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The journal of Canada's avalanche community

LESSONS IN LIVING

INCIDENT REPORTING

New research, AC at the Lake, AGM photos, and more!

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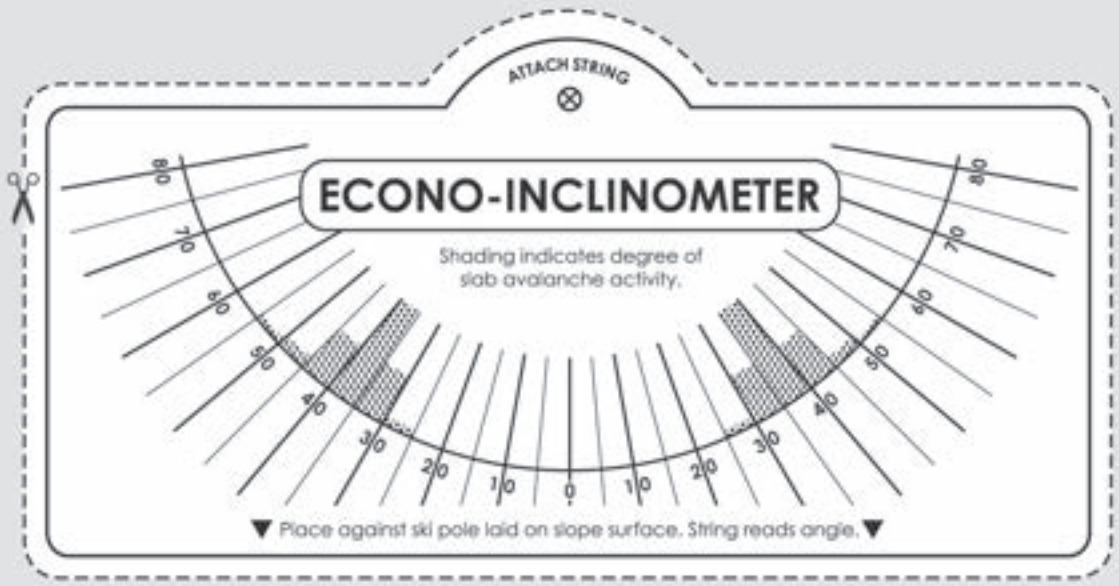

Cover shot: It was quite the winter in Stewart, BC this year. Accumulated snowfall was over 16 metres and the Ministry of Transportation Avalanche Control crew recorded over 1200 avalanches. Heli-bombing triggered this size 4 on January 25. The slide ran 1800 vertical metres before burying the highway 15 metres deep for 140 metres. It took a D-10 cat and three loaders 48 hours to remove the deposit. Photo by Mark Austin.

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Photo credits from the top: Chris Christie, CAA, Loni Klettl Collection, Lori Zacaruk Collection.

failure plane

In our 25th Anniversary AGM program and poster, a photo from Jasper National Park was wrongly attributed to Garth Lemke. Although Garth kindly provided us with the photo above, he is, in fact, far too young to have actually taken the picture, which shows a warden in pre-GoreTex days, with a frame pack and classic red Hanwags. The photo credit should have read: Courtesy Jasper National Park. We regret the error.

avalanche.ca

Our vision:
To be a world leader in avalanche awareness, education and safety services.

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Volume 81 Summer 2007

Avalanche.ca is the official publication of the Canadian Avalanche Association (CAA), the Canadian Avalanche Centre (CAC) and the Canadian Avalanche Foundation (CAF). The CAA and CAC are non-profit societies based in Revelstoke, BC, serving as Canada's national organizations promoting avalanche safety. The CAF is a registered charity formed to provide a tax-deductible fundraising mechanism for the support of public avalanche safety initiatives. The CAF is based in Canmore, AB.

The goal of Avalanche.ca is to keep readers current on avalanche-related events and issues in Canada. We foster knowledge transfer and informed debate by publishing submissions from our readers. Responsibility for content in articles submitted by our readers lies with the individual or organization producing that material. Submitted articles do not necessarily reflect the views or policies of the CAA, CAC or CAF.

Avalanche.ca always welcomes your opinions, teaching tips, photos, research papers, survival stories, new product announcements, product reviews, book reviews, historical tales, event listings, job openings, humourous anecdotes and, really, anything interesting about avalanches or those people involved with them. Help us share what you have. Please send submissions to:

Editor, Avalanche.ca
Canadian Avalanche Association
PO Box 2759, Revelstoke, BC V0E 2S0
Tel: (250) 837-2435 Fax: (250) 837-4624
E-mail: editor@avalanche.ca

Editor	Mary Clayton
Graphics & Advertising	Brent Strand

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Look At Us Now

"Look at us now!" is a phrase that jumped out at me during the CAA's 25th Anniversary party. No, it didn't come from a group of colleagues after a long night of too many beverages. It was a phrase repeated by three of our industry's founding fathers—Willi Pfisterer, Fred Schleiss and Peter Schaerer—as they each received awards in recognition of their contribution to avalanche safety in Canada.

The words came during their speeches as they remarked, with pride mixed with amazement, on the size of the gathering. I wondered what it was like for them to look out at their audience—every seat filled and scores more lining the walls. The contrast with the first CAA meeting must have been remarkable. When that handful of avalanche workers met in the Banff fire hall to explore ways to improve their profession, they couldn't have imagined what they were starting. Now, 25 years later, it's a tremendous legacy.

We're tremendously lucky to still have access to the memories, perspective and wisdom of the many individuals who laid the groundwork for the industry we have today. Throughout this year, we'll continue to celebrate our 25th anniversary by bringing you stories about the personalities whose dedication and vision helped shape our community. It's a colourful and fascinating history.

In our last issue we brought you a feature interview with Fred Schleiss, along with his brother Walter and son Johann. In this issue we have an article focusing on Willi Pfisterer and Toni Klettl, who led the early years of avalanche control at Marmot Basin near Jasper. The story originally appeared in Jasper's weekly paper, the Fitzhugh, and unites Willi and Toni with today's AC team at Marmot. I really enjoy gathering these stories that celebrate our history, and I hope you enjoy reading them.

We also have a couple of stories from more recent history that you're sure to find interesting. These are tales of close calls from this past winter that we're calling "Lessons in Living." They begin on page 61 and both are first-person accounts of near-misses, where Mother Nature was laying down some hard rules. The writers are very honest about the mistakes made, and their stories are all the more compelling because of it. Even the most experienced among us will admit there's always more to learn. Thanks to Scott Kells and Rick Tams for sharing the lessons they learned with us.

And speaking of sharing, I just want to make a plug for the CAC's new online incident reporting form. A lot of thought and energy has gone into designing this program to make it accessible and easy for anyone to share information on close-calls or notable avalanches. You can read more about it on page 35 and we're looking forward to having it up and running for the coming winter season.

Enjoy the summer!

The view from up here

The view from the side door of Canadian Mountain Holiday's Bugaboo Lodge, looking north to one of the most photographed back yards on the planet. Houndstooth Spire splits the Bugaboo Glacier, with Pigeon and Snowpatch Spires to the right and Anniversary Peak on the left. This is where the heli-skiing industry was born, when CMH founder Hans Gmoser first brought clients to ski on the glacier with the aid of helicopters back in 1965. In February, 1968, Bugaboo Lodge opened for business and skiing has never been the same. Thanks, Hans.

Courtesy of CMH

To the Editor,

While researching an article on the evolution of the Avalauncher for this journal, (*A Brief History of the Big Bang*, Winter 2005, vol. 75) I came away with a great deal of knowledge on the subject. As a result, I was quite disappointed to read Dave Sly's recent piece (*Avalanche Explosives Control Update*, Spring 2007, vol. 80) and find numerous occasions where he misleads the reader. While I applaud CIL/ Orion's dedication to the avalanche community, I feel compelled to forward some hard facts.

When Dave writes: "All parts and design for the Stubby are made in-house by CIL/Orion and the Austin Powder Company. This gives us the quality control that was lacking in the past" the reader is unaware that Dave is referring only to the plastic body and tail fin of their projectile system. This statement misleads the reader because the arming disk, arming disk clip, spacer washer, rivet, arming wire, magnet, magnet anvil, striker, flight safety pin, ejector spring, ejector spring washer, transport safety pin, pull ring, primer ferrule and the nose cone of the Stubby assembly are all items that Pete Peters of Avalanche Control Systems orders and prepares himself.

Despite Dave's derogatory connotations to anything "homemade," the previously mentioned components of the Stubby are assembled in the home of Pete Peters. Over 1000 of the white Stubby tail assemblies have been prepared there to date. Additionally, the parts used on the Stubby aren't unique to that tail assembly. Rather, they are used on a variety of different tail fin models.

Dave feels that, "the entire USA market appears ready to switch from homemade fuse assemblies to a reliable factory-made fuse assembly." And, separately, "The Mildet has been used exclusively in Canada for the past six years." First off, portions of the USA market and the entire Canadian avalanche community have been using factory-made cap fuse assemblies prior to the CIL/Orion Mildet. These include the Tec Harseim and Cobra assemblies. Secondly, to condescendingly call the cap-fuse assemblies manufactured by portions of the avalanche specialists in the USA "homemade" is to undermine our training and experience in this work.

Dave relates that, while using the Avalanche Pipe at the Aspen Highlands, "we were there the day after the largest snowfall of the season and the large explosions soon emptied the bowl of any dangerous deposits." From this, most readers would assume that avalanching had occurred. The fact of the matter is that the 30 cm of low-density storm snow, deposited without wind, had no dangerous deposits. No avalanching whatsoever occurred—not even a sluff.

Lastly, I have to comment on Dave's assertion that "Fluctuations in temperature play a large role in the diameter of an aluminum barrel, and our Stubby procedures address these barrel issues." I had a recent conversation with a metallurgical engineer, and by using the coefficient of thermal expansion for the type of aluminum used in Avalauncher barrels, it can be stated that from -20°F to +40°F a barrel's diameter changes by just .00275 inches—less than the thickness of most human hairs.

I contend that the incredible heat passed from molten cast explosive to the plastic Stubby bodies during the pouring process plays the major role in whether the full-bore Stubby projectile will fit the barrel properly, and that the vagaries of molding plastic parts to tight tolerances is a very minor factor. Additionally, Dave sells extruded barrels that, according to him, go through a post production machining process. Avalanche Control Systems, Avalanche Mitigation Services and the defunct Launcher Company all use/used drawn barrels, which come from the manufacturer as stronger, straighter units than the extruded version.

>>John Brennan is the owner/operator of Avalanche Mitigation Services, which produces and sells Avalaunchers and other projectile systems. He can be contacted at jb@avalanchemitigationservices.com

Dear Ms. Clayton:

The spring 2007 issue of *Avalanche.ca* featuring the snowslide disaster of March 4th, 1910 in Rogers Pass provides new insight into the human dimension of this tragic event. The material you present from the Revelstoke Museum and Archives combined with Cathy English's article will undoubtedly allow a more complete understanding of the avalanche cycle that besieged Rogers Pass and the Canadian Pacific Railway in early March 1910. This analysis also will contain lessons for present-day forecasters.

However, our review of the accident indicates that the photographs appearing on pages 48 and 51 of the magazine were not taken at the site of the disaster. The avalanche that caused the loss of life happened just west of the summit of Rogers Pass below Mt. Cheops near 17 Shed on the now-abandoned railway through the Pass (approximately N 51° 17' 15" W 117° 30' 50"). The photographs illustrating your article were taken on the east side of Rogers Pass below Mt. Macdonald near 14 Shed on the original railway line (approximately N 51° 19' 02" W 117° 30' 02"). This is a short distance upslope from the "Single Bench" snowshed currently protecting the Trans Canada Highway. These avalanche sites are a straight-line distance of 3.4 km apart and farther if measured following the original CPR route over Rogers Pass.

Your readers will be able to see the words "slide came down west of 17 Shed" in the telegram partially reproduced on page 48. Those familiar with Rogers Pass will recognize the view behind the workers as looking past the lower shoulders of Mt. Tupper and Mt. Macdonald and into the Beaver River valley with the Purcell Mountains in the distance. Photographs of the actual disaster site show either Mt. Abbott to the south or the Swiss Peaks/Mount Rogers to the north.

Since understanding past avalanche events is a vital to modern-day forecasting, we took a special interest in confirming these details when preparing the *Snow War: An Illustrated History of Rogers Pass, Glacier National Park, B.C.* (John G. Woods 1985) and *Rogers Pass Snow Avalanche Atlas* (V. G. Schleiss 1989). At that time, we found confusion in the labeling of the historic photographs at these locations and devoted special attention to details of the events at both slide areas.

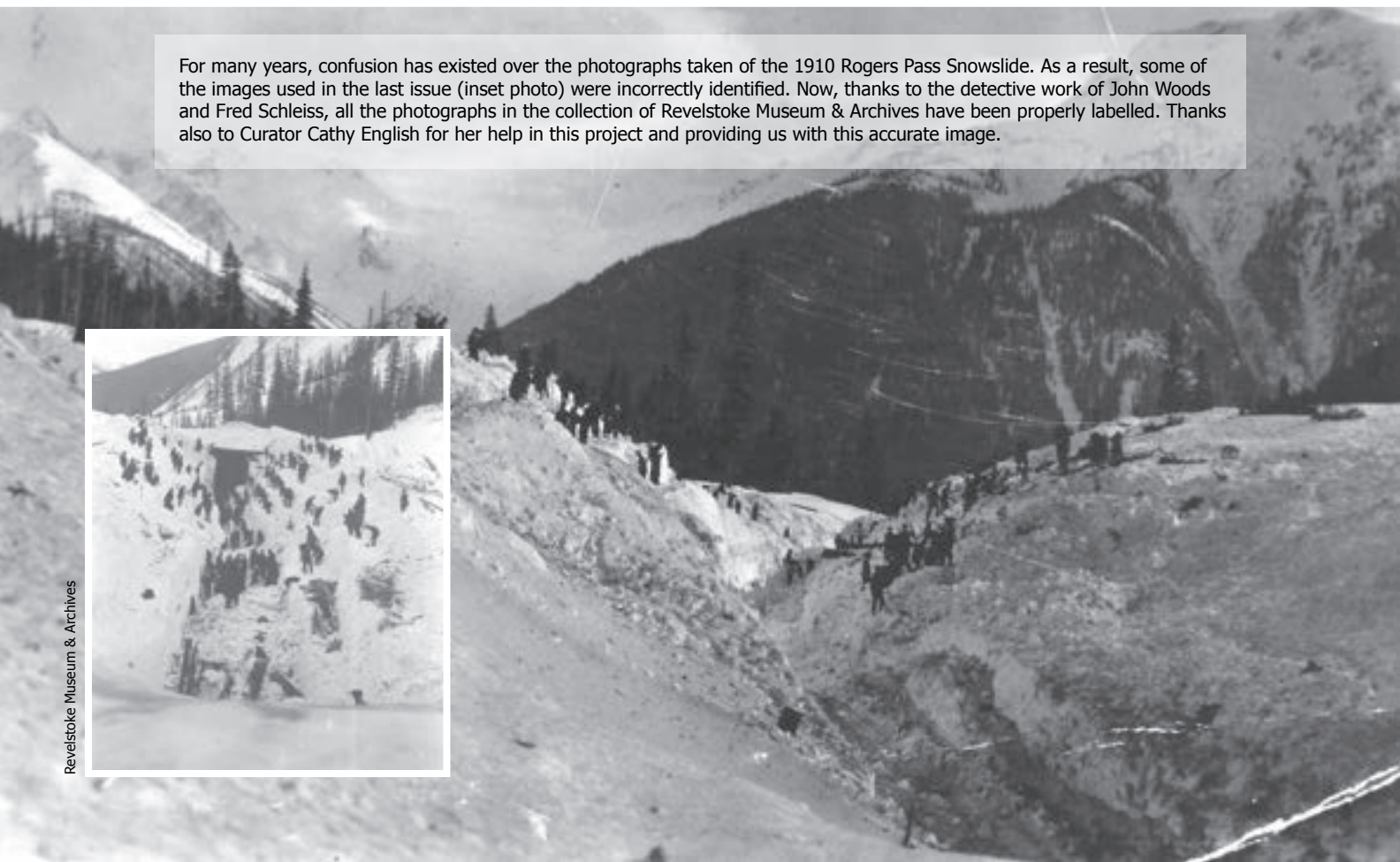
It will come as no surprise to your readers that the avalanche cycle that resulted in the deaths of so many people near 17 Shed also produced many other avalanches in Rogers Pass. The photographs appearing recently in *Avalanche.ca* illustrate a different slide that provided a dramatic photographic opportunity as workers cleared the debris.

Unfortunately, the mistaken use of photographs showing the wrong place for the 1910 disaster is commonplace in various media. This is understandable given the complexity of Rogers Pass geography and the event. We would appreciate your support in starting to correct these errors.

Sincerely yours;

V.G. Schleiss, Revelstoke
John G. Woods, Revelstoke

For many years, confusion has existed over the photographs taken of the 1910 Rogers Pass Snowslide. As a result, some of the images used in the last issue (inset photo) were incorrectly identified. Now, thanks to the detective work of John Woods and Fred Schleiss, all the photographs in the collection of Revelstoke Museum & Archives have been properly labelled. Thanks also to Curator Cathy English for her help in this project and providing us with this accurate image.



Revelstoke Museum & Archives

Clair Israelson

Workplace Safety

In recent years the CAA's advocacy and representation role has become increasingly time-consuming and important. In this piece I'll outline the most recent issue engaged by the CAA and describe what we are doing on behalf of the Canadian avalanche community.

Late in the fall of 2006, the CAA and other members of the avalanche community became aware of pending amendments to WorksafeBC (WSBC) regulations that have potential to affect all organizations in BC with workers exposed to avalanches. The CAA and other industry organizations submitted written feedback on the pending amendments, and on April 25th WSBC released a second draft of the proposed regulations as the basis for public consultation. The salient portions of the proposed regulations are reproduced below.

Part 4.1.2 Avalanche Assessment

1. In the section "avalanche assessment" means an investigation and analysis of the terrain in and around a workplace to identify any avalanche hazard areas and includes recommendations for
   a. measures to eliminate or reduce the risk to people working in the workplace, and
   b. procedures to be followed by persons working in the workplace.

"avalanche hazard area" means a workplace or part of a workplace that is at risk if an avalanche occurs;

"avalanche risk watch" means the monitoring of snow conditions by an appropriately qualified person.

2. Before work commences in a workplace where there is or may be a risk to a person working in the workplace from an avalanche, a qualified registered professional registered professional must conduct an avalanche assessment.

Note: In Part 1: Definitions, "qualified registered professional" means
   a. a professional engineer or professional geoscientist as defined in the Engineers and Geoscientists Act, or
   b. a professional forester or registered forest technologist as defined in the Foresters Act.

