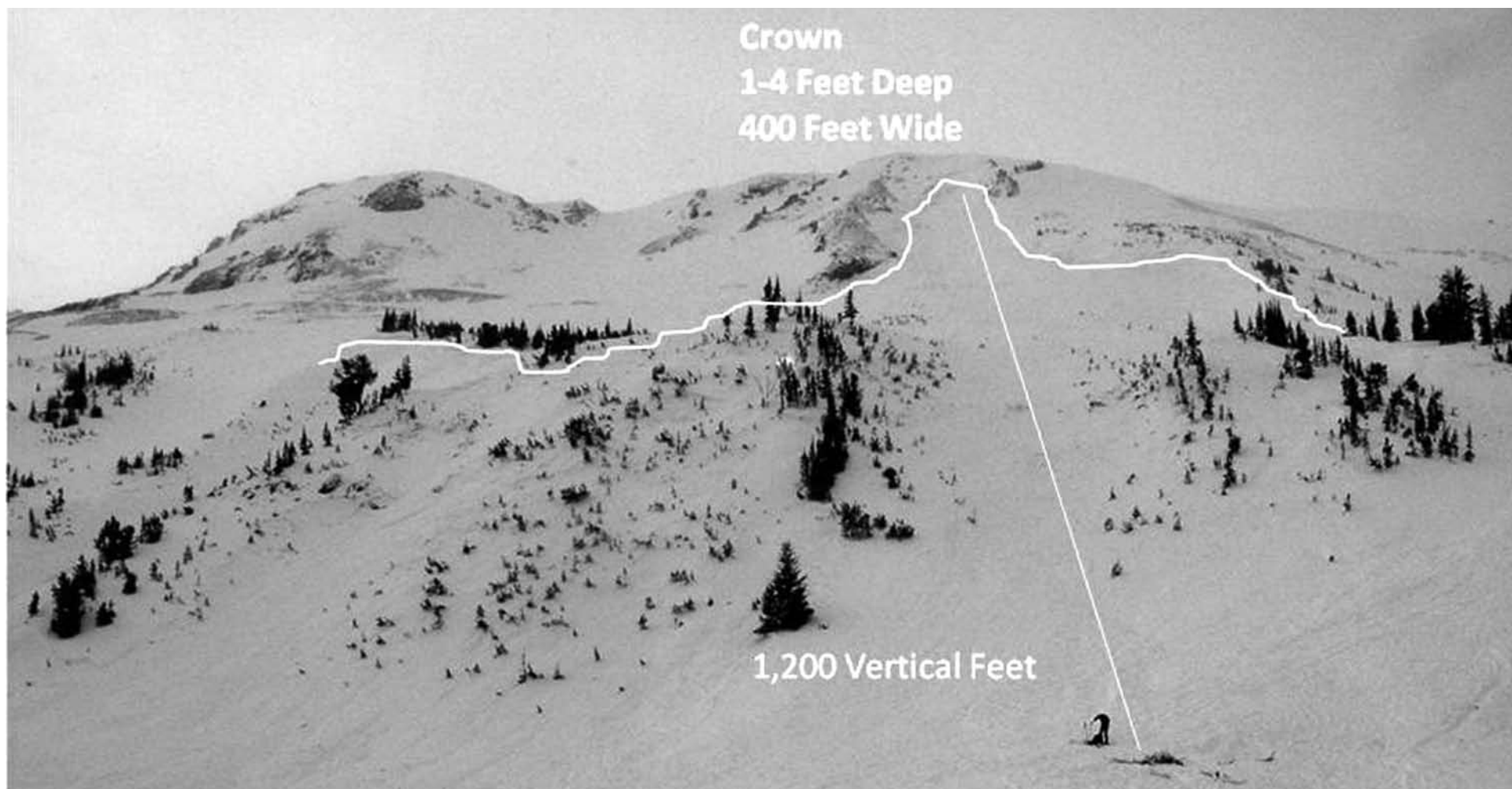
- LACK OF AWARENESS (brought on by the expectation that expertise is subconscious) of the limits of our expertise
- BIAS of our experience
- FRAILTIES of our humanity
- Inappropriate TRANSFERENCE of expertise in one realm to another
- The use of a GUT FEELING as a substitute for deliberate thought

In the original articles from which these models are developed is language on the value of reflection and deliberation. McCammon remarks that experts are more likely to seek feedback regarding both stability and instability of avalanche slopes and are more likely to review past experiences than are recreationists.<sup>1</sup> Dreyfus calls the inferential reasoning *deliberative rationality*.<sup>2</sup> We call it *mindfulness* or *reflective practice*. In fact, several models (Schubert, Gilbert, Addy, Mata, and others) have added a fifth level to the matrix to encompass this expert reflection.<sup>3</sup> These models typically associate this fifth level as that attained by outstanding educators.

Regardless of our skepticism of models, we’d like to reorganize this model both structurally and linguistically to link to our leadership skill of self-awareness and our educational goal of intentionality. We have

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## COOKE CITY: A New Year's Eve Tragedy In Two Parts

Story by Eric Knoff and Doug Chabot

### PART 1 by Eric Knoff

On December 31, 2011, two people were killed in separate avalanches in the mountains outside of Cooke City, Montana. One victim was a skier, the other a snowmobiler, both Montana residents. During the three days before the accidents the mountains around Cooke City received over 3' of dense snow totaling 4" of SWE. Consistent northwest winds blew 30-40mph with gusts in the 60s during the storm. The new snow was deposited on a layer of facets formed during an unseasonably dry December. This rapid load produced unstable conditions, prompting the Gallatin National Forest Avalanche Center (GNFAC) to issue a backcountry Avalanche Warning for the area.

The initial Avalanche Warning for the mountains around Cooke City was posted at 5pm on Friday, December 30. At this time, 2" of SWE had been recorded over a 48-hour period at the Fisher Creek Snotel site (elev. 9100') near Lulu Pass, creating our official warning criteria of HIGH avalanche danger on all slopes. Issuing the Avalanche Warning in the evening allowed it to be picked up and disseminated by the media by early Saturday morning.

I was in Cooke City at the time and spent much of December 30 ski-touring around Lulu Pass. My partner and I experienced widespread cracking and collapsing and triggered a few small avalanches. Precipitation Intensity rates were high throughout the day, and the storm continued to rage as we reached town at 5pm. On Friday evening the weather forecast was for another 1-2' of snow to accumulate by the morning of Saturday the 31st accompanied by strong northwest winds.

As forecasted, an additional 2" of SWE totaling 1.5' of snow accumulated at the nearby Snotel site by Saturday morning. This new precipitation pushed the 72-hour storm total to 30" of snow equaling 4" of SWE. The GNFAC extended the avalanche warning through Saturday the 31st, New Year's Eve Day, which dawned clear and cold. Temperatures were in the single digits and winds were blowing 10-15mph out of the NW. By 11:30am the ambient air temperature had only warmed to 8°F, but sunshine and fresh powder had drawn a large number of skiers and snowmobilers to the slopes around Daisy Pass and Lulu Pass. By this time, my partner and I had remotely triggered a size-D2 avalanche and observed both natural and human-triggered avalanches in the surrounding terrain. We both felt uneasy about the conditions and agreed that an avalanche incident was a good possibility.

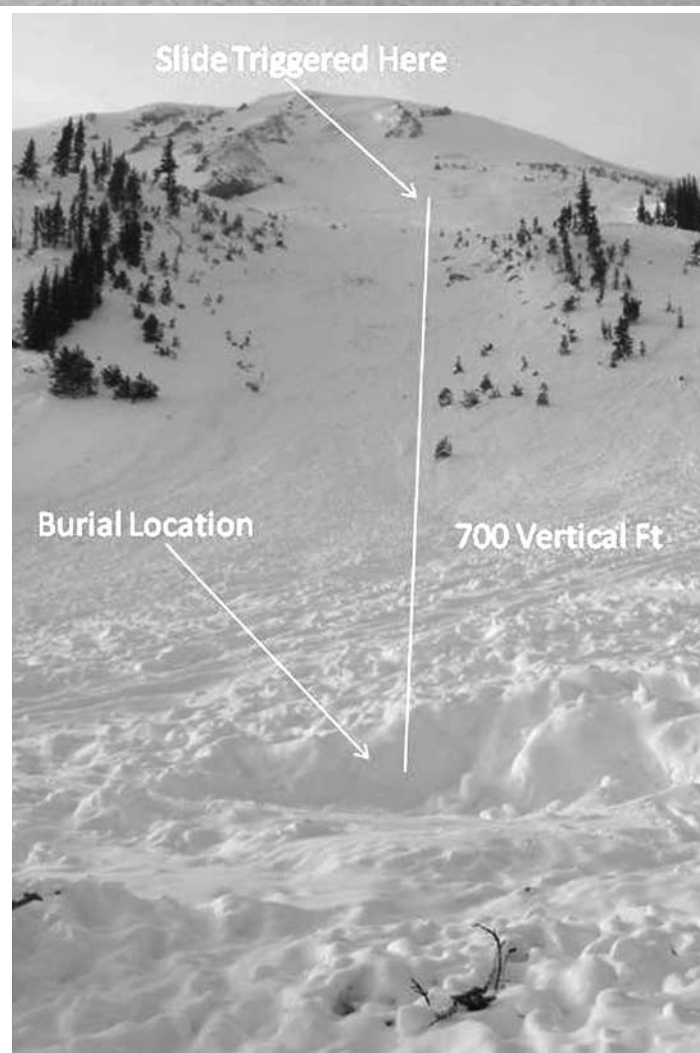
At approximately 11:45am my partner and I were finishing field observations near Lulu Pass. As we were loading our skis on the snowmobiles, I glanced across the valley just in time to watch a snowmobiler finish a turn midway up the northeast face of Mt Henderson. Suddenly, the slope broke around him, and he disappeared from my view in a wall of white. I couldn't tell if the snowmobiler who triggered the slide had been buried or if other riders were involved, but the sheer size of the avalanche made my partner and I both realize that the situation was serious.