3. If an avalanche assessment identifies an avalanche hazard area, no work may be conducted in the avalanche hazard area at any time when snow conditions have the potential of creating an avalanche, unless an avalanche risk watch is being conducted and the person conducting the avalanche risk watch determines that is safe for people to work in the avalanche hazard area.

4. If an avalanche assessment has recommended procedures to be followed by people working in an avalanche hazard area, every person working in that area must be trained in, and comply with, any procedures applicable to that person's work.

These proposed regulations were a major topic for discussion among the CAA's Board of Directors and membership at our annual general meeting in May. There was broad consensus that the CAA should work with all stakeholders to develop a strong position that would help WSBC better understand avalanche and worker safety issues.

Over the past six weeks there has been extensive dialogue with many industry organizations, professional associations, members of the avalanche community, and of course our Board of Directors on this issue. I wish to acknowledge the following organizations for their helpful comments: Association of British

Columbia Professional Foresters, Association of Canadian Mountain Guides, Association of Professional Engineers and Geoscientists of BC, Backcountry Lodge Operators of BC, BC Forest Safety Council, BC Ministry of Transportation, BC Provincial Emergency Program, Canada Ski Guide Association, Canada West Ski Areas Association, HeliCat Canada, Parks Canada, and WorkSafeBC,

On June 11 the CAA board of directors approved the CAA's oral submission, and on June 12th I delivered the following presentation at the WorkSafeBC public hearing in Vancouver.

CAA Oral Presentation Regarding Part 4.1.2, Avalanche Assessments

- The Canadian Avalanche Association (CAA) is representing workers in these matters
- The CAA is a not-for profit, non-government organization that represents the people and expertise of the Canadian avalanche community:
  - The CAA is an inclusive organization representing persons engaged in avalanche related activities in Canada. The CAA has over 800 members. Our membership includes ski patrollers, mountain guides, provincial and federal avalanche workers, engineers, geo-scientists, foresters and other registered professionals, consultants, researchers and others.
  - Describe purposes and scope of membership as stated in the CAA constitution and bylaws. (table CAA constitution and page 1 of bylaws)
  - The CAA develops national technical standards for avalanche work in Canada (table OGRS)
  - The CAA provides the formal training programs for avalanche workers in Canada (table Introductory and Advanced Avalanche Hazard Mapping course outlines as examples)
  - CAA has a long history of brokering "best practices" for many avalanche-related activities. For example, Explosives Use Procedures in collaboration with the WSBC Program Design Division (table training program documents)

Mark Klassen

General comments

- Worker safety has been an important issue for the CAA for many years. We fully support well-considered WSBC regulations that truly improve the safety of workers exposed to avalanches.
- We note that worker exposure to avalanches is increasing in many industry sectors, including construction, forestry, mining, transportation, downhill ski resorts, commercial wilderness operations, and a myriad of other activities undertaken by BC's diverse and highly mobile workforce.
- We believe that due to lack of early consultation between WorkSafeBC and stakeholders the proposed amendments relating to avalanches in Part 4.1.2 are well intentioned but misguided and unworkable.
- We see at least three distinct categories of workers exposed to avalanche hazards in British Columbia. These are:
  - "Unprotected workers" such as timber cruisers and others who travel in the mountains to do their jobs and may not have any avalanche specific training or workplace safety procedures.
  - "Protected workers" such as highways maintenance contractors, miners, loggers, etc. who work in a setting where there is someone responsible to protect them from avalanches.
  - "Avalanche workers" such as ski patrollers, mountain guides, MoT avalanche technicians, parks staff, consultants and others.
- We believe that each of these categories of workers will require different types of safety plans and operational procedures for effective protection from avalanches.
- It appears that the strategy presently described in part 4.1.2 has been designed for forestry. To use this same approach as a "one size fits all" prescription for all other sectors exposed to avalanches in BC is simply wrong and won't work.
- We contend part 4.1.2 needs significant revision in order to be effective. The CAA will, in a written submission, recommend specific wording changes to 4.1.2 so that all workers in BC have effective and realistic protection from avalanches.
- We are pleased to see that the April 25 version of the proposed amendments treats avalanche assessment and terrain stability assessment separately. This is a very important distinction, because people qualified to conduct terrain stability assess-

ments are not necessarily qualified to conduct avalanche risk assessments.

- The term "avalanche assessment" as presently defined is conceptually flawed. The correct term should be avalanche risk assessment, and understood as "defining the avalanche problem" based on analysis of terrain variables, the snow climate, the estimated return periods and magnitudes of avalanches, and the type of work that is to be done in that workplace.
- There is a second, equally crucial component that builds from the avalanche risk assessment, and that is an avalanche control plan designed for the specific operational characteristics of each workplace.
- There are two distinct methods for avalanche control:
  - "Structural avalanche control" involves long term methods for reducing avalanche risks. These methods specify worksite layout, facility design and location, and use of the worksite by workers. Structural avalanche control may include the design and construction of built defenses against avalanches.
  - "Active avalanche control" involves continuously monitoring weather, snow and avalanche conditions, and determining day-to-day changes in avalanche hazard. This is the "avalanche forecasting" element. Then, based on this avalanche forecast and the specific requirements of the operation, the avalanche hazards are controlled using a variety of techniques.


Mark Austin

- We believe active avalanche control is what is intended by the term "avalanche risk watch" in the draft regulations. We urge WSBC to use language that is in common use. "Avalanche risk watch" is ambiguous and misleading and should disappear.
- We contend that the WSBC regulations should specify avalanche risk assessments and avalanche control plans as complimentary but separate and distinct components of avalanche protection planning.
- In 2002 the CAA produced two publications, *Guidelines for Snow Avalanche Risk Determination and Mapping in Canada*, and *Land Managers Guide to Snow Avalanche Hazards in Canada*. These publications were created by a blue ribbon international team of engineers, geoscientists, foresters, and avalanche experts.
- We believe that WorkSafeBC, members of BC professional associations, CAA members, and employers should recognize these documents as conceptual guidance and technical standards for avalanche risk assessments and associated avalanche control planning in British Columbia. (table both documents)

Qualifications for avalanche risk assessments and control plans

- Avalanche risk assessments require expert subjective judgment based on avalanchespecific training, knowledge and extensive experience. This expert judgment cannot be learned in school. A qualified registered professional, without extensive avalanche specific training and experience, must not be deemed to be qualified for this work.
- We contend that Professional Membership in the Canadian Avalanche Association should be the single overriding qualification for persons conducting avalanche risk assessments and planning and specifying the contents of avalanche control plans in BC. This CAA membership, and its requirement for ongoing Continuing Professional Development ensures that members' avalanche skills and knowledge are current with evolving national and international best practices.
- We agree that qualified registered professionals—who are also CAA Professional Members—should conduct avalanche risk assessments and prepare structural avalanche control plans for developed worksites in fixed locations.
- We contend that it is totally unreasonable to require qualified registered professionals to conduct detailed avalanche risk assessments for the vast expanses of terrain used by wilderness based operations such as heli-skiing or ski or snowmobile touring operations. A much simpler qualitative avalanche risk assessment is all that is practical and useful in these wilderness settings.
- We believe that "avalanche experts" are the only people who are qualified to conduct qualitative avalanche risk assessments for wilderness workplaces, and to plan and specify the contents of active avalanche control plans.
- Please note that at the present time there is no "statement of qualifications" for "avalanche expert." Until now there has not been the need to define this. The CAA's Board of Directors and membership are committed to urgently addressing this,

and other issues, that will fall from this proposed WSBC regulation.

Proposed definition: "avalanche expert" means a person meeting all qualifications recommended by the Canadian Avalanche Association for

- conducting qualitative avalanche risk assessments for wilderness operations where avalanche risk zones are occupied by workers on a transient basis, and/or
- planning and specifying contents of active avalanche control plans.

- As usually there is no one individual who possesses all of the expertise needed to produce high-quality avalanche risk assessments and control plans, a multi-disciplinary team approach has become accepted best practice in BC. We suggest these WSBC regulations should promote the use of multi-disciplinary teams for avalanche risk assessments and avalanche control planning.
- We recommend that where a combination of structural and active avalanche risk controls are needed, that avalanche control plan should be signed off by the qualified registered professional and the avalanche expert.

Implementation considerations

- We believe that achieving adequate worker safety will require development of sector and operation specific plans that specify:
  - Accountability for avalanche risk assessments and avalanche control plans, and employer accountability for operational implementation of the avalanche risk assessments and avalanche control plans for their respective operations.
  - Operational procedures that are tailored to the specific needs of individual operations.
  - Training and experience qualifications for workers for key levels of safety decision authority within operations.

- We will all need time to develop the capacity to deliver the avalanche safety programs necessary for the safety of workers in BC.
- We believe we need a full year to work with professional associations and employers' organizations to develop consensus based qualifications and sector specific guidance for persons who will conduct avalanche risk assessments and create and implement avalanche control plans in BC.
- We believe employers will need one additional year to do the avalanche risk assessments and prepare the avalanche control plans for the spectrum of operations in BC where workers are exposed to avalanche hazards.
- We believe that WorkSafeBC and all stakeholders need to commit to an urgent collaborative process to develop guidance documents for avalanche risk assessments, control plans and operating procedures for the protection of workers in British Columbia.
- We recommend that WorkSafeBC should revise part 4.1.2, and not enact the revised section of the proposed regulations until the fall of 2009, or some later date as determined by WorkSafeBC.

Additional written comments submitted:

- The CAA has recommended training and experience qualifications that are de-facto standards for entry level avalanche workers and avalanche control team leaders.
- The CAA believes that by July 2008 similar consensus based recommended qualifications can be in place for "avalanche forecasters" or "operations managers" responsible for the operational implementation of active avalanche control plans, and for the "avalanche experts" who should be responsible to conduct qualitative avalanche risk assessments for wilderness operations, and to plan and specify the contents of active avalanche control plans.

"Professional Membership in the CAA should be the single overriding qualification for conducting avalanche risk assessments..."

Where to from here?

Based on comments made by the WSBC Chairperson, I am cautiously optimistic that the CAA presentation, and other presentations that day by the BC Government Services Employee's Union, Kicking Horse Mountain Resort, IntraWest—Whistler/Blackcomb, HeliCat Canada and Parks Canada were collectively effective in convincing WSBC that a rethink of the avalanche-related sections of the proposed regulations is required. The CAA will, prior to June 29th, submit a written recommendation containing suggested wording for a revised regulation regarding worker safety and avalanches. Time will tell if our recommendations will be accepted by WSBC. Stay tuned, this story isn't over yet!

Have a great summer season!


Brad White

Keeping Current

Greeting from afar! I have resumed traveling with my family and we are expected to be settled back into Canadian life in early September. Happily, I was able to attend our 25th Anniversary AGM in Penticton this past May. For those who were there, this is an obvious statement but for those who weren't, it was a huge success! The CPD session was an historic event—solid gold as they say.

What I noticed most on a personal level was how detached I had become from the avalanche business while I have been overseas. Even though I received InfoEx and dozens of emails about the goings on, and stayed in reasonably close contact with Clair, it was just not the same as being immersed in the avalanche community in Canada. I think we take for granted the quality and quantity of communication that takes place formally and informally in the field of avalanche safety. It was clear to me in Penticton that there were hundreds of professional avalanche workers who are truly plugged in. Congratulations to you all for the fine work you do.

One clear theme, probably the theme of this AGM, was the future of professionalism as it pertains to the CAA. What does it mean and how do we get there? There is no question that the CPD program has brought us a long way on the path to professionalism. It is also clear that this program, as it stands, is not robust enough to meet societal demands of 2007 and into the future.

This is not the time to criticize the decisions made or the directions taken by previous boards of directors. These boards managed the issues of their day with integrity and in a highly principled fashion. Now is the time to look at where we are and where we need to go. Our history tells us events can come at us that are far beyond our control. Where our association has shone in the past is the way it has responded to these events, many of which were of a magnitude to create seismic shifts in societal expectations.

Proposed changes to WorkSafe BC regulations are a perfect example of this. As we work with WorkSafe BC on this issue, our goal is to have CAA Professional Membership recognized as a standard qualification. At the same time, we must also move to clarify how this standard is achieved and maintained by our members. Tireless work has taken place to meet tight deadlines on this very issue, setting the stage for the next year of deliberation by your elected board of directors and committees.

The CAA financials seem to be in good shape right now but we must continue to grow our asset base to provide us with the stability to meet future challenges. Many of the issues on our horizon are complex and will require legal advice. As soon as we enter the legal arena the dollars go in a hurry, so now is not to time to relax the purse strings.

This issue of *Avalanche.ca* will cover off more details of the association's activities but I would like to formally point out that the ITP courses continue to perform above expectations. This is in large part to the great work of Ian Tomm, so be sure to shake his hand when you see him. Thanks Ian!

In the CAC camp we saw a solid endorsement by the Canadian Avalanche Roundtable for the products and programs delivered. A formal acknowledgement of the distance we have travelled in the few short years since the establishment of the CAC was also given. That's good news and great to hear but we mustn't pat ourselves on the back for too long. A few successful years does not a trend make. We need to ensure that we continue to target and reach our evolving audience in the years to come.

The key CAC challenge continues to be secure funding. It is important to keep in mind that the organization was established and built to be readily responsive to changes in funding levels. To say the CAC could just close up shop if the funding wells dried up would be an oversimplification. As a business, or specifically a not-for-profit society, this is true, but let's also remember the people behind the CAC—real people working very hard to provide maximum output for the inputted dollars. Thank JK and the team when you get the chance.

The CAA/CAC boards continue to work productively with the CAF. We thank the foundation for their continued financial support for various initiatives. We also look forward to our continuing collaboration to optimize our mutual efforts.

In closing, I think it is safe to say that the 2007 annual report card is a positive one. I also think it is safe to say that your Executive Director, Clair Israelson, deserves a hearty thank-you for his role in this. The boards are pleased to inform you that Clair has recently accepted a three-year contract that will take us through the 2010 Olympics. Thanks Clair!

Make no mistake, the boards recognize that despite the positive report, we have a challenging year ahead of us. We look forward to doing our best to represent you, our members and, as always, president@avalanche.ca if you have any feedback.

Cheers,

2007 Observation Guidelines and Recording Standards for Weather, Snowpack and Avalanches Revision Project

By Cam Campbell

If you haven't heard yet, the Observation Guidelines and Recording Standards for Weather, Snowpack and Avalanches (OGRS) are being revised. I would first like to thank all of you who submitted feedback and suggestions for updates. Without user input, OGRS would not have evolved into the "bible" of the Canadian avalanche community.

In 1981, a dedicated group of researchers and practitioners produced the first edition of these guidelines. The initiative was led by Peter Schaerer with major contributions made by Paul Anhorn of the National Research Council, Fred Schleiss and Walter Schleiss of Parks Canada at Rogers Pass and Geoff Freer of the British Columbia Ministry of Transportation and Highways.

According to Peter Schaerer's self-described rather vague recollection, the need for formalizing and documenting observations in avalanche hazard evaluation arrived from two sides. Professional avalanche courses were teaching snow, weather and avalanche observations, and the students needed a handout that listed and described the work. In the early years of the courses, from 1972 – 1980, the students received copies of the instruction for snow observers at Rogers Pass and a copy of the 1954 International Classification of Snow. With the formalization of the training objectives and exams in 1978, there came a need to consolidate and revise the information.

> **"Keep it short and to the point. The document should not receive the nickname of a monster."**
>
> Peter Schaerer

In addition to the purposes of instruction, there was also an operational demand. Parks Canada—mainly Banff and Jasper—had planned an exchange of observations among their staff and were looking for a system of coding and reporting. The need for standardization was apparent.

While the first edition of the observation guidelines filled a need, it didn't take long before it required revisions. A second edition was published in 1989 after consultation with the guiding industry, ski area operators, Parks Canada, Ministry of Transportation and BC Highways. The committee was composed of Herb Bleuer, Roger McCarthy, Walter Schleiss and Janice Johnson. Peter Schaerer chaired the committee and edited the review.

A third edition was published in 1995. These revisions were made by a committee selected to represent a broad spectrum of interest in snow safety and avalanche industry in Western Canada and Atmospheric Environment Service (AES). The committee was chaired by Peter Weir and included Peter Amann, Roger Atkins, Colani Bezzola, Torsten Geldsetzer, Bruce Jamieson, Ken Little, Thomas Riley, David Skjonsberg and Greg Thompson.

The current edition incorporates revisions approved by the Technical Committee of the CAA in May 2002. These revisions—made in response to suggestions received since 1995—were drafted in the summer of 2001 by a committee chaired by Doug Kelly. The committee included Jeff Goodrich, Sue Gould, Bruce Jamieson, Thomas Riley, Rob Whelan, and Doug Wilson. The changes were reviewed by Dave McClung, Bob Sayer and Simon Walker. Final revisions were compiled by Rob Whelan and Brent Strand.

Like previous years, the current revision project is in very good hands. A strong working group was chosen to represent all aspects of the Canadian avalanche community. This group is chaired by Bill Mark and includes Scott Aitken, Steve Conger, Jeremy Cox, Dave Gauthier, Jeff Goodrich, Mark Klassen, Mike Rubenstein, Chris Stethem, Ilya Storm and Simon Walker. In addition, Bob Sayer will be the CAA Technical Committee representative and Roger Atkins will be involved at arms-length to ensure compliance with CAAML data standards. Again, the CAA Technical Committee will approve the revisions.

The revision this year is expected to be somewhere between a minor tweak and a major overhaul. The most notable changes will probably be the addition of a glossary, standards for field weather observations and an updated snow stability rating system. These and other changes will be implemented while keeping in mind that OGRS is first and foremost a scientifically verified publication and not a book on snow stability evaluation. It should only contain descriptions of observations that must be recorded and reported.

A final draft should be ready for the 2007/08 season. It's not too late to get your comments in, so please send them to OGRS@avalanche.ca.

>>Cam Campbell is the project coordinator for the 2007 OGRS revision project.

New Standards for Snowmobile Operators

By Amber Wood

At the BC Commercial Snowmobile Operators Association AGM in Revelstoke on April 15, 2007, we adopted a set of guide standards and best operating practices for snowmobile operations. Due to such a diverse number of operations, we have worked hard for the last two years to encompass everyone's considerations. Now, we are pleased to announce that the Best Practices for Snowmobile Operations will be implemented over the next three years.

We will require operators working in avalanche terrain to have their guides certified with a Level 1 for Avalanche Operations. To do this we are asking for the help, cooperation and understanding of the CAA. History has proven the Level 1 for Snowmobile Operations is a difficult course for the CAA to organize, run and promote. As it is not a course that the average recreational rider would be interested in, it is hard to find enough students to make it worth the effort. We have proposed the following:

- Have a two-phased approach to the Level 1 Snowmobile Ops Course, (i.e. Module 1 and Module 2)
- Module 1 would incorporate the Snowmobile Operations Course with the five-day Resource Transportation & Industry Course (RTAM). This would allow for an introduction to weather, field observations, terrain, snowpack and safety measures, which would then be expanded on in the field during Module 2. This would also allow for increased numbers for the struggling RTAM course and allow for the minimal number of Snowmobile Guides to achieve the requirements we are asking.
- Module 2 would be a two or three day field session with smaller groups. These field sessions could be held directly after the RTAM course or later in the season at the operation's facilities.
- Work on expanding the evaluation criteria to include group management scenarios and rescue response evaluations.
- The instructor:student ratio would be discussed and incorporated with the BCCSOA's Best Management Practices.
- We would work with the CAA to develop goals and objectives that represent our industry's needs.
- Course costs would need to represent those costs currently in place for the Snowmobile Ops Course.

We are pleased to announce that the CAA Education Committee has unanimously agreed to these recommendations. We are looking forward to working closely with the CAA and are open to your suggestions to make this course happen in the near future!

>>Amber Wood is the General Manager of the BCCSOA

Lessons Learned

Explosives Report from Fernie Alpine Resort

By Mark Vesely

On the morning of April 11th 2006, at 8:26 am, the Easter control team experienced a near-miss incident regarding explosives detonation on the Dancer 1 bomb tram. The incident involved two individually-primed White Cap cast boosters that had been connected to make one larger payload.

First, the bomb tram failed to transport the shot out to its standard placement. Then, upon detonation, the two boosters separated, displacing one of the primed explosives into the blaster safety area, where it then detonated. Two avalanche technicians and one professional observer where involved and sent to hospital for exam. All were uninjured with the exception of ringing ears, rattled nerves and physical stress reactions to the incident.

In examining this event, our team focused on four points: product use, procedure, event occurrence, and future recommendations. Essentially, we asked ourselves:

1) Was the product misused?
2) Were there deviations from standard procedures regarding avalanche control work in the specified application and location?
3) What actually happened?
4) What can we recommend and/or change to avoid similar occurrence in the future?

The view from the second detonation point, looking back at the Dancer 1 bomb tram.

Product

Based on conversations with David Sly and Everett Clausen from CIL/Orion, as well as explosives safety officer Gary Kreller from WorkSafe BC, it has been concluded that the product was not misused. This conclusion is based on an agreed point that the result was unexpected in the described application. CIL/Orion's team explained the dual-product structuring of the cast booster, which consists of a cap-sensitive core surrounded by a non-cap sensitive peripheral bulk. When detonated in sequence, the burning speed of the Pentolite core initiates the Comp B peripheral bulk, and that should have been enough to initiate the second joined explosive bulk.

In retrospect, double priming one of the boosters would have been a better option. This is easily done by using a White Cap booster that is available with a double capwell design in one booster. This would have isolated the detonation systems to one of the boosters and made potential separation a low consequence event. The dual capwell product was in the magazine at the time of event but was overlooked for use by the shots assembly team.

We concluded there were two likely scenarios. Either the first booster partially detonated and fragmented, which resulted in the displacement, or the second booster failed to ignite and was then fragmented and displaced. Both scenarios suggest the degree of sensitivity of Comp B cannot be assumed to be equal among boosters. Therefore, coupling boosters in a way that utilizes the velocity of detonation of the Comp B as a primer for the second booster is not the ideal application for this product.

Procedures

Based on statements taken from all parties involved, we noted the control team followed most of its relevant procedures. The one exception involved the attachment of the explosive to the tram. That attachment had been altered with a weighted pulley and fixed length tether, instead of the originally designed releasable hitch that allowed the shot to be deployed at various locations along the line. The change in tram design was prompted by an attempt to make the system simpler, and had proven effective with previous trials and loaded runs prior to the day in question. However, the alteration of the tramway was a contributing factor to why the shot snagged and deployed short of the standard placement.

The Occurrence

The sequence of events leading up to this near-miss is a story of standard practices on an average avalanche control morning in our operation. The objectives for the day were to test wind-deposited areas in lee aspects and work towards opening zones that had been closed since the previous day, due to snowfall.

We assembled eight shots. Four single-primed 2 lb. White Cap boosters were prepared for Currie 1, 2, and 3 zones, three single-primed 4 lb. (2+2)

Mark Vesely

A White Cap booster like this one was used in this event.

shots for Saddles/Easter area, and one double-primed 4 lb. (2+2) shot for the Dancer 1 bomb tram. We were using White Cap boosters because we had already cleared our standard and more perishable products—Emulex and Ex Gel 60—from our inventories.

After the access traverse lines were cleared with the Avalauncher, the Saddles control team gathered their shots and departed for their control route. The team consisted of a Fernie forecaster, a senior route leader and a professional observer from a local cat ski operation.

The team followed procedure to the tram and assembled, tethered and deployed the shot. When the shot became hung-up, a warning was verbalized to move back a bit. At two minutes the team crouched, covered ears and awaited detonation. The shot went off and the team approached the tram. The professional observer noticed a softball-sized object fly up from the blast location and come to rest near where the second detonation suddenly went off. Measurements made after the event found the individuals in the group were between 6.1 to 7.8 m from the blast.

"What the #%&! was that?" At first the control team expressed shock and thought perhaps an Avalauncher gun had not concluded firing. The observer stated seeing the projectile and it then became clear to the group what had happened—the shot on the tram had detonated, resulting in a separation of the boosters which sent the second primed shot into the safety area. The group immediately checked over one another's condition and ceased their work. They called in another team for observation, recommendations and to assist in making decisions. The site was observed, measured, documented and the team was escorted to first aid and soon after hospital for examination.

Recommendations

It can be difficult to pinpoint the key element that goes awry and causes an incident like this. Our examination process suggests that it was the culmination of a number of actions, products and conditions that contributed to this event. Below are some of the key points we determined.

The product was not misused but it was not applied in a way ideally suited to its design. In the future, if the coupling of boosters and double priming is required, the priming should be contained in one of the boosters. The second booster should be attached with a detonation cord, wrapped in a way that links into the capwell. This configuration should ensure ignition sequencing is contained to one of the boosters and the second booster is allowed to ignite according to its design sequence. Otherwise, homogenous cap-sensitive products, with primers loading one of the explosives, will be the recommended best practice.

In terms of procedure, it is important to note that standards are integral to creating a consistent relationship between the activity and its outcome. When we deviate, even in small ways, it changes the relationship. In this case, a deviation in standards altered the way we deliver explosives in our environment.

This can be a good thing, as deviations can evolve best practices and streamline our systems. However, it can also bring about unforeseen complications that need to be addressed. Clearly, this is the main point for following standardized procedure. In this case it means noting the better practice and cleaning up the Dancer 1 bomb tram so that hang-ups are no longer a potential event.

This occurrence has also been educational in terms of human factors. As experienced as our team may be, it is interesting that the assembled shot made it through the cognitive systems check of four certified explosives handlers until its eventual lighting and deployment on the tram. People who work with this type of product regularly can sometimes reach certain levels of trust and comfort that can lead to potential assumptions. None of us thought we did anything wrong. However, the product as we applied it behaved in an unexpected manner, which resulted in this near miss.

It is commendable that the control team halted their operations, called for assistance and acknowledged being involved in a traumatic event, even though injury was avoided. Recognition by the team members that their ability to make sound decisions was temporarily impaired as a result of this event speaks volumes about their professionalism.

If there is one key recommendation to be taken from this event it is this: best practices of products, applied procedures, activities and safety systems are essential to our business and operations. In order to ensure we are operating at our highest level of safety and efficiency, it is everyone's responsibility to be diligent in communicating, understanding and delivering tasks to set standard.

>> Mark Vesely is the Ski Patrol Director at Fernie Alpine Resort. He has been involved in the avalanche safety industry for nine years as a ski patroller and educator.

Building Momentum

Full Speed Ahead for eTraining for Mountain Operations and Avalanche SAR Project

By Ken Wylie

It appears that bringing the Canadian avalanche community together to develop best practices for avalanche rescue is an idea whose time has come. This is the focus of the CAA's latest NSS-NIF project (National Search and Rescue Secretariat-New Initiatives Fund) and if what we've encountered already in the process is anything to go by, we're looking ahead to creating an extremely valuable product. More improtantly, we are already reaping the benefits of some very effective collaboration between agencies already specializing in excellence.

Sponsored by the RCMP and strongly supported by numerous SAR and avalanche organizations across Canada, eTraining is a two-year multi-stakeholder project. The project will first establish best practices and protocols for safety in winter mountain operations, best practices for avalanche SAR response and best practices for avalanche SAR management. That knowledge will then be made available on the internet through leading-edge online training programs, aimed at professional and volunteer avalanche SAR groups.

The avalanche SAR community has opened its arms to this project. We have consistently been met with enthusiasm, keen willingness to help and curiosity. Of particular note is that our in-kind contributions to the project are already significantly above budget projections. This is a true reflection of the level of professionalism and cooperation present in our community and we look forward to working with all stakeholders throughout this project to create world-class best practices and leading edge training programs to support them.

The energy and interest in this project has been tremendous and has helped to give it some real momentum this spring. Below, in point form, are some highlights of what's been accomplished so far this spring:

Brainstorming session at the subject matter experts' workshop.

May 5:

Call for resources and personnel went out to Avalanche SAR stake-holders.

May 18:

- Subject Matter Experts (SME) were identified and contracts were sent out to key people from the BC Provincial Emergency Program (PEP), Parks Canada, Ministry of Transport (MoT), Canadian Avalanche Rescue Dog Association (CARDA), Haute Gaspé Avalanche Centre (CAHG), Association of Canadian Mountain Guides (ACMG) and the Medical Committee of the International Commission for Alpine Rescue (ICAR). Individuals involved include Tim Auger, James Blench, Jeff Boyd, Mike Boissonneault, Stephane Gagnon, Jeff Haack, Kyle Hale, Clair Israelson, Jordy Shepherd and Ian Tomm.
- Members of the Managers Review Panel (MRP) were identified. This is an advisory group that will sign off on the content on behalf of their organizations and help to promote it within their respective communities. This group includes members from PEP, Kananaskis Country, CAHG, ACMG, RCMP, MoT, CARDA, Department of National Defense, HeliCat Canada and the Canada West Ski Areas Association.
- A Subject Matter Advisory (SMA) group was set up to include many of the many talented and experienced people who expressed interest in contributing to the project. This group will review materials as they are produced and provide feedback and input in the process of establishing best practices. Many of the SMA members have very specific expertise (medical, Incident Command System, etc) that will greatly benefit the initiative.

May 23-24

A meeting was held with the design and production team at the Justice Institute in Vancouver to determine

administrative and technological parameters of the project. It was a busy and successful two days and decisions were made to marry the Justice Institute's WebCT course administration systems with Dr. Nick Headley's geo-spatial visualization work for this project. This unique partnership promises to leverage much expertise in the development of online training programs and highly interactive training scenarios.

June 12-14

An SME meeting was held in Vancouver, led by Janice Johnson. The focus of the workshop was to develop goals, objectives and learning tasks for the first two portions of the program—Safety for Mountain Operations and Avalanche Search and Rescue. This was a key curriculum meeting and over the three days the SME team developed a development framework and an incredible amount of content for the online courses. Much progress was made towards the development of the best practices portion of the initiative, using the group's professional experience as well as resources from peer-reviewed papers published by the avalanche community internationally. The group left Vancouver even more excited about the potential of the project.

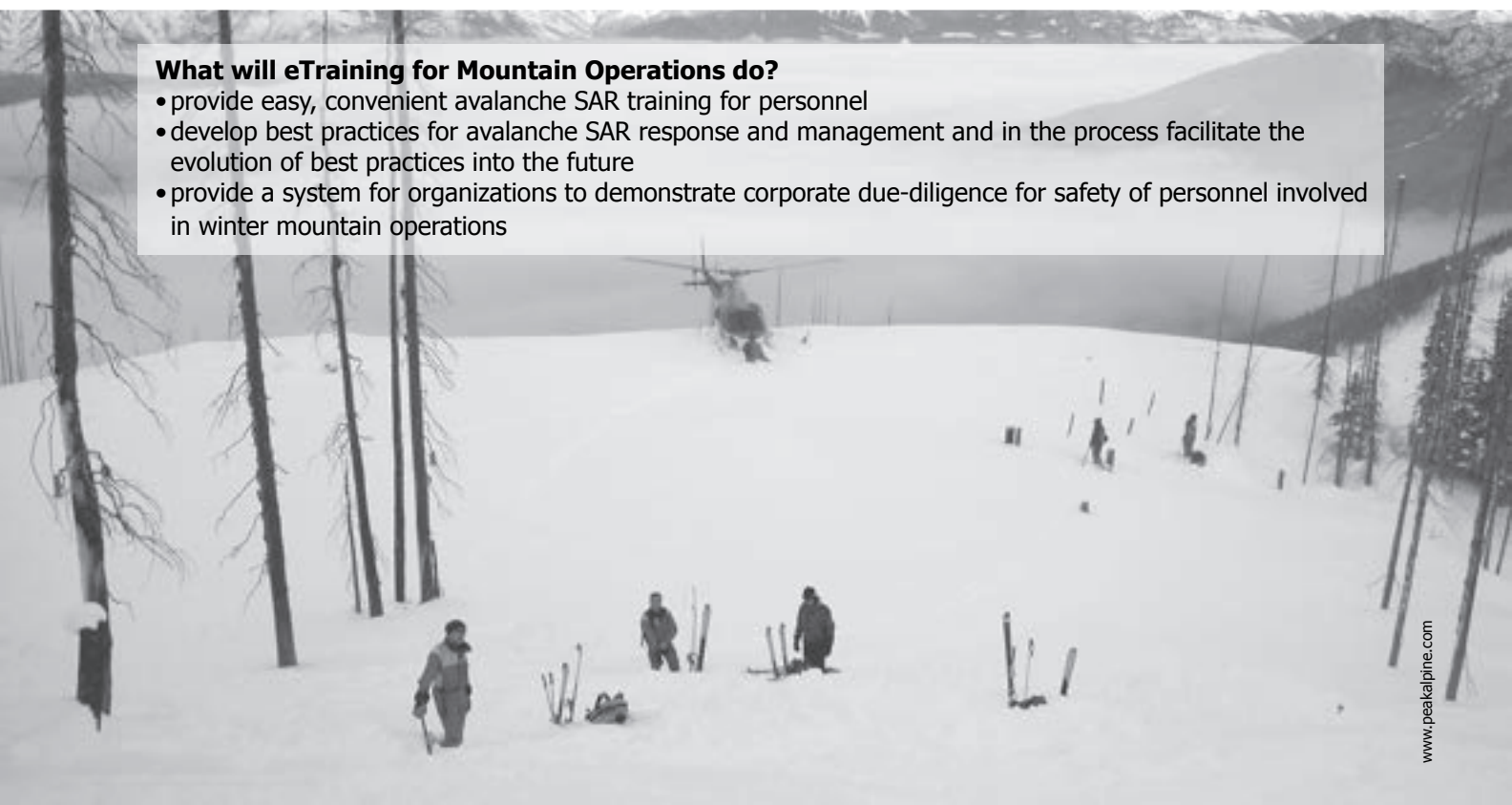
June 16-20

Swiss avalanche specialist Manuel Genswein was consulted to obtain a European perspective on avalanche SAR. Manuel has been working on two quantitative research papers on rescue shoveling and triage that will greatly contribute to the content of this project.

The project is now in its summer mode of extensive content and curriculum writing. It will be a very busy season as core curriculum is to be handed over to the programming and design team by late August—less than two months! We've been working hard on the development of the best practices documentation as well as developing the many highly interactive exercises and scenarios to be offered online.

Thanks again to Clair Israelson, Ian Tomm and the many organizations who supported the initial proposal for this exciting and important project. We welcome organizations and individuals who are interested in this initiative to become part of the project as a Subject Matter Advisor. Please contact me at kwylie@avalanche.ca for more information.

>> Ken Wylie is an IFMGA guide and the Lead Content and Curriculum Developer for the eTraining project.



What will eTraining for Mountain Operations do?

- provide easy, convenient avalanche SAR training for personnel
- develop best practices for avalanche SAR response and management and in the process facilitate the evolution of best practices into the future
- provide a system for organizations to demonstrate corporate due-diligence for safety of personnel involved in winter mountain operations

ISSW 2008 Update

By Brian Gould

So what's up with the greatest snow show on earth you ask? Well, ISSW 2008 planning is in full swing. The more I get involved, the more I realize how significant this conference is going to be. The snow and avalanche industry seems to be growing in leaps and bounds, and interest in the latest and greatest techniques and research is at an all-time high. In addition, Whistler is getting all gussied up for the big Olympic party in 2010, and it is really starting to show. With excitement like this, we expect this to be the best attended Canadian ISSW yet!

So how are we preparing? Here's an update. The logo contest we held in May-June closed a few weeks ago. Although submissions were not abundant, we have some ideas now and would like to finalize the artwork in the next few weeks. If you have interest in contributing ideas, we still would like to hear about them! Also, if you have graphic designer experience, please talk to me ASAP. Our logo will be on our website, event media, and all PR materials.

The Papers committee (led by Cam Campbell and Steve Conger) is now fully populated, and submission deadlines have been determined for abstracts. Look for a "Call for Papers" with all the details coming soon.

Andrew Wilkins has been hard at work with our sponsors to ensure they get good value for their dollar. If your company wishes to be a sponsor or exhibitor, please get in touch with Andrew or myself as soon as possible. The positions are filling rapidly.

Helene Steiner has secured several hundred room blocks in selected properties for our event. We are happy to say that prices are quite inexpensive for Whistler. In addition to hotels and condos, we are planning to set up a blog for billeting, where local snow people with guest rooms and couches can offer places to stay for low-budget delegates. Helene will be updating much of this on the website over the coming months.

John Hetherington has joined our team as the financial guru. With his guidance we hope to account for every last nickel to guarantee good value for all involved. As for me—I've been attempting to guide the entire process as well as I can through Website development (with much help from the CAA), registration systems, volunteer coordination, updates such as this one, and generally trying to make the big decisions.

As always I am keen to hear from you if you have interest to be involved, or just want to share some good ideas. See the sidebar below for how to reach any of us on the ISSW committee.