I immediately radioed Cooke City Search and Rescue, and we headed to the scene. My partner and I both felt skiing to the scene was a safer option, and we arrived around the same time as search and rescue. Arriving on the scene, we were informed that a piece of the victim's boot had been visible on the surface, cutting down on search time. Members of the victim's party dug the rider out in approximately 12 minutes with his head buried 3' deep. The victim was pulseless, and party members initiated CPR. Upon arrival, search and rescue applied an AED without success. CPR was continued for approximately 45 minutes before a physician in Cooke City gave notification over the radio to end CPR. The rescue was concluded, and the scene was clear by 1:30pm.

The avalanche broke 500' above the rider, catching him while he was riding downhill. Due to the confined nature of the path, escaping the slide was nearly impossible. The slide ran a total of 1000 vertical feet. The crown of the avalanche ranged from 1-4' deep and propagated 300-400' wide. The slope angle at the trigger point was 35 degrees, but increased to 40 degrees near the upper portion of the crown. The debris ranged from 7-10' deep near the toe of the slide. US classification of the avalanche is SS-AM-D3-R4.

### PART 2 by Doug Chabot

Two hours after this incident, skiers triggered a slide south of Cooke City in the Absaroka Beartooth Wilderness approximately five miles to the south of first incident. The accident occurred a mile inside Wyoming up the Hayden Creek drainage near the base of Pilot Peak. This story is very different, yet equally tragic. A husband and wife drove to Cooke City from Bozeman to ski together after a hectic holiday. They spent the night in Cooke City



The northeast face of Mt Henderson on December 31, 2011, on Lulu Pass, near Cooke City, Montana. Steep, leeward, and loaded from 4" of SWE in a 72-hour period, the snowpack was producing copious signs of instability, including natural and human-triggered avalanches.

and the following morning left in their telemark gear to follow a set of freshly broken ski tracks. About an hour later they met two skiers returning to town. The two skiers who broke trail found dangerous conditions and even remotely triggered a slide, which prompted them to turn around. They conveyed their avalanche concerns to the couple, who were also aware of the Avalanche Warning.

The couple continued on their tour. At the Montana/Wyoming border the husband decided they should turn on their beacons. He had an Ortovox Patroller while she had his 20+ year-old Ortovox F2. After turning it on he commented that the rechargeable batteries were weak. They continued touring despite widespread cracking and collapsing and weak batteries.

After breaking trail up a broad valley for close to a mile, the two skiers turned up an adjacent drainage with very narrow, steep walls. Many avalanche paths funneled into this gully from far above. Around 2pm they decided to ski out of the drainage and seek a more comfortable spot for

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# THE GRAND DELUSION

Story by Will Gadd

I recently attended a rare event: a memorial for someone who didn't die in the mountains. This particular high-achieving friend died of alcoholism, but was his addiction really so different than my own devotion to mountain sports? He knew alcohol would kill him, but chose to drink. And I am increasingly certain that if anyone spends enough time in the mountains, he or she will die there.

I often hear friends make statistically insane comments such as, "You can die on the way to the mountains just as easily as you can die in the mountains." That statement, for the record, is a stinking pile of self-delusional excrement that does not smell any less foul with repeated exposure. The ignorance behind those words makes me seethe internally – because I once believed exactly the same thing.

I do a lot of presentations about mountain sports, and sometimes share a list of dead friends to remind myself and the audience that the hidden price for the stunning photographs is all-too-regularly life itself. There are 27 names on my list. Not one of those friends died while driving to the mountains. Not one died on a commercial airline flight. To equate the risks of mountain sports to everyday activities like driving or even the chance of death from cancer is completely idiotic. Every friend on my list drove to the mountains a lot, and some even wrecked vehicles and spent time in the hospital from those crashes. But they died doing mountain sports.

As the list grows longer, I have a harder and harder time understanding why I take the risks I do out there. Yes, I'm careful; yes, I use good gear; yes, I run away a lot in the face of peril – but there are always elevated dangers in sports such as climbing, whitewater kayaking, and paragliding. Each friend's death has been a crack in my mental foundation of "managed risk." And then, two months ago, that foundation was shattered with the sound of someone's spine breaking. I had launched my glider off Mount Lady MacDonald, north of Canmore, and was 500 feet above my friend Stewart when he plummeted into the rocks shortly after takeoff.

I almost puked in the air as I watched and heard him hit. I didn't think anyone could survive the impact he took, and the spinning fall down the scree that followed. Thanks to prompt first aid from some great people who happened to be hiking in the area, and to a helicopter rescue team from Canmore, Stewart was in a good hospital only two hours after his accident. He remains there, with hopefully temporary spinal damage. I was thrilled when I heard that he had survived – unlike the dead, he would have the opportunity to say what he needed to his friends and family. He might even recover fully.

Just one week before Stewart crashed, I had the best flight of my life, straight over the iconic granite spires of the Bugaboos in southeastern BC. Pure joy is how I'd describe that flight. But I haven't flown since Stewart's accident in August; the thought honestly makes me nauseous. Why?

Strangely, Stewart's survival has affected me far more than if he had died. The difference with Stewart is that I can look into his eyes and see the damage. I can talk with Stewart and see the pain he is fighting through. While I admire the hell out of his courage and commitment to fight for every millimeter of progress, I also imagine not being able to hold my own children. Stewart's wounds don't fade into memory the way a fatality does – it's hard to "get over" something that's still staring you in the face. Some of Stewart's comments are beautiful even as they are heart-rending: "If I could just get one hand back it would make all the difference."

Some of my own anger probably comes from an ever-greater sense of mortality. I desperately love the fullness of life, and I desperately love mountain sports. I look at Stewart learning to eat again (he does have one arm back!) and feel true happiness that he is able to, but then I look at my glider in its bag and have to look away. I love sharing the mountains with people, but wonder how many of them will end up on my list. My world view is falling apart, and it's about as comfortable as getting scalded in the shower: I want to jump away, but there's nowhere to go.

No single day in the mountains is worth dying for, so it must be the sum of the days that is worth that risk. I tell myself that, but these days I have more empathy for the religious who have lost their faith. They, too, are often angry. The psychiatrist Elisabeth Kübler-Ross said there are five stages of grief. If so, I'm only on stage two, anger, and a hell of a long way from the final stage of acceptance. How will I ever "accept" this level of carnage, year after year?

*Will Gadd grew up in a family that hiked, climbed, and went into the mountains whenever they could. Some of his earliest memories are of long backpacking trips, wind-blown summits, and surviving winter skip trips. The first sport he really got into on his own was caving. When he was 14 he started kayaking. At 16 he bought his first climbing rope and did his first new rock route. At 25 he first flew a paraglider. At 41 his daughter came into the world. She's already doing all the stuff he did as a kid, and she's an athlete too.*

*This article was originally published on December 5, 2011, in the online magazine, Explore, which can be found at [www.explore-mag.com](http://www.explore-mag.com).*



John Stimberis shares his visual meditations on the infinite textures of snow with TAR. We wish we had room for more of his photos. *Photo by John Stimberis*

## A LOOK AT RISK

Story by Christian Santelices

What is acceptable risk? I think we all understand why we do what we do in the mountains. We understand the joy skiing untracked powder gives us and those of us who make our living as guides and instructors understand the impact it has on our guests. That's the easy part.