>>Brian Gould is the Chair of the ISSW 08 Committee

Want to get in touch? Here's how:

General e-mail	issw2008@avalanche.ca
Brian Gould at work	Brian.gould@gov.bc.ca
Helene Steiner	catours@telus.net
Andrew Wilkins	geoclimb@mycoast.net
Website	www.issw.net

ISSW

INTERNATIONAL SNOW SCIENCE WORKSHOP

CANADA

Stay Current on Workplace Regulations

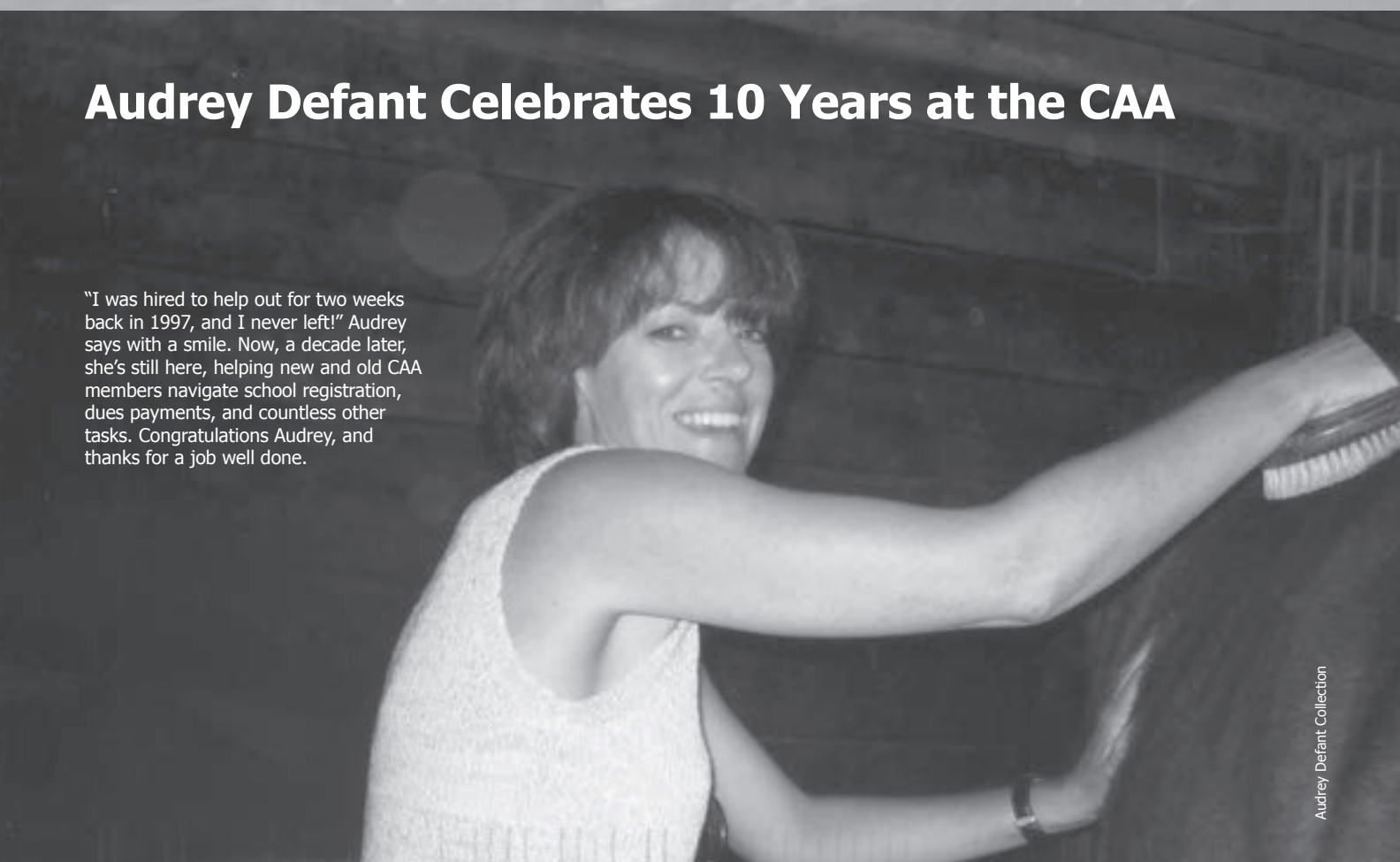
WORK SAFE BC
WORKING TO MAKE A DIFFERENCE

Click on "Information" in the Members Only section of the CAA website. There you will find a WorkSafe BC folder where we will post all information pertinent to the avalanche community as soon as it is received by our office.

Steve Parsons

Audrey Defant Celebrates 10 Years at the CAA

"I was hired to help out for two weeks back in 1997, and I never left!" Audrey says with a smile. Now, a decade later, she's still here, helping new and old CAA members navigate school registration, dues payments, and countless other tasks. Congratulations Audrey, and thanks for a job well done.



Audrey Defant Collection

CAA Introductory Avalanche Mapping Course

If you work, or would like to work, in the field of avalanche safety, this six-day course is for you. You will learn how to gather and present, at industry standard, the basic data required to identify snow avalanche areas.

This program is not just for newcomers to the avalanche field. Here's what Grant Statham, Avalanche Specialist for Parks Canada, had to say after participating: *"I wish now I'd had that course under my belt 10 years ago. It definitely adds to my skill set…I would recommend this course to any avalanche worker."*

Enroll Now!

CAA Introductory Avalanche Mapping Course
Sept 23-28, Nelson, B.C $1200

To find out more, go to avalanche.ca>Training>Avalanche Mapping

Past presidents were invited to share their memories of their time at the helm of the CAA. From left to right, Jack Bennetto, current President Steve Blake, Peter Schaerer, John Hetherington, Fred Schleiss, Chris Stethem, Bruce Jamieson, Bill Mark and Bruce Allan.

Brad White

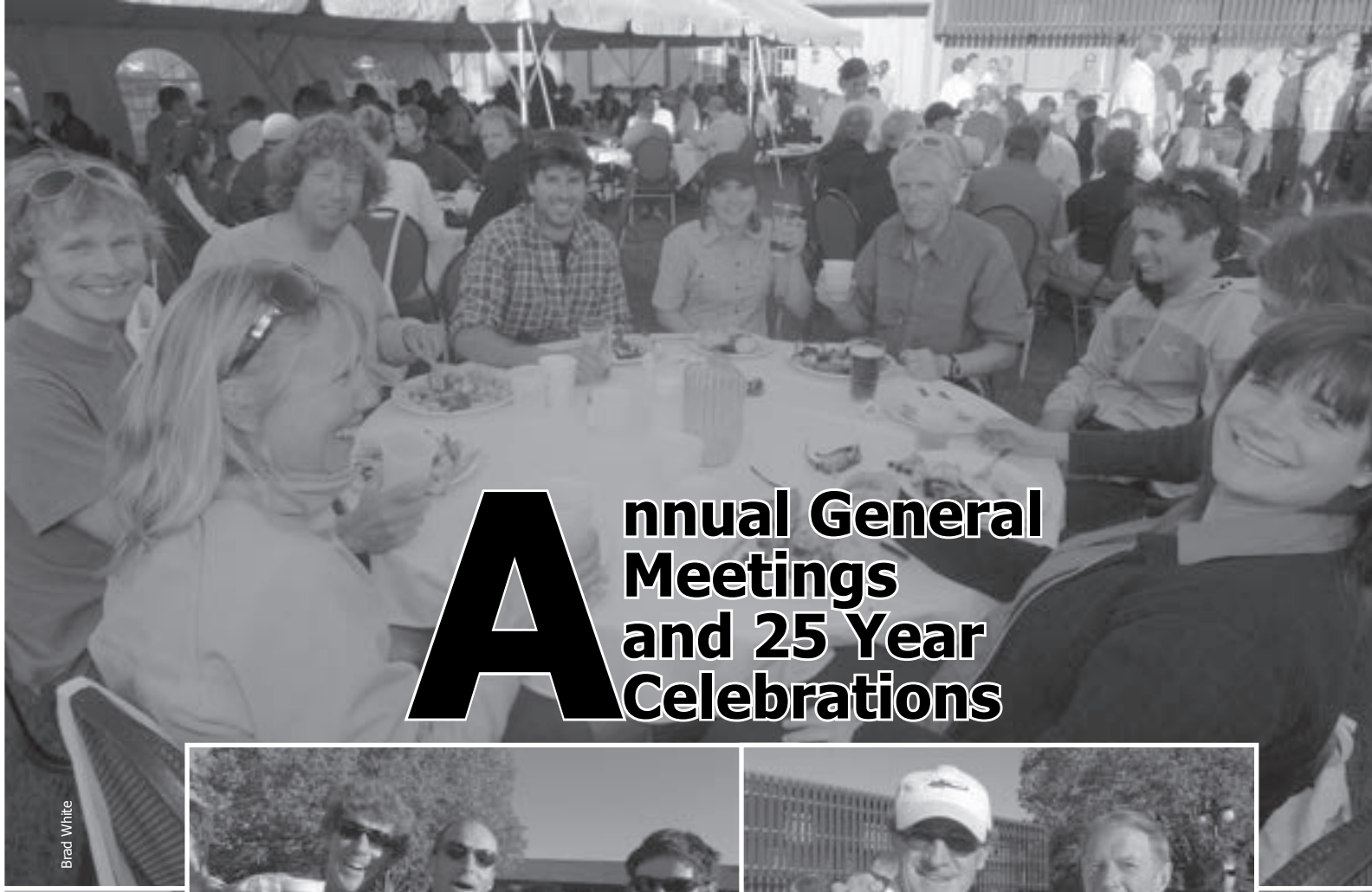
Outstanding achievement awards were given to: Garry Walton for his role in establishing the CAA professional training schools; Willi Pfisterer for his mentorship; Fred Schleiss for his influence in observation and recording standards; Peter Schaerer for his role as patriarch of the CAA; Clair Israelson for vision; Bruce Jamieson for his work in applied science for front-line avalanche workers; and Dave McClung for his dedication to avalanche research.

John Kelly

Brad White

Brad White

Annual General Meetings and 25 Year Celebrations


Brad White


Brad White


Brad White


Brad White

The Canadian Avalanche Roundtable meets annually to discuss the direction, goals and support of the CAC. The roundtable is comprised of organizations and agencies that are stakeholders in avalanche safety.

John Kelly

Peter Schaerer, Willi Pfisterer and Fred Schleiss share some memories.

Edie Schleiss

Everett Clausen from CIL/Orion smiles for the camera. Once again, CIL/Orion upheld its long tradition of donating a portion of the company's profits to the CAA. Everett is well-known for his congeniality, as well as warm and witty presentations. This year was no different, as he had us all laughing throughout his speech. Many thanks, Everett!

John Kelly

CAC Annual General Meeting Report

By Ilya Storm

There was no shortage of meetings for Steve Blake to attend during the Canadian avalanche community's annual May get together in Penticton, and May 8th was his chance to chair the third annual general meeting of the Canadian Avalanche Centre. As President, Steve not only chaired the meeting, he also delivered the Board of Directors Report. The report affirmed that the CAC has a strong governing and oversight structure, not to mention talented and dedicated employees. Steve updated the membership on the previous day's CAC Roundtable meeting. From the board's perspective, the biggest challenges facing the CAC are uncertainty surrounding long-term and secure public (government) funding, and the sustainability of Quebec-based avalanche safety programs.

Clair Israelson presented his Executive Director's Report highlighting the strategies he uses to support the CAC's stated vision and mission. They include:

- the provision of practical high quality programs
- thinking and planning forward (up to ten years)
- conducting ongoing scans of international best practices
- integrating new but proven technologies
- utilizing the best natural and social sciences research results
- promoting partnerships, collaborations and sharing this knowledge and success worldwide
- recruiting and mentoring the "rising stars" to be future leaders for Canadian avalanche programs.

Clair also identified goals to work towards, which include strengthening ties with the Centre d'Avalanche de la Haute Gaspesie. He also spoke of pursuing opportunities such as improving collective messaging between professionals and recreational users. Clair mentioned the pride we should all have in the strengths of the CAC—our good credibility with the public, our ability to provide a strong public service capacity, and our excellent relations with stakeholders. Of course, it's always nice when your boss says he has a highly competent and motivated staff working for him!

Of course there are challenges. Future challenges include the CAC helping to create a federal policy regarding avalanches as a natural hazard. And as always, securing long-term and stable funding for public avalanche safety program remains on our "to-do" list.

John Hetherington, CAC Secretary Treasurer, provided a financial report. Highlights include an increase in gross revenues through increased retail sales and private sector sponsorships, the establishment of a material renewal fund, and the challenges of actually obtaining some of the funds pledged to the CAC. John reiterated a theme raised by both Steve and Clair—that long-term and secure government funding structure is still required, and that the CAC's success in attracting private and corporate sponsorship hinges on continued government support.

John Kelly presented the Operations Manager's report outlining notable successes in communications and public outreach initiatives, avalanche education and research, and the public avalanche warning program. Rolling out and supporting the Avaluator was a major focus for the winter, and by all accounts it was well received. Major initiatives for next year will focus on enhancing the public avalanche forecast program, continued Avalanche Skills Training (AST) course renewal, and further upgrades to the online Avalanche First Responder Course. In support of JK's operation report, I provided a summary of the winter's weather, snowpack, avalanches, and avalanche fatalities—which, as of April 30, were seven people in five separate accidents.

It seems every annual general meeting has an election, and this year Mike Mortimer was acclaimed in his position as Director for Supporters and applauded for his work on the board to date.

From my perspective as a public avalanche forecaster, the best part of the meeting was the ADFAR 2 Report, delivered by Pascal Haegeli. The original ADFAR project (Avalanche Decision-making for Amateur Recreationists) brought us the Avaluator. ADFAR 2 will:

- continue social science research on decision-making, primarily directed towards out-of-bounds riders, with the goal of improving avalanche safety messaging;
- revise, expand, and improve the Avalanche Danger Scale;
- research the benefit of people making "amateur snowpack observations" in the field, in order to improve recreational decisions compared to decision-making based on a public avalanche forecast alone;
- evaluate the Avaluator and assess its effectiveness;
- develop a second decision-making framework targeting advanced recreationists.

Although the CAC continues to face challenges, particularly in regards to sustained and secure government funding, the meeting's "take home message" is that we are well positioned to face the hurdles along the path. The CAC will continue to successfully deliver and improve public avalanche safety programs and services in Canada.

>>Ilya Storm is a public avalanche forecaster at the CAC.

Maximizing Support for the Avaluator User

A New Look at Avalanche Forecast Lexicon and Structure

By Karl Klassen

As of spring 2007, the Avaluator is in the hands of about 6,000 users. Of these, 3,800 have received formal training in its use as part of their Avalanche Skills Training Level 1 course. In this training they have been taught to gather information from public avalanche forecasts in a systematic fashion. However, avalanche bulletins from different agencies don't all correspond to the framework and terminology laid out in the AST courses and the Avaluator. At this spring's Avalanche Bulletin Writer's workshop held on May 8 in Penticton, forecasters from all major forecasting agencies discussed these issues and agreed that evolving Canada's avalanche bulletins to correspond more effectively with the Avaluator would be worth exploring.

The Avaluator incorporates two main steps to help people make informed decisions: the Trip Planner and the Obvious Clues checklist. The Trip Planner combines an Avalanche Terrain Exposure Scale (ATES) rating and an avalanche danger rating on a matrix. The user finds the applicable ratings for their chosen trip and applies them to the matrix to receive an idea of how serious the trip might be. The Obvious Clues checklist is used for on-slope evaluation of conditions. In addition to being taught how to use the trip planner and obvious clues, AST students are trained to look for trends in avalanche danger over time and identify certain information in the text of avalanche forecasts and bulletins, weather information, and weather forecast to help plan their trips.

The Avalanche Terrain Exposure Scale, developed by Parks Canada, is relatively new, having been in use for only a few years. It has proven to be a key element in filling a longstanding communications gap between professionals and recreationists. That is, how to simply and effectively discuss the complexity of terrain when talking about avalanche risk. The public model (figure 1) provides simple descriptors for users, while the technical model (figure 2) gives advanced and professional users specific criteria for the rating process. Although it is a new approach, there is widespread acceptance for ATES in the avalanche community. Avalanche forecasters can best support Avaluator users if they use ATES public model terminology when discussing avalanche risks related to terrain (see Forecasters' Lexicon on page 32).

Public avalanche bulletins have a long history in Canada—certainly they have been around a lot longer than ATES. Unlike ATES, however, there is significant variation in structure from one agency to the next. If a more common structure could be developed between agencies, it would make it easier for all users—not only those using the Avaluator—to effectively obtain information when planning trips in different jurisdictions. Such a structure might address the following major issues:

- Forecasting of avalanche danger into the future (current day plus two or three days ahead)
- Choosing common header names for parts of the bulletin content (e.g. Travel Advisory, Synopsis, Avalanche Activity, Outlook, Snowpack Structure, Travel Conditions, Weather, etc.)
- Guidelines for the content that falls under the headers named above

Although the avalanche danger scale has also been around much longer than ATES, there is more divergence in how it is used than one might expect. One simple example: the avalanche danger scale doesn't have a good way of describing the variable conditions experienced in freeze-thaw cycles. Looking at various reports over the past spring, it became clear that forecasters in different agencies were using different wording and criteria when assigning danger ratings during freeze-thaw cycles.

Recently, there has been discussion about a revision of the danger scale. Part of the discussion focuses on providing forecasters with a more formal and uniform approach to the rating process. The Avaluator supports the idea that another look at the danger scale is warranted and strongly suggests that freeze-thaw criteria and terminology should be part of that review and revision.

In the spring of 2007, CAC forecasters began discussing a new structure for our public avalanche information products. This evolved into the idea of an integrated suite of products that support various levels of users (figure 3):

- Untrained and inexperienced: Backcountry Avalanche Advisory.
- Those with basic training: Avaluator and associated supporting information such as ATES and the avalanche danger scale.
- Those with advanced training: traditional textual products, such as
  - o Travel Advisory,
  - o Avalanche Activity,
  - o Snowpack Summary,
  - o Weather observations,
  - o Weather forecast, etc.

The core of this suite would be avalanche danger ratings. These would be issued on a sub-regional scale. That is, more than one rating would be applied to one of our current single forecast regions. In the South Columbia, for instance, we might issue separate danger ratings for the Purcells and the Selkirks/Monashees. Danger ratings would be issued on a daily basis with a two- or three-day forecast of danger.

The Backcountry Avalanche Advisory (BAA) would be automatically produced on a sub-regional scale when danger ratings are assigned. Forecasters would be asked to verify the BAA rating and would have the opportunity to manually override and adjust the rating if necessary. Similarly, Avaluator Travel Planning ratings (red/yellow/green) for various ATES terrain

Avalanche Terrain Exposure Scale Public Model (Source: Parks Canada)

Description	Class	Terrain Criteria
Simple	1	Exposure to low angle or primarily forested terrain. Some forest openings may involve the runout zones of infrequent avalanches. Many options to reduce or eliminate exposure. No glacier travel.
Challenging	**2**	Exposure to well defined avalanche paths, starting zones or terrain traps; options exist to reduce or eliminate exposure with careful routefinding. Glacier travel is straightforward but crevasse hazards may exist.
Complex	**3**	Exposure to multiple overlapping avalanche paths or large expanses of steep, open terrain; multiple avalanche starting zones and terrain traps below; minimal options to reduce exposure. Complicated glacier travel with extensive crevasse bands or icefalls.