But where do we draw the line between pushing the limits of safety on our own or with clients? I have a list of people who have pushed the line both personally and professionally, and they or their clients are not around to testify to the wisdom of their decision or to the benefit found from crossing the line. Hans Saari skiing a more extreme entrance to the Gervasutti Couloir in the Alps, slipping on ice that he did not know was there because he had not climbed the route on the approach. An Argentine guide acquaintance who marched a large university group across an obvious avalanche path in the Andes – the slope avalanched, and several died as a result. George Gardner, who died soloing the Lower Exum Ridge on the Grand Teton.

George's accident is the most personal. He was a dear friend and my mentor at Exum Mountain Guides. I strived to emulate his teaching skills, his enthusiasm for sharing the mountains, his love for his fellow guides and human beings. After the initial grief from finding his broken body at the base of the Exum Ridge, I was pissed at him for walking away from his friends for some "personal time" to go solo this route. Why hadn't he asked one of us to come along and climb it with him? Was soloing it really that important? Was leaving a wife and two children worth whatever personal transcendent experience he was seeking on that day?

We all experience the mountains in our own way and find our own personal joy from them. These days, skiing groomers with my kids is as joyful an experience as skiing a steep couloir in Grand Teton National Park. I love pushing my own personal physical and mental limits, but due to my responsibilities, that's generally pretty mundane by today's increasingly dangerous standards. I'm amazed at what the "youth" are doing these days, whether they are doing it to make a name for themselves in the industry, fuel their ego, or are genuinely interested in pursuing a purer form of their sport. I'm impressed, but also at times incredulous of these accomplishments.

What I deal with more these days as a guide and educator is making decisions for individuals or groups. Most of the time it's easy – I take the most conservative line, and that is what my guests can handle. Sometimes I have folks who are more advanced, and I can think about pushing them and the terrain a little more in an effort to 1) show them more advanced skills and 2) find better snow or a more exciting experience. But even in those instances I feel like I need to make the decision based on solid knowledge of the conditions and their abilities. I'm not making the decision for myself. The decisions I make on a day-to-day basis



**Where do we draw the line between pushing the limits of safety? I have a list of people who have pushed the line both personally and professionally, and they or their clients are not around to testify to the wisdom of their decision or to the benefit found from crossing the line.**

in the mountains with clients affect my guests certainly, but more importantly, they affect their loved ones – spouses, children, parents, and friends of the folks who are skiing with me that day. It would be a living nightmare to have to sit in front of those people and explain why I decided to take them to a place that killed or injured them. I often think about my Argentine friend and what he must be going through. I don't think he's working as a guide anymore. In Europe, he likely would have been prosecuted and put in jail if his decision was found to be unsound.

The hardest thing is when I have clients who are better skiers than me, and who have a certain agenda. It's sometimes tough to ratchet them back and look at terrain and risk from my perspective. The problem is that I want to give them what they want, but I need to really think about my decisions and what could go wrong on those days. Here are some tools I use to help me make decisions and manage terrain:

**Follow the snowpack on a daily basis.**

Only by knowing what is going on below can I hope to make wise, educated decisions about what to ski. Ask those you trust about what they are seeing and experiencing in terrain that you want to ski.

**Know my clients' abilities and desires.**

Ask questions, find out what their goals are for the day and what they have done in the past. For bigger objectives, make sure they work their way up to their goals. Preparation is key.

**Do a pre-mortem check.**

What is the likelihood of something happening on this slope and what would the consequences be? What would really happen to that "safe zone" if the slope went big? If I got caught here, would my client be able to dig me out? Could I really hope to dig them out in time if something happened? Do I even want to risk that possibility?

**Work the terrain.**

Use the macro and micro terrain features to help keep you on the right side of the snow. Decided to ski the avalanche path? Ski the small ridge within it, for example.

**Use double checks.**

I will often "check" my decision with ALPTRUTH and/or FACETS before dropping into an avalanche path. A great exercise that we did in AAI's guide training this year is figuring out where on the FACETS scale each of us live in our decision-making model. I live in Acceptance – I want my clients to have a great time and to think I'm an awesome guide. That often affects my decisions, and I need to recognize that every day.

**Reflection.**

Every day I sit down and think about my day and the decisions I made. What could I have done better? Where did I make a questionable decision? What did I do well that I should remember for next time?

In the end, what's important as a guide or personal skier is to always ask questions, to strive to learn more, to be open to questions or criticism from our peers. Humility will help to keep you on top and open to learning.

*Christian Santelices believes that experiencing nature firsthand has the power to transform people's lives. As a fully certified IFMGA/UIAGM mountain guide, professional photographer, public speaker, writer, and community activist, his career has been dedicated to helping facilitate this process. During the summer months you'll find him working in the Tetons as co-chief guide for Exum Mountain Guides. The rest of the year he teaches avalanche courses, ski guides, and leads custom adventures and corporate community-building retreats worldwide through his guiding company Aerial Boundaries. He lives in Teton Valley, Wyoming, with his wife Sue, daughter Mariela, and son Nicolai.* ❄️



## Juneau: Thane Road Avalanches

Story & photos by Tom Mattice

With 95" of snow on the ground by Thanksgiving at the Eaglecrest Ski Area in Juneau, Alaska, it was a Turkey Day to remember and be thankful for. Things continued to build up fast with consistent snowfall and another 21" dump on December 1, bringing our mountain totals to 102". Our first melt-freeze event of the year came on December 3-5 with a few natural avalanches to relieve the stress in several of our mountain starting zones.

On December 8 we went back under the hammer with continued snowfall everyday until January 2 with the exception of two days. For those of you who don't know, Juneau is located at sea level. With lots of near-freezing temperatures and even a little rain down low, we saw a great deal of settlement and consolidation building strength into this deep, relatively homogenous snowpack.

From New Year's Eve through January 2 we saw an 8°C warming trend bringing summit temperatures right to 0°C during an event that left 30mm of precipitation and 25cm of new snow. On January 2 along Thane Road, south of town, we created 10 slab avalanches during a 23-shot firing mission with the Alaska Department of Transportation and Public Facilities' 105mm Howitzer. Three of the 10 avalanches crossed the road in the same path. Most of the activity brought down only the 25cm of new snow, yet one crown in particular fractured from a rock face with depths of around 25cm deeper into a wind drifted slab to approx depths of 10-12'.

We have been hovering around 140-144" of base since December 27. All things considered, the fall of 2011 is one that will be remembered for a long time to come!

*Tom Mattice is director of the Southeast Alaska Avalanche Center and emergency programs manager for the City of Juneau, Alaska.* ❄️



# GET IT DONE; STAY SAFE

## Reflections on The Grand Delusion

Story by Mattie Sheafor

Years ago I worked with and became friends with Alex Lowe. Alex embodied the rare combination of genetic ability and the drive to proficiency that most of us dream of having. He was psyched like none other, and when he was in the mountains he wore a huge smile. But just ask him about Jenny and his three boys, and his eyes twinkled, his smile shone exponentially brighter as he spoke. He had a terrific smile anyway, but to see this man's face actually become radiant – there was no doubt about what lit his heart up.

Alex's passing shook my foundation. I received the news while on my own climbing trip in the Alps. A lot of us seemed to think if anyone was immune to these realities, it was definitely Alex. And in the wake of the sadness I remember considering that maybe I was done with climbing. When I next checked my email I found a last bubbly note from him exhorting me to do my best and enjoy every moment.

Earlier this winter I found myself belaying Alex's youngest, now grown son at a frozen cliff and standing beside the man (one of Alex's former partners) who stepped in as his dad years ago after Alex died in the avalanche on Shishipangma. It is different than if Alex was here, but it is still good. Something about Alex's energy remains in those of us who can't forget him.

I started climbing 25 years ago this month. Alex is but one of the 21 friends on my own list of those who have died in the mountains. One name belongs to my best friend, Karen, who disappeared after topping out on a rad Alaskan grade VII route, six years ago this May. I still think about her every single day. I've stopped being surprised by this. Instead, I am just grateful for a friend who touched me so potently.

And lately, when news comes of another friend lost to the mountains I have noticed that the losses feel as though they have started to stack together; loss referencing other loss, I guess. It starts to feel like too much. I feel that this is the place that Will has written from – it is dark, familiar. (see Will Gadd's essay, "The Grand Delusion," on page 28)

Certainly there are no guarantees in this life, beyond the fact that our time here is limited. But if I have my dearest wish, I want to know my sons as they grow into men. Every day I spend with them is the richest treasure. I am SO lucky!

### The Crucible

Why leave to climb? Why indeed. I ask myself this before every trip. I'm packing now to meet a climbing partner for a short but much anticipated trip. Someone who lost his best friend climbing too, who loves his wife like I love my boys, who has every intention of coming home safe and sound. And who feels, like me, that life is short, and we best get after it using our skills and building more memories.

I can speak from the heart of what my 25 years of climbing have meant to me:

WIS ski tour stream crossing.  
 LIKELIHOOD= high  
 CONSEQUENCES= broken sled or fuel in the food  
 ACTION= add a sled spotter

Photo by Jaime Musnicki



# THE MORALITY OF MOUNTAIN SPORTS

Story by Rob Shaul

Occasionally we visit the moral/business aspects of mountain sports. One of my sponsored athletes, Mattie Sheafor (see story, above), a good friend of Will Gadd's, forwarded me his essay (see page 28) – and I thought it would be a good opportunity to poll the reactions of the rest of my athletes, asking them, "Knowing the dangers of what you do, why do you continue to challenge the odds. Why risk everything for your sport?"

I was looking for honesty – and for the most part got it. Responses are posted on our site at [www.mountainathlete.com](http://www.mountainathlete.com).

Christian's response was the most honest so far – the idea of addiction is one I find rings true.

Interestingly, I forwarded Will's essay to several of the combat veterans I work with – special forces soldiers, some of whom are down range.

In general, the mountain athletes have far more fallen friends than the soldiers – you wouldn't think that, would you?

But the soldiers don't have to do mental gymnastics to justify to themselves and their families for continuing to put themselves in harm's way. The altruistic motives of "for country," and "for my brother next to me," are pretty solid reasons. Some of these guys certainly like the rush of combat too, but are hesitant to admit it.

Rob Shaul is a professional strength and conditioning coach and the founder of Mountain Athlete in Jackson, WY. ❄️❄️

remarkable landscapes shared with dear partners; the pleasure of the movement across a rock face, up surreal frozen waterfalls, spectacular desert towers, exposed ridges. I know the satisfaction of spending time alone on big walls with only hummingbirds for company, self reliant and self contained. I can describe the gifts of knowing fear, humility, and forging will and how I try to use this evolution of thought in my everyday life.

All of these things are relevant and have been useful for me, but if I'm going to be as honest as Will is in his essay, there's a further stretch to be made. There is a kernel of elitism at the core of these arguments that doesn't ring wholly true to me.

I cannot discount this possibility: that all the incredible ways in which climbing has informed and shaped my life might have been achieved walking a different sort of path, maybe becoming an avid disciple of another type of sport/discipline that holds less inherent risk? So I spend a little more attention to diversifying as I age, and maybe one day, if I work at it, standing in a river's current watching a fish rise will teach me too. This is the route I've traveled though, it makes up a part of who I am, the prism I see through.

Other justifications feel shaky to me. I know what drew me to climbing initially was some of the same stuff that keeps me now going to the gym. It is a crucible – a place to work toward greater capacity, and there is no room for masks – I love the simplicity. Pretense falls away quickly whether you are on the sharp end of the rope or trying to lift something heavy over your head. You either do or you don't, no pretending. Only certain personalities seem to persist in these places, and generally they are ones I am predisposed to liking. It makes for an interesting camaraderie. In climbing we have this mutual vulnerability in spades. Nothing like sharing a portaledge and a poop tube to break down walls. Holding someone's line while they try to ascend something at their limit is akin to a privilege, it is an act of trust and partnership to the core. This connection is the part I value the most.

Lately I think I have to be satisfied with the idea of holding competing tensions: No single day in the mountains would be worth losing time with the people I love or their suffering. No way. And, I love all that climbing accesses for me, both within and without. I churn about the inherent risk manifest in my sport, but attending to managing it through every means at my disposal makes me present. And processing the accompanying fear/doubt does feel terrifically satisfying. Is that addiction? Rejuvenation? Evolution?

It is what it is. Until I figure out a better answer, I will do my best to prepare. And my hopeful self will continue to splurge on wrinkle cream with SPF. We are younger than we're going to be. Get it done, stay safe. And tell your people you love them as often as you can.

Mattie Sheafor lives in Jackson, WY, with her two sons, where she works as a reading teacher at Jackson Elementary School and guides for Exum Mountain Guides, Aerial Boundaries, Chicks Rock, and Chicks with Picks. Mattie is the founder of Women That Rock, the first women-teaching-women climbing nonprofit in the US. She works with Marmot and Mountain Athlete. ❄️❄️



### COOKE CITY TRAGEDIES

continued from page 27

lunch. The husband left the drainage, and his wife followed a few minutes behind. The drainage opened into a 50'-wide avalanche path. A few hundred feet up the path he triggered a small slide and yelled for his wife to grab a tree. The avalanche propagated uphill, releasing a majority of the slide path. The slide completely buried the husband and the dog, but the wife was not caught.

She turned her avalanche transceiver to "receive," put her earpiece in, and started searching. She could only get a signal when the volume was on its highest setting, making it impossible to pinpoint. Weak batteries were likely the cause of this malfunction. She searched the debris for three hours and dug multiple holes in the snow, but was forced to abandon her effort to find her husband as it got dark. She skied back to town solo. That evening Search and Rescue went to the scene and retrieved the body.

Four days later, a canine miracle happened when the dog dug himself out of the debris and walked back to Cooke City. Looking for his owners, he sat outside the door of the hotel they had spent the night at.

The slope angle averaged 35 degrees in the starting zone with the steepest part measuring over 40 degrees. The crown face was 1-4' deep and 800' wide and ran 250' vertical. The starting zone averaged a northwest aspect. The debris was split between two paths with the one the skiers were in being 50' wide. The debris in the creek bottom was 10-12' deep. US Classification of the avalanche is SS-AS-D2.5-R3.

Eric Knoff and Doug Chabot are forecasters at Gallatin National Forest Avalanche Center. At press time they are investigating another snowmobiler avalanche fatality that occurred near Cooke City on February 21. ❄️❄️







Snow creatures crouch in the wind above Eaglecrest Ski Area in Juneau, Alaska, in March of 2009.

Photo by Mike Bartholow

## IN THE DEN OF THE DRAGONS

### A Perspective on Guiding & Instructing in Avalanche Terrain

Story by Jim Woodmencey

It has often been said that we are entering the “Den of the Dragons” whenever we are in avalanche terrain in the mountains. I first heard this from Doug Fesler up in Alaska, and I will credit him as the originator of this great phrase.

While we may be entering the realm of the dragon while out there guiding skiers or instructing an avalanche class, it is not very often that we actually get to see one up close and breathing fire. There may be visual evidence of dead dragons laying around, those that died of natural causes or those slain by the local ski patrol or highway department, offering us the opportunity to say, “See, there’s dragons in these here hills.”

In some conditions we may even awaken one on approach, or step on one’s tail with a ski-cut and get some action. But most of the time that we are out in the mountains our job is to avoid an actual battle with the dragon.

The conundrum is that some of the best skiing and best terrain for teaching an avalanche course is exactly where we might trigger or become involved in an avalanche.

It’s always a great learning tool if we can spot or even provoke an avalanche from a safe distance. But getting close enough to ride them like a bucking bronco is certainly too close.

It will make you look like a god or a hero when you do show clients “the goods,” but it is a very fine line we walk to get there, between taking them to “the best terrain” and being “totally safe.” Teaching or guiding in avalanche terrain requires that we take one extra step back from that line.

As a backcountry ski guide or an avalanche instructor your first priority should not be to impress your clientele with “the goods.” Foremost in your mind should always be, “Is this slope safe?” In reality that may be better stated as, “Is this slope safe enough?” – safe enough to take my group onto without starting an avalanche.

#### Dragons and Bisons and Bears, Oh My

Everyone’s comfort level is different. Some will push the envelope a little further than others. It might be because they are a more aggressive skier, have a more confident personality, or have less experience. A guide or instructor who has been involved directly with an incident during their career – whether it be a close call, a client burial, or a fatality – is less likely to push the limit.

Always striving to dazzle the clientele with the most awesome terrain should become secondary to safety, and should never override or interfere with your decision-making process.

Teaching an avalanche field course or guiding skiers in the backcountry is really more like being a tour guide in Yellowstone. Everyone wants to see a grizzly bear and a buffalo. And everyone wants to get as close as possible to get a really good picture. Grizzly bears are the more ominous of the two creatures, and we tend to give them more respect and a wider berth. We certainly don’t want to surprise a grizzly when we are hiking through the woods. Hiking in grizzly bear country is like skiing on a high avalanche hazard day, we tend to be extra cautious. The grizzly bear is more like the dragon – we don’t often see them, but when we do, we back off as expeditiously as possible.

The buffalo, on the other hand is a more docile-looking beast. They graze in tranquil open meadows just like a domestic cow, often within easy reach alongside the highway. They exhibit no real signs of danger and will allow you to approach without ever lifting their head from the grass. Much more like touring on a lower-hazard day with fresh, untracked powder slopes beckoning.