Figure 1. ATES Public Model

(Simple/Challenging/Complex) with associated travel advice on a sub-regional scale would also be automatically selected with forecaster verification and override/adjustment before posting.

When the Canadian Avalanche Information System (CAIS) becomes a fully developed database that can be queried, avalanche and weather information would be automatically inserted into a pre-set format so the avalanche activity and weather observations portion of forecasts would be automatically produced and posted on a daily basis—again on a sub-regional scale. Similarly, we hope to eventually extract information from weather forecasts automatically so the weather forecast sections of our avalanche information products could become a sub-regional, daily product.

Forecasters would issue regional scale snowpack summaries and travel advisories, using higher level language to provide more technical information for advanced users. These would be updated on a less frequent basis than other products, perhaps three times a week during winter and maybe less often in spring or during periods where little change is occurring in the snowpack.

Underpinning the entire suite would be an online, open-source text and photo glossary to which any forecasting

Avalanche Terrain Exposure Scale Technical Model v.1-04 (Source: Parks Canada)

	Simple	Challenging	*Complex*
Slope angle	Angles generally < 30º	***Mostly low angle, isolated slopes >35º***	Variable with large % >35º
Slope shape	Uniform	Some convexities	Convoluted
Forest density	Primarily treed with some forest openings	Mixed trees and open terrain	Large expanses of open terrain. Isolated tree bands
Terrain traps	Minimal, some creek slopes or cutbanks	Some depressions, gullies and/or overhead avalanche terrain	***Many depressions, gullies, cliffs, hidden slopes above gullies, cornices***
Avalanche frequency (events: years)	1:30 ≥ size 2	1:1 for < size 2 ***1:3 for ≥ size 2***	1:1 < size 3 ***1:1 ≥ size 3***
Start zone density	Limited open terrain	Some open terrain. Isolated avalanche paths leading to valley bottom	Large expanses of open terrain. Multiple avalanche paths leading to valley bottom
Runout zone characteristics	Solitary, well defined areas, smooth transitions, spread deposits	Abrupt transitions or depressions with deep deposits	Multiple converging runout zones, confined deposition area, steep tracks overhead
Interaction with avalanche paths	Runout zones only	Single path or paths with separation	***Numerous and overlapping paths***
Route options	Numerous, terrain allows multiple choices	A selection of choices of varying exposure, options to avoid avalanche paths	***Limited chances to reduce exposure, avoidance not possible***
Exposure time	None, or limited exposure crossing runouts only	***Isolated exposure to start zones and tracks***	***Frequent exposure to start zones and tracks***
Glaciation	None	***Generally smooth with isolated bands of crevasses***	***Broken or steep sections of crevasses, icefalls or serac exposure***

Figure 2. ATES Technical Model

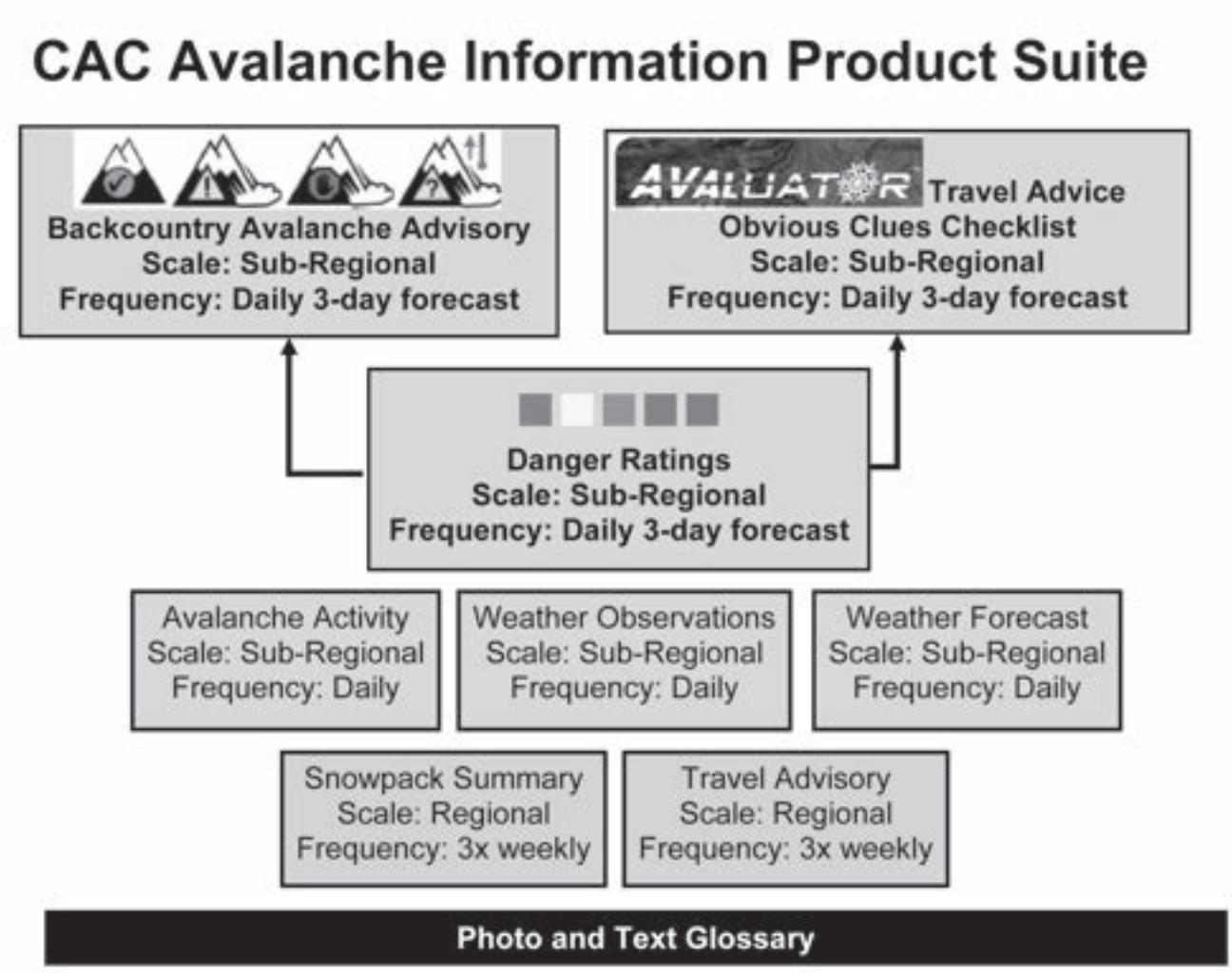


Figure 3. Canadian Avalanche Centre Avalanche Information Product Suite.

agency could hyperlink when producing avalanche information products. The foundation of such a glossary probably already exists in various places (the Utah Avalanche Center and the Parks Canada/CAC English/French avalanche dictionary come to mind as starting points). Having such a glossary would bring avalanche information to a higher level, moving it from an information-only product to an educational resource for users.

In summary, this article is not intended to be proscriptive and above all, is not suggesting we should immediately stop writing forecasts and bulletins in the traditional way or make radical changes to how we present that information. Nor are we suggesting that every agency's products have to look the same. Our main concern is developing a common approach to the general structure of our bulletins and forecasts, and using an agreed-upon lexicon in our communications with the public. As professionals, we all see the value in a standardized language to communicate technical data. As professionals, we should also see the value in ensuring our communications with the public are equally precise.

The CAC will likely play a lead role in this process and, with support from and dialogue with our colleagues, we hope to make progress over the summer and fall with visible changes coming perhaps as soon as the 2007-2008 season. Comments and suggestions are welcome. Please send them to Ilya Storm at istorm@avalanche.ca.

>>Karl Klassen is an IFMGA mountain guide and a public avalanche forecaster with the CAC.

Photo: Canadian Pacific Railway Archives

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Forecasters' Lexicon

The Avaluator Trip Planner, Obvious Clues, and AST training for use of the Avaluator has brought new terminology into play. In the 2006-2007 season, CAC forecasters developed and started using a lexicon based on the Avaluator and the AST decision-making curriculum. Below are drafts of the CAC's lexicon from which the forecasters draw terminology for various parts of their avalanche forecast:

Risk of Travel (From the Avaluator)

When trips fall into the green area of the Avaluator trip planner chart

Previous recreational avalanche accidents and expert advice indicate:

- Recreational avalanche accidents are generally infrequent.
- These conditions are appropriate for informed backcountry travel in avalanche terrain.
- Use NORMAL CAUTION, that is:
  - o Always watch for isolated slabs.
  - o Be especially careful if the avalanche bulletin mentions deep or persistent instabilities.
  - o Basic avalanche rescue skills are always essential when you travel in avalanche terrain.
- Analysis of past accidents shows that if travel had been limited to trips that fall fully into the green portion of the chart, 75% of recreational accidents would have been prevented.

Expert opinion is that ***travel on trips that fall into the green area of the chart is generally appropriate for recreational travellers with basic avalanche training and little or no experience.***

When trips fall into the yellow area of the Avaluator trip planner chart

Previous recreational avalanche accidents and expert advice indicate:

- Recreational accidents are more frequent and are likely to occur with human or natural triggers.
- Travelling under these conditions requires EXTRA CAUTION, that is:
  - o Advanced avalanche skills including:
    - □ detailed trip planning,
    - □ route-finding and navigation,
    - □ stability evaluation,
    - □ group management,
    - □ rescue skills, and
    - □ wilderness first aid

  are required for safe backcountry travel under these conditions.
- You can learn these skills in avalanche and other courses, but practice and humility are essential.
- Analysis of past accidents shows that if travel had been limited to trips that fall into the green and yellow portion of the chart, 40% of recreational accidents would have been prevented.

It is the opinion of experts that ***travel on trips that fall into the yellow area of the chart is not appropriate for people with only basic training and little or no experience.*** Safe travel in the yellow zone requires additional skills and knowledge about terrain and snowpack. Recreationists with:

- advanced avalanche training and experience in similar conditions and terrain
- formal leadership training

may be capable of travelling on trips in the yellow zone while maintaining adequate margins of safety.

When trips fall into the red area of the Avaluator trip planner chart

Previous recreational avalanche accidents and expert advice indicate:

- Conditions are primed for recreational avalanche accidents.
- Even careful decisions made by recreational groups can result in serious accidents.
- Since the margin of error is very small under red conditions, safe backcountry travel requires extremely careful planning and extensive experience.
- Backcountry travel under these conditions is NOT RECOMMENDED without professional-level safety systems and guidance.

Trips that fall into the red area of the chart indicate high risk conditions. It is the opinion of experts that ***recreational parties should not travel on trips in the red zone.*** Recreational training alone can not prepare you for safely travelling in these conditions. Professional-level safety systems and guidance are required for safely travelling on red zone trips.

Terrain Keywords and Phrases (from ATES)

- Simple terrain
- Low angle terrain
- Primarily forested terrain
- Runout zones of infrequent avalanches
- Many options to reduce or eliminate exposure
- Challenging terrain
- Well defined avalanche paths, starting zones or terrain traps
- Options to reduce or eliminate exposure with careful route finding
- Crevasse hazards
- Complex terrain
- Multiple overlapping avalanche paths
- Large expanses of steep, open terrain
- Multiple avalanche starting zones
- Terrain traps below
- Minimal options to reduce exposure
- Complicated glacier travel

Slope Evaluation Keywords and Phrases (From the Avaluator)

- *Recent avalanches* (within the last 48 hours), generally in the "Avalanche Activity" section if the text is broken into sections.
- *"Whumphing"* or easy test results or pops and drops generally under the "Snowpack Structure" heading if the text is broken into sections.
- *Thawing or melting* due to *sun, rain, or warm temperatures,* usually under the "Snowpack Structure" heading or something similar if the text is broken into sections.
- *New loading* from *rain* or *snow* that has occurred within the last 48 hours.
- *New slabs* that have formed within the last 48 hours.
- *Windloading* that has occurred within the last 48 hours.
- *Windslabs* that have formed within the last 48 hours.
- *Deep instability* or *persistent weak layer* often under the "Snowpack Structure" heading or something similar if the text is broken into sections.
- *Isolated slabs,* particularly when danger ratings are moderate and low. Usually mentioned in the "Snowpack Structure" heading or something similar if the text is broken into sections.
- *Variability* in conditions or danger in a region.
- *Steep* terrain (generally over 30 degrees of incline), *convex* features, and *terrain traps* generally mentioned in the "Travel Advisory" or something similar if the text is broken into sections.
- *Hollow snow* sounds or a *feeling of hollowness*.
- *Wet, mushy* snow.
- Obvious avalanche paths are usually marked by a *distinct line where the trees stop*.
- Within the path itself, you may see *damaged or stunted trees*.

Weather Keywords and Phrases (From AST Curriculum and Avaluator)

- *New snowfall,* especially following a cold dry spell.
- *Moderate* or *strong* winds.
- *Rising temperatures* (especially rapid increases).
- *Warm temperatures* (especially at or above the freezing mark).
- *Strong solar radiation* (especially in the spring).

Avaluator users are also advised to use forecast and actual weather conditions to determine if the conditions driving a deteriorating avalanche danger trend are, in fact, occurring:

- *When expected:* If weather arrives sooner than anticipated, avalanche conditions will likely deteriorate earlier than forecast.
- *As expected:* If weather is worse than forecast, avalanche conditions will likely deteriorate more than forecast.

Phil Hein

Youth Avalanche Education Project

By Verena Blasy

The CAC's Youth Avalanche Education Project began this year in the Revelstoke school district with the help of some funding from Revelstoke Mountain Resort. I had the pleasure of creating and running this program with a lot of help from pre-existing programs for elementary and high school students in BC and Alberta. We chose to focus on grades six and 10 this year, as these students spend time at the ski hill through their Physical Education programs. Almost 200 students (75 grade six students and 120 high school students) had a presentation come into their classroom this past winter.

The grade six program was based almost entirely on Monica Nissen's Snow Safety and Education Program (SSEP), with a few adaptations to make it more applicable to Revelstoke students. This program uses videos, photographs, props, demonstrations and student activities to teach students about ski-hill and backcountry safety. The grade 10 program was a more detailed version of the grade six program, and focused solely on the backcountry.

As the instructor, I have two main points that I really want students to understand at the end of my presentation. First, they need a lot of knowledge, as well as safety equipment, to safely go into the backcountry. Second, going out of bounds at a ski hill is the same as going into the backcountry.

I loved doing these programs, especially the elementary ones. The grade six students were excited, enthusiastic and had loads of questions. They were especially interested in learning about actual avalanches—how big they can get and how fast they move. They all loved seeing footage of real avalanches, just like most of us do.

It's not quite so cool to be keen and excited in class at the high school level, so I found these programs to be a bit more challenging. Students who had already spent time in the backcountry or on the ski hill were still quite enthusiastic. I hope to work on making the high school program more interactive and more hands-on to engage these students a bit more.

I found the grade six students to be very open to the message of safety. This was good to see because I believe it is critical to get to them at this age. As many prevention programs have shown, it quickly becomes more challenging to reach high school students with safety messages.

Next year we plan to expand this program, to reach more grades and possibly other mountain communities as well. We will be creating an in-class program for grade three students, as this is the first year students go to the ski hill. For other grades we plan to create teacher resources that can be used in class, and are linked to the curriculum already existing for these grades. We are also exploring the concept of a peer-to-peer program at the high school, as research has shown that this is a more effective way to teach teens about risk reduction.

I was always impressed by how many students had already spent time in the backcountry. There were usually one or two kids in each class who had been backcountry skiing or heli-skiing, and between five and ten who had been snowmobiling. This, combined with a new resort that will soon make backcountry access on Mount Mackenzie a very easy thing, makes the avalanche education program all the more important. I believe that making our students avalanche aware could prevent some serious accidents in the coming years.

>>Verena Blasy is a substitute teacher in Revelstoke. When she's not teaching kids about avalanches, she works for the Mountain Caribou Education Program.

These grade 6 students at Arrow Heights Elementary in Revelstoke were eager to learn more about avalanches and snow safety.

Mary Clayton

Incident Reporting Emerges from the Dark Ages

By Cam Campbell

The need for new avalanche incident report forms became apparent as soon as 2.275 MHz transceivers were obsolete. Developing useful and usable forms became one of the objectives of the ADFAR project, which corresponded with the creation of the avalanche incident database. For an idea of what avalanche incident reporting previously looked like, check out Appendix B in OGRS.

In the fall of 2005, I was contracted to create new forms that would comply with the recently created avalanche incident database. This resulted in two paper-based forms, one of which was highly detailed to comply with the database. The other was a one-page concise form for non-fatal incidents.

The concise forms were heavily oriented towards human factors, a quality which led to considerable criticism. As Chris Stethem put it, "You need a degree in psychology to fill them out." In addition, physical information about the avalanche was omitted from the concise form in favor of human factors information. This was necessary to keep the form to a single page (a self-imposed limit) while collecting data I thought would be most valuable as, at the time, we had virtually no human factors information.

However, my concise form wasn't accepted into practice and Karl Klassen took over the project. He combined the concise form with a notable avalanche form into a clickable word document that people could download from the website. We at the CAC forecast office have used this form for non-fatal incidents for the past two winters.

This spring, the ADFAR project took it one step further and a new online form was designed. The new web-based approach collects information on the time and location of the incident, group information such as activity, size and composition, physical avalanche details, people or property involved, weather and snowpack details, Avaluator-related comments (i.e. obvious clues present) and human factors. This information is requested in varying degrees depending on whether the form is being filled out by a member of the party involved or a witness, and whether it was an involvement, close call, property damage or simply a notable avalanche.

The online form is easy to navigate and quick to complete, thanks to the clean and logical organization and plethora of drop-down menus. There is also report preview function that can be viewed at any time and a progress report indicating the proportion completed. Most of the drop-down menus give both plain language and data code options (e.g. weak layer, trigger and size), which makes it accessible to someone with little avalanche knowledge. Experienced reporters can provide more detail by sub-classifying crystals, make additional comments or even attach files.

Information collected through the online form will be used to populate the avalanche incident database, which in turn will be used for research. Current research projects using this database include ADFAR 2, which aims to further develop the Avaluator and perform a risk assessment on out-of-bounds skiers and boarders, among other objectives. Another project is the Public Safety Canada-funded initiative to inventory activity and mitigation measures in avalanche terrain in Canada. This project also aims to update the Natural Resources Canada map of fatal avalanches and website descriptions of significant avalanche accidents.