So, we walk right up to that buffalo to get the best photo, and in the blink-of-an-eye that big old shaggy one-ton bison charges without warning. You may have time to turn around and yell just before he tosses you 10 feet in the air and tears a six-inch hole in your ass with his horns.

Just like the allure of that untracked slope, or that perfect example of a 38-degree northeast-facing slope to dig a snowpit on, they may look docile, but be prepared to get “buffaloed.” As a guide or instructor you always want to show your customer the best of the best. The pressure to deliver can cause us to make bad decisions – a heuristic trap that isn’t really on the list we give to students!

It’s not an easy job, getting as close as possible to the “goods” without ever over-stepping that boundary. But as professionals we need to be able to delineate where that boundary is on any given day. And if we don’t feel like we can, then we must step back even further, take it down another notch, until we can assure ourselves that we will not be awakening the dragon, pissing off the grizzly bear, or irritating the mighty bison.

*Over the span of the last 30-some years Jim has worked as a mountain guide in the Cascades and Alaska, a climbing ranger in the Tetons, an avalanche forecaster in Alaska, a heli-ski guide in Wyoming, and an avalanche instructor. Jim is a AAA certified instructor and also a meteorologist for Mountain Weather in Jackson, Wyoming.* ❄️



## THERE'S ALWAYS ANOTHER RUN

Story by Roger Yim

*What is your risk tolerance personally and institutionally? How do you and your company manage students/ clients and their desires in the field?*

Essentially I try not to differ the two. I have always felt I would care for my clients and students similar to my loved ones and friends. So from this heartfelt position I try to make the best decision for the people, terrain, and situation I am in.

The differences for me are that with groups, clients, and students, I have the extra challenges of group size (especially cat skiing) and skill level (novices for students and clients). When I ski personally, I am usually with a smaller group. It is usually one to three people, and they have greater skills and ability to ski tougher lines. That being said, many of my non-professional friends rarely practice rescue skills but have good terrain and snowpack awareness.

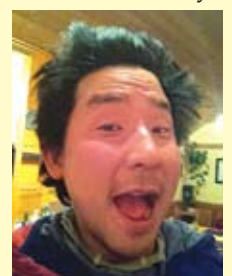
On the flip side of things, when I work at a cat-ski operation where there is a high terrain familiarity and constant management of the terrain (i.e., pro-level obs, tracking of layers, and avy cycles) I am always amazed what we can ski with clients on a daily basis, especially in times of instability or high hazard.

Conversely I am also amazed how conservative we can be in those same times. On a NOLS course, there is a greater tradition of conservatism due to the low level of skills and “school” and not guiding context. However, during my most recent NOLS course, due to the amount of time we spend out there, we were able to ski 30+ slopes during a high hazard period because we had the time to gain confidence in the snowpack and certain terrain features. I think if I was skiing a different area with less time and knowledge I would be more prudent.

I read about your idea of the “Powder Demons.” (see *TAR 30-3 editorial*) I am a victim of the demons for sure. I have lived and worked in places, spent way too much money, taken endless courses and probably an unhealthy amount of time in search of skiing the “good stuff.” The motivation that makes me wake up at 5:30am for a dawn patrol with friends is the same energy I put into a guides’ meeting, trying to figure out where to ski. The same energy is put into choosing safe places, good snow, and everyone coming home in one happy, blissful piece.

This is a good thing, but the motivation we get to ski should not affect our clear, thoughtful, and ethical practice of backcountry skiing. When I feel clouded in judgment in either a professional or personal setting, I look at myself and realize how lucky I am to be skiing and have this choice in front of me. That perspective allows me to walk away because there is always another run, another day, and another time.

*Roger Yim is the skiing Korean who can be found deep in the Tetons for NOLS and in the Selkirk Mountains for Retalack ski lodge.* ❄️





# RISK, RISK TOLERANCE, AND TEACHING IN AVALANCHE TERRAIN

Story & photo by Jake Hutchinson

*Author disclaimer: The following are my personal thoughts and opinions, not necessarily those of the good people who employ me!*

What is acceptable risk in avalanche terrain while teaching? Can you ever take the risk meter to zero in the mountains? How much further do I push my risk threshold when I'm alone or with a partner or two versus when I'm teaching? All of these things have been running through my head since Lynne first solicited my opinion on this stuff. As I ponder it, I realize the answers are nearly as complex as the Wasatch snowpack right now, and I also realize both my teaching and personal thresholds have taken a tremendous step to the cautious side this season – or have they?

I guess the first two questions may be the easiest and least complex. I believe it is a disservice to take students of avalanches into the mountains, teach them about the snow, and then avoid avalanche terrain no matter what the snow tells us. What does a student learn after careful evaluation, discussion, and testing reveals a stable snowpack, a solid group with all the skills and gear, and then a decision is made to ski the 28-degree slope? I trigger avalanches while on avalanche courses, which means I'm taking students into steep, avalanche-prone terrain. I also turn around and choose a mellower line or a different drainage more times than I remember. If we don't use our own experience, skill sets, and judgement to guide our decision-making in front of students, then what are we really teaching them?

I guess my first rule is that a student getting caught in avalanches, no matter how small, isn't an option. Students unintentionally triggering avalanches doesn't sit well with me either. So, I treat every field session as a guided ski tour, which I guess it essentially is. I always enter any avalanche slope first and perform whatever snow assessment may be necessary before bringing students out onto the slope. I try to guide students to think through the stability assessment and a go or no-go decision for the slope we are assessing. I have both changed student's minds and had mine changed by their assessment and reasoning.

The great thing about teaching in the Wasatch is that in most years, the snowpack is generally quite stable and straightforward. Many years and in many courses, students can be safely managed in complex avalanche terrain and steep slopes, which allows for great teaching opportunities for group management, terrain choices, and where and when to dig a pit or do a stability test. This season all bets are off and a different



Twin Lakes Pass slide triggered while demonstrating cornice management: HS-ACi-D2.5-R3.

but maybe more impactful terrain management skillset and teaching opportunity has come into play. Since we buried the facets with a hard slab, I have become a master at seeking out small test slopes and pockets. Most of my field sessions have been spent on terrain at or below 30 degrees, with very careful consideration given to the terrain above and around me. I've also been quite leery of corniced ridges pulling into low-angle terrain. We currently sit in a deep-slab problem with a low chance to trigger a slide, but consequences are severe at best if you do find one. This season has drastically changed where I go and when. I have backed off a few notches in both my teaching and my personal skiing decisions.

My personal risk threshold has certainly changed over the years, I feel more confident in my skiing, assessment skills, and avalanche-management techniques than I ever have. I am certainly willing to accept the possibility that I or one of my partners may trigger an avalanche while out skiing, and we often do. Most of the time it's intentional; occasionally it isn't. The deciding factor often boils down to what kind of avalanche are we dealing with? Soft slabs or hard slabs? New snow or old? Large and full of venom or small and predictable? This year I had big aspirations of skiing some lines I haven't touched

in years due to working too much and playing too little, but I've put them on the shelf until next year. As I constantly tell my mom, dying in an avalanche isn't an option for me. In a year like this the meadow skipping and long, remote ridge walks seem to suit me just fine.



*Jake is a reformed career ski patroller, now on tour full time for the American Avalanche Institute – living from a duffle bag and learning about weak snow around the West. In his spare time he is vice president of Wasatch Backcountry Rescue and tries to remember to ski for fun once in awhile.*



## RISK AT AGE 50

Story by Phil Powers

With the burgeoning of backcountry skiing and the search for the best lines on the steepest powder, the likelihood of someone dropping in from above while we slog up the valleys below is greater than ever. Those skiers are triggers. Judging the slopes and picking a route for one's own party is hard enough. Wondering if someone will trigger an avalanche above us brings yet another concern to backcountry travel.

Even climbing in summer presents the possibility that those above us might send missiles our way – it's happened for years in places like Cathedral Ledge near North Conway. One of my dear friends was killed when someone recklessly lobbed a rock down a vertical face in the Wind Rivers. It's one thing to worry about people above when one is on a face that is topped by a road, quite another while forging a new route in the Wind River Range.

Concern about other people is real. Any visitor to the mountains, frontcountry or back, must take the effect we might have on others seriously. Since some people don't, be more wary than ever. Add "other people" to the list of hazards we confront when we venture out. It is a variable that, to me, seems unpredictable in a whole new way.



Route finding on an AMGA Ski Guide Course, Snoqualmie Pass, WA.

Photo by Iain Morris



# DESIRE VERSUS FEAR

Story and photo by Chris Marshall

*January 22, 2012, 0415:* My alarm rings. *0445:* With a cup of coffee in hand, a student and I begin the slow creep up Red Mountain Pass to check our storm boards. Only one lane had been plowed, and that was mostly filled back in.