The new online incident report form will be up and running for this coming season. You'll find it under Bulletins>Report an Incident. Please tell your colleagues, students, clients and friends about this form, and encourage them to use it. The development of new tools, programs and services needs good research to advance, and the data collected will play an important role in furthering avalanche safety.

>> Cam Campbell is a public avalanche forecaster for the CAC.

Preview of new online incident report form.

In February of this year, the Canadian Avalanche Foundation held its annual gala fundraising dinners in Calgary and Whistler. These events focus on raising money for avalanche safety and education in Canada, and have a terrific record of success. Behind these successful evenings are an impressive number of dedicated, hard working and generous individuals. Below you'll find a long list of the people and companies who contributed to making this past event the most successful one yet.

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Scoping New Lines

By Mary Clayton

The Canadian Avalanche Foundation is heading in an exciting new direction by funding two innovative projects aimed at youth education. One is a film and the other a website, and the CAF plans to have considerable overlap between the two. "We're very excited about these projects," says CAF President Chris Stethem. "There is a real need for a wide range of educational approaches to avalanche safety. It's a new world in so many ways—kids are hucking higher and riding bigger lines than we ever did. On top of that, internet and other media use is changing radically. We hope to tap into that energy with our messages of avalanche safety and education."

Rocky Mountain Sherpas (RMS) out of Calgary is the production company heading up the film project. Dave Mossop, Eric Crosland, Malcolm Sangster and Evan Woolley are the creative brains behind RMS, and all are long-time backcountry shredders who have created an impressive track record for their young company. Their latest film "Yes to the NO" premiered at the 2006 Banff Mountain Film Festival and has been selected to play on the festival's world tour.

The objective of this CAF project is to create a film that convinces young viewers to take an introductory avalanche course. "We see this as a progressive series of short films," says Malcolm Sangster. "The opening film will serve as an emotional hook that provokes interest, and then five short training films will dive into the details of backcountry science."

Reaching younger viewers means using the latest technology and exploring new ways of communication. CAF Director Scott Flavelle is the CAF liaison for this project and he says it's important to step back and give the film-makers full rein for their creative talents. "We can't let our forty-something opinions get in the way," he explains. "To make this project meaningful for the intended audience, it needs to speak their language."

The filmmakers will use current athletes and industry professionals in real-life situations in various mountain ranges throughout the winter season. "We'll use modern cinematic language, spectacular imagery and healthy amounts of creativity to engage, educate and inspire viewers," says Sangster. "This film will save lives."

The website project is aimed at a similar group—young people with a taste for backcountry adventure. Still in its conceptual stage, the site is titled "Behind the Lines," and will explore the realities behind the radical lines showcased in extreme ski and boarding videos. Ottawa-based 76 Design is at the helm of this project. Inspired by such cultural landmarks as South Park, Dogtown and Z-Boys, Spinal Tap, YouTube and Dodgeball, "Behind the Lines" will take a fresh and irreverent look at backcountry safety and education.

Projects such as these don't come cheaply but the CAF has done an amazing job of raising enough funds to be able to support these initiatives. A tremendous thanks is owed to all those who have made contributions for avalanche safety and education. These two new projects promise to make a real difference.

Creative energy times four. The Rocky Mountain Sherpas, from left to right: Dave Mossop, Eric Crosland, Evan Woolley and Malcolm Sangster.

Kent Swanson Memorial

Reflections on a Tragedy

By Ian Tomm

It seems every once in a while an experience leaves a lasting mark. Sometimes these experiences are sad, other times they are remarkably positive. I've had a couple, as we all have in this business. It may be just one of the traits of this industry that keeps us engaged and committed to the pursuit of excellence in avalanche safety work in Canada.

Fortunately, this past February I had the opportunity to participate as the lead instructor on Portland Mountain Rescue's Kent Swanson Jr. Memorial Avalanche Course. It was an experience that has left one of those lasting marks on me, and involves remembering and honouring some sad times of our community's past.

Every year or two Portland Mountain Rescue (PMR) brings in an avalanche professional to lead a two-day avalanche seminar on the slopes of Mount Hood, Oregon. Known as the Kent Swanson Jr. Memorial Avalanche Course, it is intended as a refresher for Oregon and Washington mountain safety workers, both professional and volunteer. The list of past course leaders is impressive. Even more impressive is how this course reflects on Canadian professionalism.

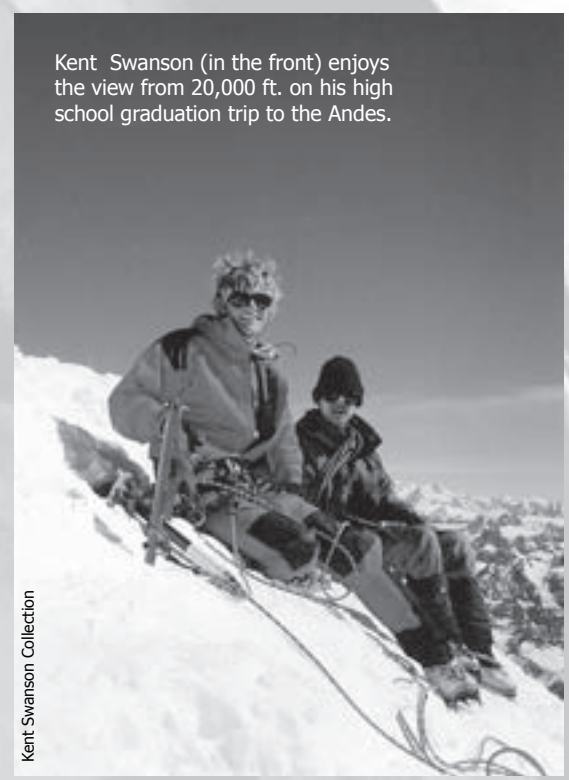
Most of the individuals chosen to lead this course are current, professional members of the CAA. All are considered leaders in our community today. PMR is a very dedicated and professional volunteer search and rescue organization. The level of expertise the various members of the group bring to the organization is impressive, and their mission record speaks for itself.

With Mt. Hood widely considered one of the most climbed peaks in the world—and rescue missions all too frequent—those charged with public safety on its flanks can only be the best. Their integration and organization with surrounding SAR organizations, local and state police and the US military are the envy of many, and a model to which we in Canada should aspire.

While avalanche danger may not be a primary hazard for much of the year due to the local climate, PMR members recognize the importance of constant training and refreshers to ensure avalanche SAR skills remain honed. Their use of Canadian avalanche expertise is a reflection of their dedication to high standards of training and, if I can speak on behalf of the CAA and its members, a true honour for our association.

The origins of the Kent Swanson Jr. Memorial Avalanche Course are rooted in tragedy. In January, 1997, a helicopter crashed while flying in to a CAA Level 1 course at Ptarmigan Hut near Kimberley, BC. All four passengers and the pilot were killed. Two members of the PMR group were on that course. Kent Swanson Jr. was in the helicopter that crashed, along with Art Twomey, long-time member, instructor, mentor and leader in the CAA.

Out of that terrible accident came a truly remarkable memorial to a key member of the PMR group. This course represents an ongoing commitment by the Swanson family to the ongoing development of avalanche skills in the PMR group. It was an honor to work with these people and I hope this article and memorial to Kent Swanson Jr. can help us all remember our fallen colleague, Art Twomey, at the same time.



Kent Swanson (in the front) enjoys the view from 20,000 ft. on his high school graduation trip to the Andes.

Kent Swanson Collection

Avalanche Course

The Making of a Legacy

By Tom Stringfield, with help from Frans Bogardus, Doug Striker, Rocky Henderson and Glenn Kessler

Kent Swanson grew up in a suburb of Baltimore, Maryland. His high school graduation present from his parents was a ticket to the American Alpine Institute's (AAI) Bolivia Tour, which culminated in a climb of Ancohuma, at 21,095 ft. All the participants took turns standing on each other's hands, so they could say they had climbed higher than the mountain. In Kent's case, he reached 21,101 ft.

That experience shaped his decisions about his future. For his higher education, Kent chose Lewis and Clark College in Portland, Oregon, a short drive from the Cascade Mountains. Much of Kent's time away from the classroom was spent in the Cascades—climbing, skiing, mountain biking and fly fishing, but mostly climbing.

Kent was not a peak-bagger with a checklist but someone who looked for a deeper connection with each mountain, climbing it multiple times by different routes in different seasons. A couple of similar-minded students at Lewis and Clark were his early climbing partners. Soon, they began to look for better information on climbing and climbing safety, and together they joined Portland Mountain Rescue, a unit of the Mountain Rescue Association.

There, Kent's mountain skill really blossomed, and he quickly became a trusted member of the group. As a skillful high-endurance climber, Kent was credited with twice leading rescue teams to bring back climbers lost in atrocious weather on Oregon's Mt. Hood, all while still a student at Lewis and Clark. His summer vacation jobs included guiding for Rainier Mountaineering, Inc. (RMI) on Washington's Mt. Rainier.

Kent's after-graduation plans were built around a career in the mountains. He worked as a guide for both RMI and AAI and as a ski patroller for Mammoth Mountain in east-central California. His work as a ski patroller supported his dreams of operating a backcountry ski operation, as well as suggesting the need for more avalanche education. This, as fate would have it, led him to the CAA course and the helicopter crash that claimed his life.

After Kent's death, several members of Portland Mountain Rescue wanted to create a fitting memorial, and Kent's family wanted to help. Together, they developed the Kent Swanson Jr. Memorial Avalanche Course as a refresher course for mountain rescuers, ski patrollers, climbing rangers, guides and other winter mountain professionals in the Pacific Northwest. Since the maritime climate of the Cascade Range produces extreme avalanche hazard much less frequently than BC's interior ranges and the Rockies, avalanche skills in the Pacific Northwest can become a bit rusty. Polishing away the rust and introducing new developments in avalanche science are the course's primary objectives.

The PMR course organizers have ties to both Kent and Art Twomey. Long-time PMR member Rocky Henderson became Kent's mountain mentor shortly after Kent joined the rescue group. Rocky, who passed along his climbing and skiing skills to Kent, was also a frequent client at Art's backcountry ski operation in the Purcells.

PMR member Glenn Kessler was another of Kent's mountain teachers. Glenn has worked as a climbing ranger on Mt. Hood and Mt. Rainier, and had developed a plan with Kent for jointly purchasing a backcountry ski operation in California. Glenn had also spent time at Art's facility in the Purcells and was signed up for the same avalanche class as Kent. He was to be on the helicopter's second flight into Boulder Basin.

Another long-time PMR member, Tom Stringfield, watched with pride as Kent's climbing and rescue skills became more professional. Tom was also an Art Twomey client, and together with Rocky completed Art's week-long avalanche course in the early 1990s. Rocky, Glenn and Tom continue to organize the course as a memorial to Kent.

The goal of course organizers has been to find the best possible instructors on the continent to lead the course. The course has been offered six times since its inception in 1998 and the instructor list is a "who's who" in the avalanche business. Clair Israelson instructed the first course in 1998, followed by Bruce Jamieson in 2000, Chris Stethem in 2001, Ian McCammon in 2003, Phil Hein in 2005 and Ian Tomm this past winter. Clair and Phil both have independent ties to the Kent Swanson, Jr. story, as both helped in the search and recovery effort after the helicopter crash.

Kent's parents, Kent Sr. and Trish Swanson, remain close to the course project and have made donations to PMR for each course to help with expenses and keep the course affordable for its students. Portland Mountain Rescue intends to continue offering this course, and to continue inviting the most respected avalanche professionals on the continent as lead instructors, as long the need continues. PMR believes the course is a fitting memorial to Kent Swanson Jr. and looks forward to an ongoing partnership with the Swanson family.

Kent Swanson Collection

New Leader for Alpine Club of Canada

In early May of this year, Lawrence White of Canmore took over the duties of Executive Director for the Alpine Club of Canada. Lawrence replaces Bruce Keith, who is retiring after having served in the role for the past 12 years.

Lawrence has worked full time at the ACC national office for five years, serving as the Mountain Adventures Coordinator, Facilities Administration Manager and most recently as the Director of Facilities. He first came to the club as a practicum student from Capilano College in North Vancouver, where he was studying Tourism Management. The ACC quickly recognized Lawrence's potential and invited him back to work full time as soon as the right job became available.

Lawrence is bilingual (English and French) and is very passionate about the ACC. He has spent a significant amount of time volunteering in many areas of the club. Looking to the future, President Cam Roe said, "We have just finished celebrating our centennial, and Lawrence will bring a high level of commitment and energy to the Executive Director position as we begin our second century."

Congratulations Lawrence! The CAA and CAC look forward to continuing our great relationship with the ACC.

Lawrence White Collection

Did you know:

- The Alpine Club of Canada was established in 1906.
- It's a non-profit club, volunteer driven with over 10,000 members in local sections across Canada, the USA and around the world.
- The ACC promotes alpine access and environmental preservation, carries out mountaineering safety and research studies, promotes mountain heritage and culture, and provides winter and summer mountaineering adventure trips in Canada and abroad.
- The ACC operates a clubhouse in Canmore, Alberta, and 23 backcountry huts in the mountains of Alberta and BC.

Dave Richards

Zac's Tracs Honoured for Avalanche Safety Work

One of the CAC's snowmobile champions, Lori Zacaruk, was honoured with her husband Randy when they were presented with the CCSO (Canadian Council of Snowmobile Organizations) Excellence Award for 2007, in recognition of their work in avalanche safety training. Through their company "Zac's Tracs," Lori and Randy have reached over 10,000 school students, 1500 adults in classroom presentations, and close to 750 snowmobilers in hands-on field training exercises over the past seven years.

Lori and Randy Zacaruk are presented with an award for excellence at the International Snowmobile Congress in Minneapolis, Minnesota. With them in the photo are (from left to right) Canadian Council of Snowmobile Organizations President Pat Whiteway, Executive Director of the Alberta Snowmobile Association (ASA) Louise Sherren, Randy and Lori Zacaruk, and ASA President Pat McGrath.

The presentation was made during the International Snowmobile Congress held in Minneapolis, Minnesota, in early June. The four-day conference is one of the highlights of the snowmobiling calendar, and delegates from all the Canadian provinces and the Yukon Territory were joined by representatives from 23 states, Sweden, and Russia.

While at the conference, Lori made presentations to the CCSO, the International Association of Snowmobile Administrators (IASA) and the International Snowmobile Media Council (ISMC). The focus of her talk was to encourage partnerships between the snowmobile and avalanche communities.

Along with her presentations, Lori handed out the CAC's "Thrill" brochures, which were well received. She also had informal discussions with delegates from Newfoundland, Yukon, BC, Saskatchewan, Alberta, Idaho and Sweden, and spoke with the Safety Director of the CCSO, and Ed Klim, president of ISMA (the International Snowmobile Manufacturers Association.)

"Don't think for a moment that I was a wallflower!" says Lori. "I believe many good connections were made. The snowmobile industry is looking for avalanche education and support and now the world knows where to look." Congratulations, Lori and Randy—great work!

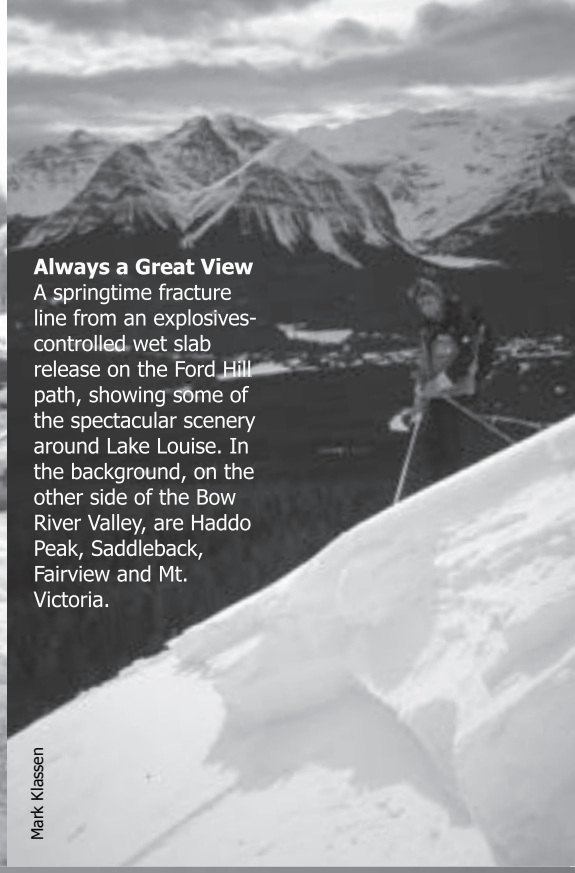
What is the ISC?

The International Snowmobile Congress (ISC) is an annual event held in states and provinces across the snow belt of North America. It brings together snowmobile and groomer manufacturers, leaders of snowmobile organizations, grassroots snowmobilers, snowmobile publication staff, snowmobile administrators (natural resources), government representatives and other people interested in snowmobiling.

- o American Council of Snowmobile Associations (ACSA) —delegates of state snowmobile associations
- o Canadian Council of Snowmobile Associations (CCSO) —delegates of provincial associations
- o International Snowmobile Council—delegates of ACSA and CCSO
- o International Snowmobile Manufacturers Association (ISMA)— represents Arctic Cat, Polaris, Bombardier Recreational Products and Yamaha
- o International Snowmobile Media Council (ISMC) —snowmobile publication representatives
- o International Snowmobile Tourism Council (ISTC) —representatives from tourism groups
- o International Association of Snowmobile Administrators (IASA) — representatives of natural resource departments
- o Iron Dog Brigade (IDB) —an honorary, by invitation only, group. Members must be nominated by an IDB member and must have a minimum of 10 years active service to the growth and betterment of snowmobiling

Dave Iles Collection

The End of a Great Season
Some of the members of Lake Louise's Avalanche Control Team smile for the camera on the last day of the 2006-07 season. Team leader Dave Iles called it, "the best season ever—more terrain open and no incidents!" From left to right: Todd Kermode, Jay Chrysafidis, Richard "Rocket" Miller, Dave Iles, Steve Robertson and Geoff Osler.



Mark Klassen

Always a Great View
A springtime fracture line from an explosives-controlled wet slab release on the Ford Hill path, showing some of the spectacular scenery around Lake Louise. In the background, on the other side of the Bow River Valley, are Haddo Peak, Saddleback, Fairview and Mt. Victoria.