Prescott College's Avalanche Forecasting class was off to a good start. The December/January dry spell had left plenty of faceted crystals and depth hoar for students to get acquainted with. The January 16-17 event had added less than 1" SWE – enough to stir the dragon, but not enough for her to roar. We get to the top of Red; it's snowing and blowing so hard it's difficult to find our study plot. 40cm with 1.6" H<sub>2</sub>O and plenty of wind – the dragon is about to roar.

Back at the house, anticipation and excitement runs throughout the group as we get ready for our field day. Being an avalanche forecasting class, our objectives for the day are to see how the snowpack has responded to the new load, and to test our hypothesis that this storm event was more than enough to tip the scale, causing a natural avalanche cycle and creating unstable and sensitive conditions.

Our plan was to go into a zone that I knew well: thickly treed for the most part, but steep and open slopes above some of the up track presented a true objective hazard. The CAIC bulletin rated the avalanche hazard High in the northern San Juans. I had been in this zone many times on High hazard days, and I knew the terrain well – I knew where the dangerous spots were, and I had confidence in my ability to manage a group through these hazards. Talking with my co-instructor, David Lovejoy, we both felt that our plan was acceptable given our institutional risk tolerance. We also admitted that we didn't see ourselves making it very far before turning tail.

As we arrived at the trailhead, I was aware of my desire to facilitate a learning experience for our students by moving them through the terrain to meet our day's objectives. Moreover, while my avalanche antennae were alert and buzzing, fear of our route and the hazards we would encounter wasn't overwhelming. I perceived the risk to be manageable and within my range of tolerance. Starting up the track, a track the students had traveled before during Low hazard, I noticed a general lack of attention to the risk at hand. Excitement about the new snow abounded, putting people into a jovial mood. Conversation drifted away from the storm, the snowpack, and the acute hazard at hand.

To draw attention to the hazard, I let students lead the group with one of us close behind. Shortly thereafter, a student stuck his ski pole grip into a bank above the skin track to excavate a column for a hand shear: whumph! The bank avalanched along the next 100' of the up track. Dangerous, no; telling, yes. As we came to a switchback not more than a quarter mile from the trailhead, we stopped, discussed, and reassessed our day's objectives. We believed that we could dig a few pits in safe locations near where we were. Students spread out, collected data, and came back together. No one was able to dig a pit without experiencing a whumph upon approach or excavation. I asked my TA what he thought; he replied, "I don't like this, I'm not very comfortable." This sentiment was palpable throughout the group. I stated that if the group wanted, we could continue up the skin track and manage the hazard. A choice was offered. They chose to go back to the flatland in the park and practice rescue drills.

When given the opportunity to be involved with the decision-making and risk management, students' desire to be out in fresh powder was outweighed by the



This sensitive cutbank collapsed when a student swiped his pole through it, providing an invaluable opportunity for the class to evaluate risk tolerance as a group. See another photo from the same day on page 18.

element of fear. Prior to opening the decision-making up to the whole group, students' perceived risk seemed low(er), and their risk tolerance seemed high(er) as they were guided. When ownership in the decision-making process increased, they moved away from the expert halo perception track, and correspondingly, their risk perception and tolerances shifted.

The outcomes from this experience had both short-term and potentially lasting effects. Students were able to experience a decision-making process where the outcome didn't match their initial desire. The experience of pulling the plug and turning back on a premeditated plan is invaluable. Students were able to use class 1 data to make a conservative decision in a real-life risk-management situation. This will hopefully have the lasting effect that, even in groups with more experienced members, their observations and contributions are valued.

For me, too, this process was valuable. Without open communication, I wouldn't have turned around at that point. My desire to provide an experience was replaced by managing fear in my students. Would we have had an accident if we continued? Would we have been able to manage the group within an acceptable risk tolerance? These are questions that won't be answered, and while important to ponder, they take a backseat to the learning opportunities afforded to all on this day.

*Chris Marshall is on the Adventure Education faculty at Prescott College and on the board of KPAC, the Kachina Peaks Avalanche Center. He is taking spring of 2012 off from instructing courses in order to sample powder around the West. Congratulations to Chris for winning an AMGA course scholarship for 2012.* ❄️



I once felt pretty good about my ability to manage risk. Reinhold Messner went so far as to argue that through deep experience some climbers gained such an edge that they might change the odds. In his essay, *The Will to Survive*, (2001) he wrote, "I would even dare to suggest that the climber who is in tune with himself and the world will not normally perish on a mountain. Does this then mean that every mountain accident has a spiritual cause?"

I felt that way myself once. Sleeping on the ground more days than not and climbing or skiing when I woke bred an awareness and a confidence that led me to believe I could keep myself safe on any terrain. I relished that feeling and believed in its truth. The deep knowledge and awareness of the mountain world I possessed allowed me to go to some pretty wild and remote heights and come back intact.

Recent research – popularized by David Brooks in *The Social Animal* – points to the ability of the human mind to make sense of and draw conclusions from the myriad data that our conscious mind ignores. In my opinion, it's not Messner's "spirituality" that is at play in keeping us safe. It is the extraordinary work that our subconscious mind can do once it has

the experience and learning with which to do it.

Now, without the same daily practice in the backcountry and with the added fears that come naturally with age, I no longer have the same faith I once did in my ability to predict natural hazard in the vertical world. With a mortality that is more evident and a set of responsibilities that are more present, the invincibility I once felt is hugely tempered. Looking back I wonder: how much of my success in avoiding hurt on dangerous ground was deep intuition or subconscious decision-making? How much was luck?

I do believe the human mind has abilities to process information well beyond conscious cogitation. But, there are limits. The invincibility I once felt was almost certainly more arrogant than I admitted at the time.

Climbers and skiers are doing unimaginable things in the mountains today. It is inspiring and impressive. It expands the human envelope of what we believe is possible in every walk of life. I am in no position to judge the risks others take. I stand in admiration. I do know, however, that I have lost too many friends. I have seen, in the eyes of my family, what it would really have been like for them to lose me. With these added inputs I have to admit: expert though I may

have been, I was clearly more lucky than good.

As time passes our hazard evaluation techniques change. As a young climber I had very few partners and we knew each other well. With the advent of sport and gym climbing, we climb with a much wider variety of partners. As a result, we must add a more thorough conversation about the plan for each pitch to the repertoire.

With more skiers in the backcountry than ever, we all need to take the prospect of people below into consideration before we step onto a slope. I might also need a bit more luck.

*Phil Powers is a long-time climber with first ascents in the Alaska, Teton, and Karakoram ranges. He has authored two books on climbing and now serves as executive director at the American Alpine Club and co-owner of Jackson Hole Mountain Guides. He lives with his wife, Sarah, and children in Colorado.* ❄️





# AN AVALANCHE LESSON FROM MY FATHER

Story by Jonathan S. Shefftz

My father taught his two sons so very much, but he never taught us anything about avalanche safety. Except for passing along what he heard about how important spitting is if buried in an avalanche. Which of course is entirely worthless. Although all of that was okay, since we were just skiing inbounds back East anyway.

But I thought of my father recently when I was trying to Say Something Profound. At my AIARE Instructor Refresher Course this past fall, we discussed course closure, including Colin Zacharias's *Where Do We Go From Here?* article. I had never been very concerned with course closure – thank all my students for their hard work, pass out the official certificates and course evaluation forms, urge them all to continue with their education, and wish them well. What else was there to say? I'd already said everything I could possibly think of to say, whether in the classroom, in the field, or via feedback on the extensive homework assignments.

This year though was different, as it was the first year, in my six years of avalanche safety instruction, that a former student had been in an avalanche. Both the former student and his partner were okay, but I was not. I joked that the course had been very large with numerous other instructors, and as I had no input on course content or format at the time, I could disavow all responsibility for the incident.

But a picture taken shortly before the incident was striking, almost haunting. The former student stands at the base of a couloir prone to avalanching. Freshly wind-loaded snow sits on top of a water-ice bed surface. Since taking the course with me years ago, the former student has spent his winters as the caretaker of a nearby hut. My safety instruction – combined with such obvious clues and such experience – couldn't prevent that kind of avalanche incident? My father had taught history to many generations of university students, and although some learned more than others, at least all of them learned the basics, e.g., Hitler = bad (very much so). But if I hadn't succeeded in teaching that such a freshly loaded wind slab on top of water ice in a steep avalanche path = bad (very much so), then what was the point of it all?

Now this gets into glass half full versus glass half empty, or rather in the context of avalanche safety class graduates, 99% effective versus 1% ineffective. But I nevertheless started mulling over in my head how to Say Something Profound upon course closure.

I thought of a recent incident, publicized even in the mass media. Which incident really doesn't matter, since the vast majority are all so similar. The party members were experienced backcountry skiers. Which they almost always are, since most people skiing in the backcountry are experienced backcountry skiers, just like most

people skiing at resorts are experienced lift-served skiers. So most backcountry skiing avalanche incidents involve experienced backcountry skiers, just like most highway driving fatalities involve experienced drivers. But the mass media accounts still emphasized the shock at how a backcountry skiing avalanche incident could involve experienced backcountry skiers.

The mass media accounts also wanted us to marvel at the party members' various skiing accomplishments, credentials, and qualifications – all of which were entirely irrelevant to avalanche safety. And at least one was a "pro" skier. Just like I was a "pro" skier when I was an NCAA varsity alpine ski racing coach, starting to get into backcountry skiing, with absolutely no avalanche or even general backcountry skills. My only strength back then was that I was aware of my numerous weaknesses.

So in this latest high-publicity incident, the party members chose a slope that was probably at the precisely optimal angle to maximize fracture initiation given the snow conditions, and after skiing, waited above a terrain trap into which most of them would soon be entrained. The avalanche danger that day was relatively widespread and uniform. Anything not steep enough to slide probably would not have been much fun to ski in the deep freshly fallen snow.

But still, as often happens, only the Nth skier triggered the slide. So maybe the probability of triggering a slide – even in the midst of all those obvious clues – was only 1/N that day on that slope. Then again, the probability of losing a single round of Russian Roulette is "only" 1/6. To last very long in the backcountry, the probability of an avalanche needs to be far lower.

Yet that also means that slopes with only a very small probability of sliding have to be foregone. And on days with nearly uniform instability and deep snow that renders lower-angle slopes into tedious downhill trailbreaking, pretty much all backcountry skiing for turns has to be foregone.

This reminded me of a snow-related story my father often told me, often on the chairlift, or in the car driving to and from ski areas. He had not started skiing until adulthood. Which was hardly surprisingly, as skiing was decidedly not the pastime for children of immigrant parents in urban Boston growing up during the Great Depression.

Yet even aside from all that, he could not play outside during the winter with all the other kids from the neighborhood because of his childhood asthma, which was so poorly understood back then that cold weather was thought to be the trigger of the frequent terrifying attacks (for which no effective drugs were available yet). So his childhood memories of winter were staying inside, protected by his mother (like she as a child had been protected by her family from the various marauding soldiers

during the Russian Civil War, from which they barely escaped to America), as he heard the other children playing in the snow.

How he longed to join the other kids throwing snowballs, making snow angels, and sledding down hills! Those were very painful memories for him, although he always told them in a positive way, to emphasize how grateful he was to be able to ski as an adult (especially with his two sons).

For a backcountry skier to turn back from an enticing yet potentially unstable slope, or even foregoing any backcountry turn-oriented skiing, while others are out skiing there, and having fun, and probably coming back from that one outing just fine – that can be just as unhappy and lonely as a little kid shut away in a small house during the Great Depression.

But if you get to live like my father did to ski every year for over five decades straight, complete a fulfilling career, teach your two children to ski, see them marry and bless you with grandchildren, and in the last moment at the very final end have your wife of nearly five decades loyal as ever by your side...whether profound or otherwise, that's my course closure.

*Jonathan Shefftz is an AIARE-qualified instructor, NSP avalanche instructor, and AAA affiliate member. When he is not searching out elusive freshies in southern New England or trying to convince skiers to run up and down ski areas in the NE Rando Race Series, he works as a financial economics consultant and has been qualified as an expert witness in both federal and state courts. He lives in western Massachusetts with his wife and toddler daughter, who has already learned about avalanche safety in the form of proper probing techniques (see photo below). He can be reached at [jshefftz@post.harvard.edu](mailto:jshefftz@post.harvard.edu).* ❄️



The granddaughter getting an early lesson on avalanche safety in the form of proper probing technique.

## Lethal Clients

Remember to include the quote about how as a guide, your clients are always trying to kill you!

I think that seriously says a lot about how a guide has to survive the same risks, day after day, whereas for a client, the once-in-a-lifetime opportunity can lead to more risk taking. Note how the recent CMH fatality was an executive working in Dubai – that has to put lots of pressure on a guide to take risks.

Jonathan Shefftz ❄️

## BE SAFE, HAVE FUN, GO SKIING

Story by Chris Shelly

Risk tolerance, risk perception, risk management, risk acceptance – what do these terms mean to me on a professional and personal level? How do I differentiate or manage risk on a professional level as opposed to a personal level? Well, money for one – albeit not much, but money nonetheless.

For me the difference between professional and personal risk is a tomato/tomhaotie. When I get paid to keep people safe I want to do just that, keep them safe. They think it is all about fun, which is just fine by me – educate them. I also want to show them a great experience and meet, or hopefully even exceed, their expectations. I have a priority list: be safe, have fun, then go skiing. I always try to keep it in this order. I also believe in being as aggressive (determined by me based on conditions and ability level) as I can and pulling back – never the other way around – and always sticking

to my safety protocols. There is a difference between taking risks and taking chances, and therein lies the rub.

On a personal level I adhere to the same way of thinking, but now I am only taking care of myself and friends, not the public or paying clients. And yes, I owe myself and friends the same consideration as I do strangers who may or may not know I am looking out for them, and that they are looking out for me. At the end of the day if we are all smiling, can do it again tomorrow, and can call our parents and friends with only stories of joy, it was a good day and risk has been managed – till the next time.

*Chris Shelly worked as the snow safety director at Moonlight Basin for a number of years as well as the patrol and snow safety director at Ohua, NZ. He currently works as a mechanized ski guide and as the forecaster for H2O Guides in Valdez.* ❄️



# TRICKS FOR COMMUNICATING RISK

Story by Kent McBride

My risk tolerances are much less than when I first began guiding (thank you, experience). I also believe that my tolerances are much less than what is expected of me institutionally, just like most guides would claim.

The way I manage my clients and students desires for risk-related adventure is to point out the hazards that I'm truly concerned about by getting as close as possible to existing risks while still assuring safety. Just staying in the parking lot and telling my clients that it's not safe to ski today isn't good enough – obviously there are exceptions, and they are based on judgment. Getting out near the hazard also helps me stay in tune with minute changes in the snow. This year's dangerous snowpack in the Tetons is a prime example of curbing clients' appetites for steep skiing in tricky hard slab conditions. Simply put, the Tetons have a very weak continental layer on the ground with a thick maritime slab on top.

During an hour approach you can highlight the key points of a Level I avalanche course to help outline concerns to the client. An example of this might be digging a pit with a client to show them what layers exist and what this means for overall stability or instability. If I don't have time to dig a full pit for buried facets, I will ask clients to do a pole test by turning their pole upside down and pushing as far into the snow as they can, reaching into the resulting hole and

pulling out a handful of faceted snow. This is an easy way to show weak structure.

Getting up on a vista and passing around a pair of binoculars while pointing out numerous crowns with debris piles at their base is an easy way to convey hazards to my clients.

Another interactive display of snow stability is to utilize the force that a group of four to five clients can generate by gathering in a flat safe zone and jumping together to cause a collapse... this really gets their attention and drives home the fact that the snowpack is very weak.

We start out skiing runs without any consequence, and if the clients are following directions and I have their respect, then we can move to more serious terrain. If you show them good and fun skiing they will most likely follow your instructions.

What really helps is discussing the hazards and what I'm trying to avoid. They respect this, and it makes everything seem a lot easier to understand. With education we become a team. I work with a lot of return clients, and we have mutual respect for each other. I try to treat them like ski partners and have fun.

*Kent McBride is a UIAGM guide who works with Exum Mountain Guides, First Ascent, and many others. He lives in Jackson, Wyoming, with his wife Penny and son Kai, who is a fool for homegrown strawberries.* ❄️

## EXPERTISE MATRIX

continued from page 26

replaced *unconscious* with *unaware* and *conscious* with *aware*. We want our students and instructors with their heads up, their eyes open, and their thoughts focused on the situation at hand. We have also added a fifth level to the matrix that reflects the paths the expert might take: either the reflective path of the true master or the complacent path of the false master.

We draw this model in a circle, indicating we move all the time between these levels of expertise. We draw a loop back to *aware* and *competent* and label that loop *mindfulness* – the intentional consideration of how we think that is vital in the lifelong process of developing our judgment, making us aware and competent master practitioners. We draw another loop of *complacency*, a trap of the expert who is not reflective and risks becoming unaware of their incompetence.