The Lake

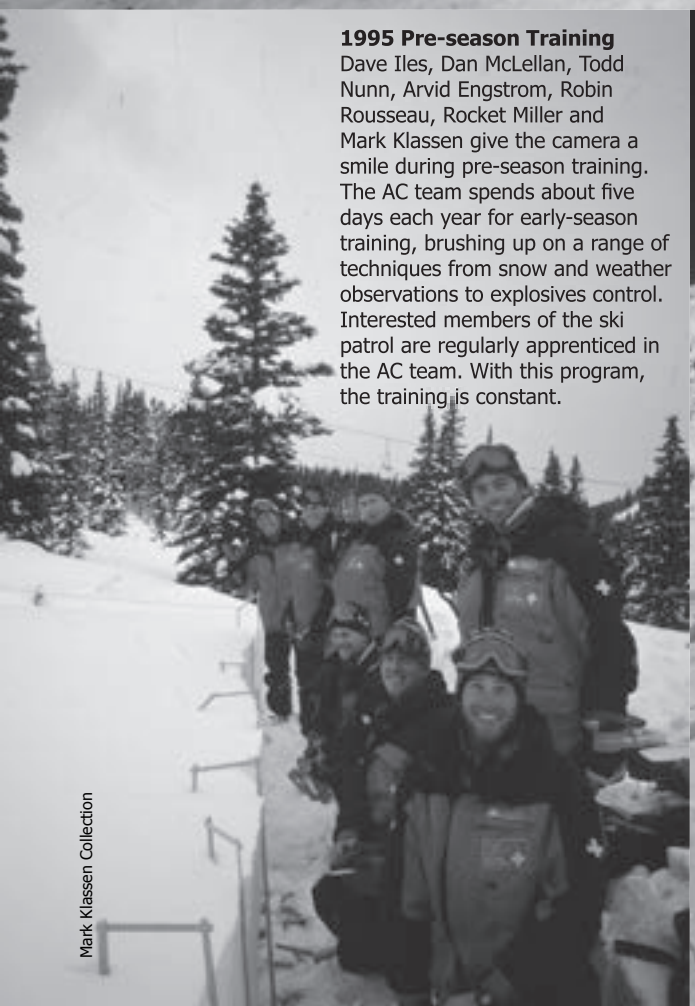
The avalanche control team at work at Lake Louise Mountain Resort, in the heart of Alberta's Rocky Mountains.

Chris Moseley

Ready to Fire
Chad Hemphill mans the Marmot Avalauncher as Rocket Miller points out the target. The team is controlling the "Elevator Shaft," a popular double-black diamond run.

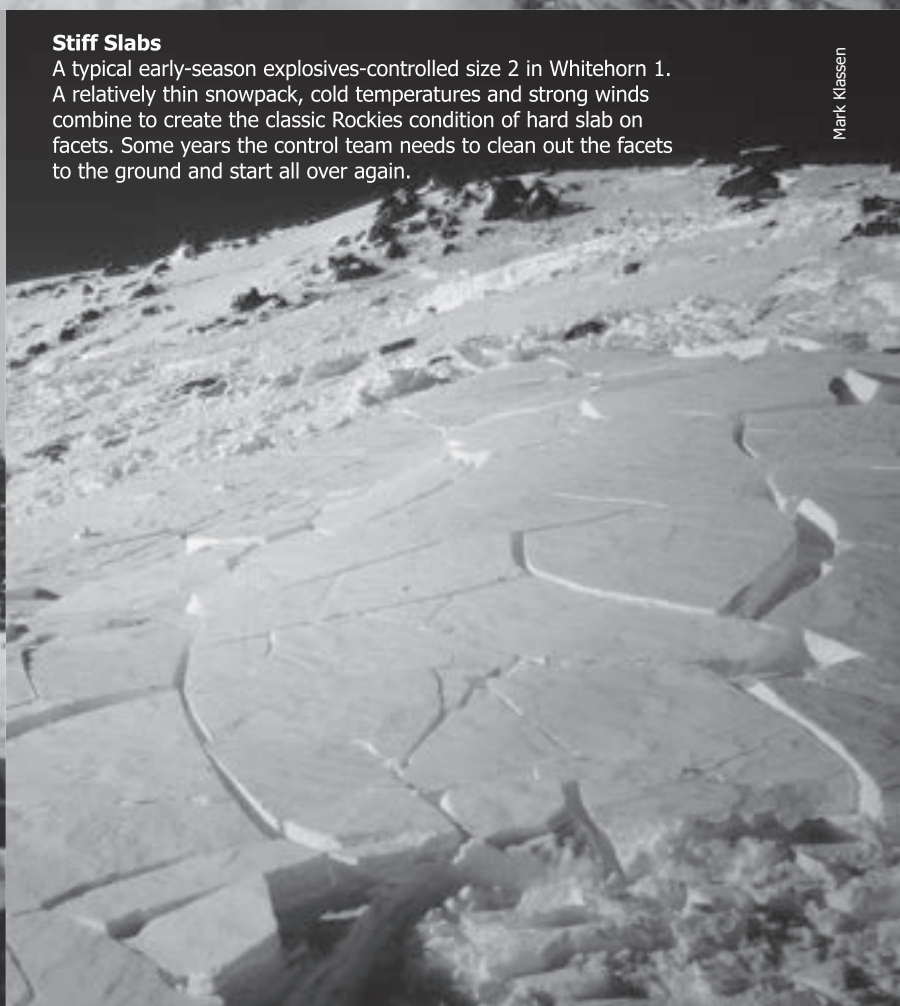
Mark Klassen

Ski Compaction
A mixed Warden Service/Ski Patrol team consisting of Marc Ledwidge, John Luttrell and Art Laurenson works on some November ski compaction in Flush Bowl back in 1988. Control teams compacting thin snowpack areas at the beginning of the winter was, and still is, essential to enabling the ski area to open steep terrain later in the season.



Mark Klassen Collection

1995 Pre-season Training
Dave Iles, Dan McLellan, Todd Nunn, Arvid Engstrom, Robin Rousseau, Rocket Miller and Mark Klassen give the camera a smile during pre-season training. The AC team spends about five days each year for early-season training, brushing up on a range of techniques from snow and weather observations to explosives control. Interested members of the ski patrol are regularly apprenticed in the AC team. With this program, the training is constant.



Mark Klassen

Stiff Slabs
A typical early-season explosives-controlled size 2 in Whitehorn 1. A relatively thin snowpack, cold temperatures and strong winds combine to create the classic Rockies condition of hard slab on facets. Some years the control team needs to clean out the facets to the ground and start all over again.

By The Numbers:
Lake Louise Mountain Resort

10	Number of people on the avalanche control team (seven full-time, three part-time)
8	Number of CAA professional members on the AC team
1500	Average number of hand charges thrown each season
200	Average number of Avalauncher rounds discharged each season
4	Number of Avalauncher guns at the ski area
90	Approximate number of avalanche paths in the ski area boundary
1990	Year the responsibility for AC passed from Parks Canada to the ski area.
1200	The amount of previously closed terrain (in acres) opened since 1990
4200	The current operational boundary (in acres)
135	Average number of days on skis per season for full-time members of the AC team
49	Number of black diamond runs
45	Number of double black diamond runs
28	Number of CAA ITP courses held in Lake Louise since 1998

Love This Job!
Craig Sheppard looks more than ready to go heli-bombing. The mission on this day was to perform avalanche control near the edge of the operational boundary on the Skoki Lodge access trail, after a storm dropped 60 cm on the area. Skoki Lodge is a popular backcountry destination 10 km east of the ski area.

Chris Moseley

The Backside
To Lake Louise old-timers, this photo will bring back memories. The Whitehorn 2 area is now open to skiing, and mid-winter ground release avalanches of this size are probably a thing of the past due to extensive early-season compaction and control work. Back in January 1994, when this shot was taken, Whitehorn 2 was permanently closed and the AC team could almost always count on getting impressive results like these sometime over the season. On this day, several size 3 avalanches with fracture lines over 2 metres deep occurred after several days of snow and wind followed by a drop in temperature from –2°C to –30°C in a 12-hour period.

Mark Klassen

Originally printed in the Fitzhugh, Jasper's weekly newspaper on May 3, 2007

Not Letting it Slide

Former park wardens and current avalanche technicians converge to talk past, present and most importantly, explosives

By Bob Covey

Keeping the slopes of Jasper's commercial ski hill safe from avalanche danger is a task that falls on the shoulders of Marmot Basin's professional avalanche technicians. But it wasn't so long ago that the Parks Canada Warden Service – the men and women recognized as guardians of the peaks — had Marmot Basin as part of their catchment area. Like many aspects of public safety in the days that Marmot was growing into a tourist-mecca, those working in the field were using cutting edge techniques as far as avalanche control, rescue techniques and explosives work. On Friday, April 20, two of the original pioneers of avalanche rescue were invited to Marmot Basin for an informal meet and greet with some of the current avalanche control (AC) techs. Call it a linking between past and present or simply a b.s. session; the Fitzhugh had the opportunity to gain perspective on avalanche work, Then and Now.

When former park warden Tony Klettl came to Marmot Basin to head up the avalanche patrol in the mid 1960s, he had nowhere near the resources that Tim Ricci, director of public safety at the hill today, has at his disposal. Klettl had four staffers including himself, compared to Ricci's 26 (includes ski patrol), dogs hadn't yet been trained for searching, the first avalanche beacons were a few years away from being developed and heli bombing (something Ricci himself has only just been introduced to) wasn't even a thought in park administrators' heads. But never mind missing out on technology of the future, when he first took the reins, Klettl was short of the basic equipment that was manufactured for his era, primitive though it may seem today.

Bob Covey

Toni Klettl founded the avalanche control program at Marmot Basin. Here he shares stories with current AC director Tim Ricci.

Loni Klettl Collection

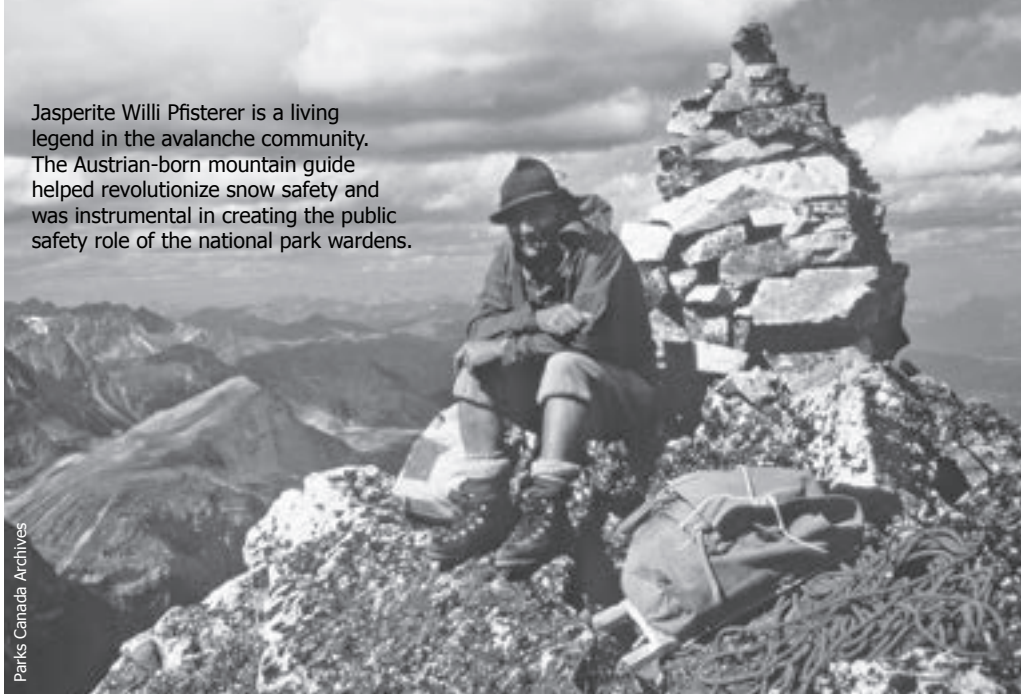
Cue Willi Pfisterer, one of the fathers of modern mountain rescue, an accomplished skier and charter member of the Association of Canadian Mountain Guides. Pfisterer had been developing the avalanche research program at Rogers Pass and it was he who helped Klettl in getting provisioned with the proper knowledge, man-power and equipment for running Marmot's avalanche safety program.

During their time at the AC hut last week, when not poring over the still intact snow studies and weather plots that Klettl and Pfisterer themselves mapped some 40 years ago, much of the former wardens' stories recalled the now-dinosaurian equipment that park wardens handled. One such relic was the predecessor to today's Avalauncher, the Howitzer 105 recoilless rifle. This massive, military-issued cannon was so large it had to be towed behind a truck and when fired, operators had to back off 100 feet so to not be blasted by the charge out of its bottom end. It was only one of five such guns in Canada and Klettl seemed to be the only one at Marmot who was crazy enough to go near it.

"If you followed the safety protocols it was no problem," Klettl said, brushing the wide-eyed stares of his successors aside.

Pfisterer, a stickler for protocol himself, remembered the first time the wardens fired the 105. The discharge blew some of the windows out of the chalet, he said.

"Those windows needed to be replaced anyway," Klettl said, rousing a hearty laugh.


Jasperite Willi Pfisterer is a living legend in the avalanche community. The Austrian-born mountain guide helped revolutionize snow safety and was instrumental in creating the public safety role of the national park wardens.

Parks Canada Archives

Ricci, while giving Klettl and Pfisterer a look at what constitutes an avalanche bomb today—sheathed in plastic, complete with tail fins and built-in locators in case it turns out to be a "dud"—said the crew still finds old 105 shells during their post-season cleanup. It's a legacy that's not quite as useful as the old snow studies and weather charts, but interesting nonetheless.

Avalanche technicians being what they are, the conversation stayed on explosives for a good portion of the visit. The old boys told them about the mortars they used to lob at high-up cornices while Ricci and fellow AC tech Kelly MacDonald explained how today they use the Avalauncher—which was introduced to Marmot in the late 1960s, so Klettl and Pfisterer were both familiar with the machine.

"Did you find it accurate?" Ricci questioned Klettl, to which the 80-year-old Klettl replied in the positive. Pfisterer, whose intolerance for ineptitude is stuff of legend, grimaced scornfully. "Are you lining the damn thing up properly?" he said, to which a surprised Ricci assured him he was.

The differences were marked, but the similarities between their jobs four decades apart were noted, too. One such commonality was that of responding to injuries obtained by the skiing public. The men had somewhat of a morbid laugh at the different lacerations they've had to treat, one-upping each other with stories of sliced open buttocks, thighs and even throats. "You could see the jugular," Klettl shrugged, to which the men nodded knowingly.

When Ricci brought out his modern-day avalanche beacon to show Pfisterer and Klettl how far the device has come since the "Scotty," Pfisterer inspected it approvingly but issued a rule of thumb for avalanche safety equipment: make it accessible.

"You've got to make it affordable and you've got to make it easy to use," Pfisterer said. "You can't have some guy who just lost his wife panicking and not knowing how to work it."

Just as Pfisterer and Klettl could see how far equipment and technology has come in the field of avalanche control, the two pioneers could reinforce that there's no replacing the common sense and first-hand knowledge that's gained by putting in the hours on the ground. As the current AC crew at Marmot Basin continue to cut their teeth, they can appreciate the foundations laid by men like Klettl and Pfisterer.

"It's nice to put a face to a name," Ricci said.

For the former wardens' sakes, the can rest easy knowing the program they created is in good hands.

"I'm pleased to see the things we did are still there," Pfisterer said.


Bob Covey

Former park warden Willi Pfisterer regales Kelly MacDonald (centre) and Bob Bell (right) from Marmot Basin with tales of the good old days. Pfisterer helped get the AC program at Marmot started, supplying fellow warden Toni Klettl with resources.

>>Bob Covey is the editor of the Fitzhugh, Jasper's independent, locally owned newspaper.

Brent Strand

Schedule of Coming Events

July 9-13, 2007
IUGG General Assembly

The International Union of Geodesy and Geophysics meets every four years. This year, a session on snow avalanches will be held, focusing on field observations and modelling. Emphasis will be on the integration of observations and the verification and improvement of models.
Where: Perugia, Italy
Info: www.iugg2007perugia.it

October 17-20, 2007
SAR*SCENE* 2007

The sixteenth annual search and rescue conference will be held in Victoria, BC. As Canada's leading national forum on search and rescue, SAR*SCENE* is a unique opportunity for members of the SAR community to come together and share their expertise. Highlighted this year will be demonstrations on search and rescue in Western Canada.
Where: Victoria, BC
Info: www.nss.gc.ca or call 1-800-727-9414.

October 24-26, 2007
Wilderness Risk Manager's Conference

This annual conference focuses on risk management and practical skills for the wilderness adventure and education industry. Attendees share field and administrative techniques in risk management, while building valuable networks with other leaders in the outdoor field.
Where: Banff, Alberta
Info: www.nols.edu/srmc

SWarm - A simple model to estimate near-surface daytime warming

Laura Bakermans
Department of Civil Engineering, University of Calgary

Near-surface daytime warming can have important effects on snow stability. Of particular concern for avalanche practitioners is a loss of slab stiffness, which can increase the potential for both human-triggered and natural avalanches (e.g. McClung, 1996; McClung and Schweizer, 1997). Although experienced avalanche practitioners have an intuitive understanding of daytime warming, the magnitude, spatial variation and effects on stability can be difficult to quantify.

The net energy balance drives near-surface daytime temperature changes. Energy transfer mechanisms that contribute to the surface energy balance include radiation, convection and conduction; the relative importance of each will vary due to differences in location, snowpack characteristics, meteorological conditions and time of year and/or day. Daily fluctuations in near-surface temperature occur because cool snow surface temperatures overnight (typically due to outgoing long wave radiation) are followed by warming of near-surface snowpack layers during the day (typically due to incoming short wave radiation). In this article, the term daytime warming is used to describe the increase in snow temperature, at 10 cm depth below the snow surface, from sunrise to the time at which the maximum value occurs in the afternoon (Figure 1).

For my MSc thesis, I developed a model (SWarm) that estimates the expected magnitude of daytime warming over terrain. While information about the effects of warming on stability will ultimately be the most useful for avalanche practitioners, further research is required to better understand the interaction between warming and snowpack structure. In the interim, I hope that output from SWarm is useful information for avalanche practitioners to consider along with other snowpack and weather factors when evaluating stability.

SWarm was developed from field measurements of temperatures within the top 30 cm of the snowpack. The following criteria were considered while building the model:

- simple input requirements (so that special equipment, like radiometers, are not required)
- ease of application
- visual model output

SWarm, which is based on a Microsoft Excel spreadsheet, is available for free download from the University of Calgary Applied Snow and Avalanche Research website: http://www.schulich.ucalgary.ca/Civil/Avalanche/papers_all.htm (googling 'SWarm.xls' will also get you there).

Inputs required by SWarm include latitude, longitude, date, estimated average daily sky condition and the number of days since snowfall. Output values, given as an estimate of daytime warming (ºC) at 10 cm vertical depth below the snow surface (ΔT10), are plotted visually and provided in a table (Figure 2). Slope angle and aspect information can also be entered to obtain a daytime warming value for a specific location.