As educators, we should strive for reflective competence. The ability to intentionally develop our own judgment and to pass on the lessons we have learned to our students requires that we spend time reflecting on our decision-making process. How can we expect to teach others if we cannot articulate what we ourselves have experienced? In our opinion, the hallmark of an expert is not that she has reached a level of subconscious heuristic processing. It is that she has developed the intentional practice of self-reflection that allows her to understand why she subconsciously chose to follow or ignore the heuristic at hand. It is this willingness to question one's underlying decision-making processes that allows one to truly become an expert. Once an individual enters the cycle of mindfulness, she becomes a much better student and educator.

<sup>1</sup> Dreyfus HL, Dreyfus SE. Expertise in Real World Contexts. *Organization Studies* 2005; (26)5: 779-792.

<sup>2</sup> Atkins D, McCammon M. *Differences Between Avalanche Experts and Novices*, International Snow Science Workshop Sept 19–24, 2004, Jackson, WY

<sup>3</sup> Discussion cited on [www.citehr.com/23983-conscious-competence-learningmodel.html](http://www.citehr.com/23983-conscious-competence-learningmodel.html), retrieved 10/20/10 ❄️

## fiction

She loves me, she loves me not.  
She loves me, she loves me not.  
She loves me...

Story by John Stimeris

She was so kind and full of promise when we last met, last winter. She arrived full of love, returning from an unexplained absence. She told me she learned her lesson; everything was going to be different this time around. And all was well until she left, again. My heart was broken. The landscape about me was a frozen wasteland in her absence. She met someone else, down south. I stared at an empty sky and longed for her return.

She came back, burst through the door and embraced me like she had never left. The door was wide open and the cold blew in. It felt good, so good considering SHE was here. I smiled, we played, and life was good again. But she had a few tricks up her sleeve. It wasn't going to be so easy this time. Love and longing; absence makes the heart grow fonder. Her love was tumultuous, full of surprise and intrigue. She challenged me in so many ways, but we worked through it. Best of all she was staying this time. Maybe a little too long.

It felt like our winter together never really ended. When she did finally leave her memory was strong, a constant reminder that she was not far. The memory of our winter together continued to dominate our summer apart. So much so that summer never felt quite right. Did it really arrive? Will she really return?

Rumors started that she would. Oh the rumors! The boys down at the Ol' CPC always seem to have a pulse on what's happening. We stood upon the shore, the edge of the continent, staring into the future, awaiting her arrival. The memory of a lost summer faded just as the first sense of her arrival began to reach us. She's a bit cold you know; our hands and faces felt the brush of her return in September along with the rain. The rain continued into October and November. She always brings rain and gray skies and the cold. That's just the way she is. Then she arrived, burst open the door and covered us in her love. She's back and all is well. It's going to be so good this time, I can tell. It's for real.

She needed to get away for Thanksgiving, but by early December I was beginning to have my doubts. And I continued to wonder through the month. Wonder turned to worry, until she sent a little love just before the New Year. It was just enough to keep our hope alive and make us happy, but then nothing.

The rumors were out there. She was up north this time. Something to do with her parent being somewhere near the gulf. But I knew better, she found someone else. Alaska! Damn it, he always gets the girl. By the time the news reached us it was getting pathetic. Really Alaska, do you need to rub it in? Must you brag to all of us about how much you're getting? But she slipped away while AK was bragging. She returned with a new attitude. She was here, but this time her love was like a roller coaster. Cold, then warm, then cold again. All is stable, only to heat up again and send us into a tail spin. She iced me out and returned



Poster courtesy Matchstick Productions

with a soft embrace, then iced me out again. She cried, soaked us in her tears, then she left again. The boys down at the Ol' CPC said she'd gone up north again, but don't you worry, she'll be back. They're probably right, but I don't know. Maybe it's time to grab a corner booth, and cry into my beer. You know I should call that guy from down south. Sierra, I think? Man, he'll understand. I hear she won't even talk to him; left that poor boy high and dry.

*John Stimeris is a highway forecaster for the Washington State DOT, vice-president of the AAA, and a fine amateur photographer. He steals time from a busy winter to write this meditative fiction.* ❄️



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## TURNAGAIN PASS

*continued from page 13*

moderately thorough full assessment on him. I asked him the questions like his name, date, where he was, and what had happened. He knew his name, guessed it was Tuesday, and didn't know what had happened. We helped him back into his skis, and he took his own skins off, and C&D proceeded down.

I located my gear and was preparing to catch up with them when Wendy (Chugach Avalanche Center forecaster) came on scene. I remember at some point after we located C, I told someone that it might be a good idea to go down and find Wendy as she had a sat phone in her pack. I gave Wendy a quick recap of what happened and continued down to catch up with C&D. About halfway down, D traversed to the car and I went with C straight down the roadside where D picked us up, and we proceeded to the hospital. I think the official diagnosis at the hospital was concussion with a clean CT scan.

I think A&B were on a beacon search from above, and we all arrived at the burial site at the same time. This was a group rescue, and we were incredibly lucky to have all of the experience and calm and efficient response afforded by all people involved in the incident. I remembered C being behind D on the skin track and assumed he would be downslope from D's location. I also saw poles (which were D's) downslope from D. I think the fact that C caught a tree kept him in place while D was swept past him. From the time the avalanche occurred until we found C, I was tunnel-visioned on my beacon search, so there are probably inaccuracies in my account, but I wrote this with the intent of it being used as a learning experience, teaching tool, etc.

### Things I think I should have done differently *(aside from not skiing the backcountry that day)*

1. When I made contact with D, I should have ensured his beacon was not in transmit mode before I continued my search. I had no clear picture of D's

condition other than knowing he could talk and didn't know where C was. I probably should have started my search from D's location rather than continue downslope.

2. I was using a beacon that belonged to Meaghan which I had experience with but not recent experience. I didn't have a good feel for how it searched or its sensitivity. I was borrowing hers because my own was analog and inferior. I have a Barryvox that was malfunctioning, and I actually gave it to Wendy earlier that week so she could refresh the software. Had I been as confident as I should have been in the use of the Tracker, I could have had a faster search.
3. After we located C, I should have realized how he was buried in relation to that tree and dug accordingly.

### Thoughts on beacon storage on the body

My initial exposure to avalanche safety was as a ski patroller in high school. We were taught "beacons belong harnessed to torso over base layer of clothing under outermost layer."

In 2003 or so I took a level I class from Alaska Avalanche School along with the two victims from the avalanche last month, and we were taught "beacons belong harnessed to torso over base layer of clothing under outermost layer."

In 2007 I met my fiancé while skiing with her and her boyfriend at the time. They were both mountain guides and were up here to take the AMGA test for ski mountaineering in Valdez, and they were wearing beacons in pockets. I brought this point up with him and made the argument that I am about to make.

As a rescuer I can see why it is advantageous to have a beacon in the pocket, but as a victim I don't see the advantage – in fact I see several disadvantages.

One swipe with a utility knife is all it would take to open up a sewn-in pocket, and then all you have connecting the beacon to you is a bungee lanyard? I once got caught up in a situation where I thought a buddy was caught up in a slide that he actually skied out of, but I didn't know that and couldn't see it. It

was an early season avalanche, i.e., climax slide with a shallow snowpack, and the bed surface was shale. The debris ran down a draw and piled up in a terrain trap, and as I destroyed my skis billygoating down this shale slope as fast as I could, I thought: he's going to be hurt bad. Got down to the debris pile, started searching, got no signal, my heart stopped, looked right, and about a quarter mile away I saw a figure with a gnome-like mountain hardware hat on and knew it was him – he skied out of it, but it fractured slightly above me as well, and I had to turn and face the slope to anchor myself. It was foggy that day, so I couldn't see him. If he had his beacon in his pocket and was caught in that one, I think his pants would have been ripped to shreds, and there's a good chance his bungee lanyard wouldn't have been enough to keep his beacon attached to him. He always harnesses his beacon to his torso.

Getting thrown up against trees like C was? How much force does it take to separate a zipper? One branch can tear fabric easily; ever torn your ski pants before? Ever lost keys out of a pocket because you forgot to close it? Ever seen an open femur fracture in person? If that bone end is sharp enough to tear through skin muscle and connective tissue, you know it's going through your pants. My beacon in my pocket sits right about mid-shaft, maybe slightly proximal lateral femur. Now if you are buried in an avalanche and have an open femur fracture and are relying on a beacon search to save your life, it might be a Hail Mary, but I want the chance.

It just seems like this practice allows a lot of opportunity for beacon loss versus putting the harness on, and it troubles me that all of the professionals are adopting this practice. I keep bringing it up to everyone, and I just haven't gotten an explanation that convinces me that it makes sense to do that. Is there anything published on this? What is avalanche education curriculum preaching these days?

*Editor's Note: Who has answers to Cody's questions? Send your replies to the editor by July 1, please.*

Athlete/Team Rider Robbie Hilliard; Photo: Joe Royer; Ruby Mountains, Nevada