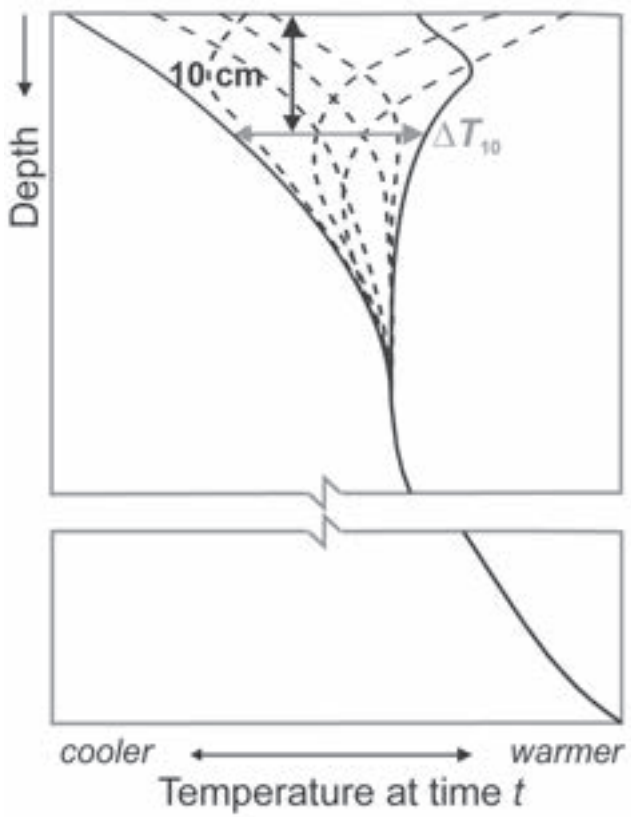
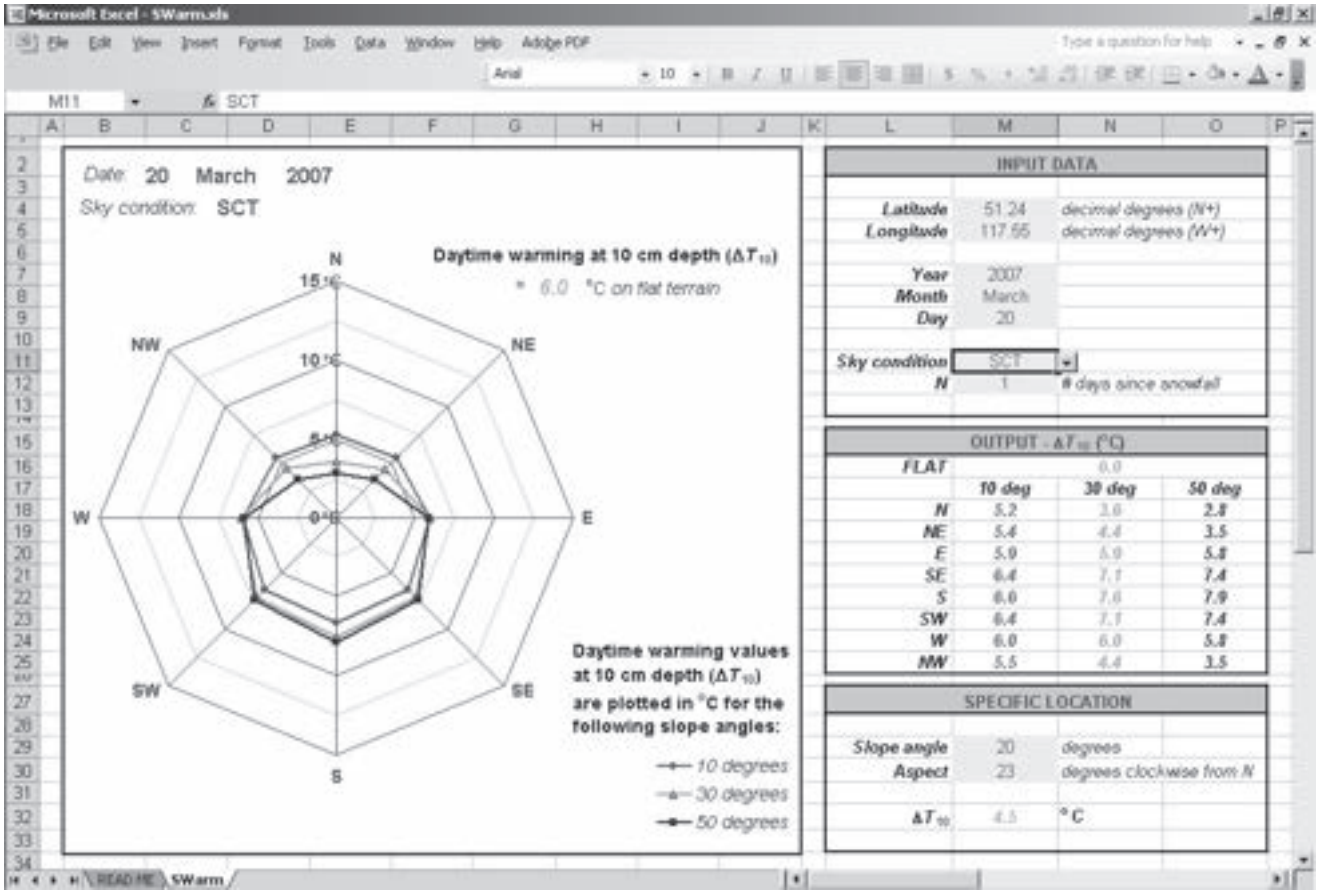


Figure 1. Illustration of daytime warming at 10 cm depth below the snow surface (ΔT_{10}), based on sketch of temperature profiles at different times during the day.

Limitations to model performance arise both from the simplicity of the data input requirements and from the limited range of conditions captured in the model-building dataset. Examples of factors not considered by the model include variation in cloud cover over the day, shading by trees or nearby terrain features, spatial variation in near-surface snowpack conditions, strong winds or precipitation, and isothermal snowpack temperatures. These limitations are outlined in the SWarm spreadsheet file and discussed in detail in my thesis (Bakermans, 2006, Chapter 6). Based on the model-building dataset, the estimated accuracy of the model is 1.6 ºC.

Without a well-defined relationship to instability, it is, at



first, difficult to see the benefit of including quantitative information about daytime warming, like SWarm output, in the stability evaluation process. However, many other weather factors typically considered also lack a clear effect on stability. What is different is that quantitative information about near-surface warming has not been readily available in the past, and the experienced-based associations with avalanche activity that exist for other weather factors have not been established. In order to build these mental links, quantitative estimates need to be incorporated into snow stability discussions.

SWarm also has potential as a learning tool to initiate discussion regarding near-surface daytime warming and its potential effects on stability. The visual model output may help new avalanche practitioners to better understand how slope characteristics, time of year, and cloud cover influence daytime warming due to solar radiation. The limitations of this simple model highlight the complexity of this process and identify additional factors that can affect daytime warming. Combined with field experience, this learning may speed the development of associations between weather conditions, terrain, snowpack structure and avalanche activity.

Are the daytime warming estimates provided by SWarm an improvement on an experienced-based assessment of daytime warming? If so, what is the best way to include this information in discussions about stability? These are questions best left to avalanche forecasters and field practitioners. Give SWarm a try and see what you think.

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FATAL AVALANCHE ACCIDENTS AND FORECASTED DANGER LEVELS: PATTERNS IN THE UNITED STATES, CANADA, SWITZERLAND AND FRANCE

Ethan Greene[1*], Thomas Wiesinger[2], Karl Birkeland[3], Cécile Coléou4, Alan Jones[5], and Grant Statham[6]

[1]Colorado Avalanche Information Center Boulder, Colorado, U.S.A.
[2]Swiss Federal Institute for Snow and Avalanche Research SLF, Davos, Switzerland
[3]USDA-Forest Service National Avalanche Center, Bozeman, Montana, U.S.A.
[4]Météo-France, Saint Martin D'Heres, France
[5]Canadian Avalanche Center, Revelstoke, British Columbia, Canada
[6]Parks Canada, Banff, Alberta, Canada

KEYWORDS: avalanche accidents, avalanche danger, avalanche forecasting

Abstract

Throughout the winter, avalanche forecasters issue bulletins to help the public and the managers of public facilities make avalanche safety decisions. These bulletins typically describe important snowpack features and current weather events before rating the avalanche danger on a scale of one through five. Although the character of avalanche conditions may vary between regions, the physical processes that form avalanches are universal. In addition, the methods used to forecast avalanche activity are similar throughout North America and Europe. We use the distribution of fatal avalanche accidents with respect to forecasted avalanche danger level to examine how effectively avalanche forecast groups communicate with the public and how consistent these groups are within countries and internationally. The results show that avalanche forecast groups are effectively communicating with the public when relatively benign or very dangerous conditions exist.

1. Introduction

People who make decisions for themselves or others about avalanche safety often get information from an avalanche forecasting group. This group might be focused on a well defined area, like a transportation corridor or skiing area, but usually they are providing information for a large geographic area and a diverse group of users. It is often difficult for the avalanche forecasting group to determine how useful their products are and how their various customers use the information. Quantitative verification of avalanche forecasts is difficult and often costly (Schweizer et al., 2003). We collected information on the distribution of fatal avalanche accidents with forecasted avalanche danger level to examine variations within North America and compare the distributions with data from France and Switzerland. Our intention is to provide insight into the consistency of avalanche bulletins and whether or not they help the public make sound avalanche safety decisions.

Since we examine fatal accidents with respect to a forecasted danger level, it is impossible to separate the data from the avalanche danger scale. Avalanche danger scales are an important issue in avalanche forecasting as they are the primary tool we use to communicate with the public. The forecasting groups that participated in this study use one of two avalanche danger scales. Section 3 compares and contrasts the two scales.

*Corresponding author address: Ethan Greene, Colorado Avalanche Information Center, 325 Broadway WS1, Boulder, CO 80305, USA; tel:303-499-9650; fax: 303-499-9618; email: ethan.greene@state.co.us

2. Previous Work

Each country represented in this study collects information on fatal avalanche accidents, but the information is stored and disseminated differently. Descriptions of each accident are published in summary publications such as *The Snowy Torrents* (Logan and Atkins, 1996) or *Avalanche Accidents in Canada* (Jamieson and Geldsetzer, 1996), or in the annual reports of each forecasting group. These volumes may include the forecasted avalanche danger level for each accident but do not examine long-term trends or patterns in fatal accidents with respect to the forecasted avalanche danger.

McClung (2000) used data from fatal avalanche accidents in backcountry areas of Switzerland and France to examine the avalanche danger scale and forecast verification. He used Bayesian methods to calculate probability mass functions for each danger level in a five level scale. His analysis concluded that fatal accidents are most likely to occur when the avalanche danger is rated Considerable (Level 3). The greatest increase in the likelihood of a fatal accident occurred between Moderate and Considerable (Levels 2 and 3), with only a slight increase from High to Extreme (Levels 4 and 5). One main conclusion of his work was that the High and Extreme levels could be combined to create an effective four-level scale.

Harvey (2002) examined 12 years of data from recreational accidents in Switzerland. The dataset included both fatal accidents and other destructive avalanches. He discussed

patterns in avalanche dimensions, terrain characteristics and forecasted danger levels. Harvey concluded that at all danger levels, fatal avalanches are similar in size and occur in similar locations. He also concluded that the probability of triggering an avalanche increases with increasing slope angle and both the probability of triggering an avalanche and the number of potential trigger points decrease with forecasted danger level.

3. Avalanche Danger Scales

Avalanche danger is defined as the potential for avalanches to cause injury or death (Greene et al., 2004; Stucki et al., 2004). All the avalanche forecast centers included in this study use a five-level scale to rate the avalanche danger in their bulletins. Although the scales used in North America and Europe both contain the same number of levels, there are some notable differences in the definitions of each danger category.

3.1 North American Avalanche Danger Scale

The avalanche danger scale used in North America (Dennis and Moore, 1996) is based on the probability of triggering an avalanche. Each avalanche danger level is defined by the probability that a natural and human trigged avalanche will occur. The five levels also include some information on where avalanches could be triggered and give a recommendation to backcountry travelers of what they can do to minimize the risk. The scale was developed as a tool to communicate variations in avalanche danger to people involved in backcountry recreation. This scale is not typically used by programs that forecast for transportation corridors, municipal areas or mechanized skiing.

3.2 European Avalanche Danger Scale

The European Avalanche Danger Scale (Meister, 1994) considers snow stability, avalanche frequency, avalanche size and the probability of triggering an avalanche (Table 1). Each danger level definition discusses the amount of bonding within the snowpack, the size and number of avalanches, and the potential for natural and human triggered avalanches. The spatial extent of snow stability and the load required to produce an avalanche are also included in some of the danger level definitions. The scale was developed to communicate avalanche danger to the general public, managers of towns and transportation corridors, as well as recreationalists.

3.3 Combining North American and European Avalanche Danger Ratings

The North American and European avalanche danger scales each use five levels to describe a continuum of avalanche conditions. Although in some respects the scales are quite similar, within each definition there are notable differences (Table 2). The European scale includes more parameters than the North American scale, but both scales are based on a progression of avalanche frequency, and they also

Table 1: English translation of the European Avalanche Danger Scale.

Danger Level	Snowpack stability	Avalanche triggering probability
LOW	The snowpack is generally well bonded and stable.	Triggering is generally possible only with high additional loads[2] on very few steep extreme slopes[4]. Only sluffs and small natural[6] avalanches are possible.
MODERATE	The snowpack is only moderately well bonded on some[1] steep[3] slopes, otherwise it is generally well bonded.	Triggering is particularly possible with high additional loads[2], mainly on the steep[3] slopes indicated in the bulletin. Large sized natural[6] avalanches not expected.
CONSIDERABLE	The snowpack is moderately to weakly bonded on many[1] steep[3] slopes.	Triggering is possible, sometimes even with low additional loads[2] mainly on the steep[3] slopes indicated in the bulletin. In certain conditions, a few medium and occasionally large sized natural[6] avalanches are possible.
HIGH	The snowpack is weakly bonded on most[1] steep slopes.	Triggering is probable even with low additional loads[2] on many steep[3] slopes. In certain conditions, frequent medium and also increasingly large sized natural[6] avalanches are expected.
EXTREME	The snowpack is generally weakly bonded and largely unstable.	Numerous large natural[6] avalanches are expected, even on moderately steep terrain.

[1] Generally described in more detail in the avalanche bulletin (e.g. altitude, slope aspect, type of terrain, etc.).
[2] Additional load:
high - e.g. group of skiers without spacing, snowmobile/groomer, avalanche blasting
low - e.g. single skier, snowboarder, snowshoeer.
[3] Steep slopes: slopes with an incline of approximately more than 30 degrees.
[4] Steep extreme slopes: those which are particularly unfavourable in terms of the incline, terrain profile, proximity to ridge, smoothness of underlying ground surface.
[5] Aspect: compass bearing directly down the slope.
[6] Natural: Without human assistance.
Exposed: especially exposed to danger

Table 2: Selected differences between the North American and European Avalanche Danger Scales.

Danger Level	North American	European
LOW	Isolated area of instability.	The snowpack is generally…**stable**.
MODERATE	Unstable slabs possible on steep terrain. Natural avalanches unlikely.	Triggering…possible with high additional loads... Large natural avalanches not expected.
CONSIDERABLE	Human triggered avalanches **probable**.	Triggering is **possible,** sometimes even with low additional loads...
HIGH	Natural and human triggered avalanches likely. Unstable slopes likely on a variety of aspects and slope angles.	Triggering is probable even with low additional loads on **many** steep slopes. In **certain conditions**, frequent medium and also increasingly large sized natural avalanches are expected. Snowpack is weakly bonded in most places.
EXTREME	Extremely unstable slabs certain…Large destructive avalanches possible. Widespread natural **or** human triggered avalanches certain.	Numerous large natural avalanches are expected even on moderately steep slopes.

both rely heavily on how easy it will be to trigger an avalanche. Despite their differences, we believe that generally the levels in both scales are used to describe similar conditions. For the purpose of this investigation we consider each of the five levels to be equivalent.

4. Data and Methods

We collected data on avalanche fatalities and the corresponding forecasted avalanche danger level from France, Switzerland, Canada and the United States. These data cover the time period from the fall of 1996 through the spring of 2006. All recreational, occupational and residential fatalities are included in the dataset. We made every attempt to determine the danger level forecasted for the area, elevation and slope angle where the accident occurred. We also collected frequency data of the forecasted avalanche danger to normalize the avalanche fatality distributions.

4.1 United States

Avalanche bulletins in the United States are issued by both government and private organizations. These entities issue forecasts on a variety of time periods ranging from daily to weekly. We collected data on avalanche fatalities that occurred within the forecast area of any avalanche center in the U.S.

During the established time period over 200 people were killed in snow avalanches within the United States. Three criteria were used to decide if an accident should be included in the dataset for this study. First, the avalanche bulletin had to be issued within 24 hours of the accident. Second, the avalanche bulletin had to be publicly available. Third, the avalanche accident had to be within the forecast area of the avalanche centers.

For the comparison of normalized distributions we only used data from the CAIC. This comparison required counts of both avalanche fatalities and the total number of times each danger level was used in a bulletin, and the CAIC is the only avalanche center in the U.S. that collected these data over the given time period.

4.2 Canada

The Canadian dataset covers the period from November 1996 through July 2006. The dataset includes all regions within Canada where an avalanche fatality occurred and a corresponding avalanche danger rating was publicly available. Thirty-seven fatalities were not included because there was no avalanche bulletin available at the time or for the area.

Avalanche bulletin data was collected from the Canadian Avalanche Center (CAC), Parks Canada (PC), and Kananaskis Country (KC). Within these organizations, 11 distinct forecast areas exist. There are three other organizations within Canada producing avalanche bulletins; two of these (Whistler/Blackcomb and Vancouver North Shore) have overlapping forecast areas with Canadian Avalanche Center areas. Center d'avalanche de la Haute-Gaspésie is located in Quebec. There have been no fatal accidents in this region while the program has been in operation.

Parks Canada produces daily avalanche bulletins, while the Canadian Avalanche Center and Kananaskis Country publish 3-5 bulletins per week, per area. Avalanche danger ratings in Canada are applied to three elevation bands: alpine, treeline, and below treeline. The elevation band of each accident was interpreted using local knowledge and accident reports. For example, when an avalanche runs 1000 meters it may cross several elevation bands and the assigned danger rating will depend on the location where the victim was caught or struck from above. The danger rating for each fatality was based on avalanche bulletin information that was current at the time of the accident.

Forecast frequency data was only available from the Canadian Avalanche Center. Therefore the fatality day used in

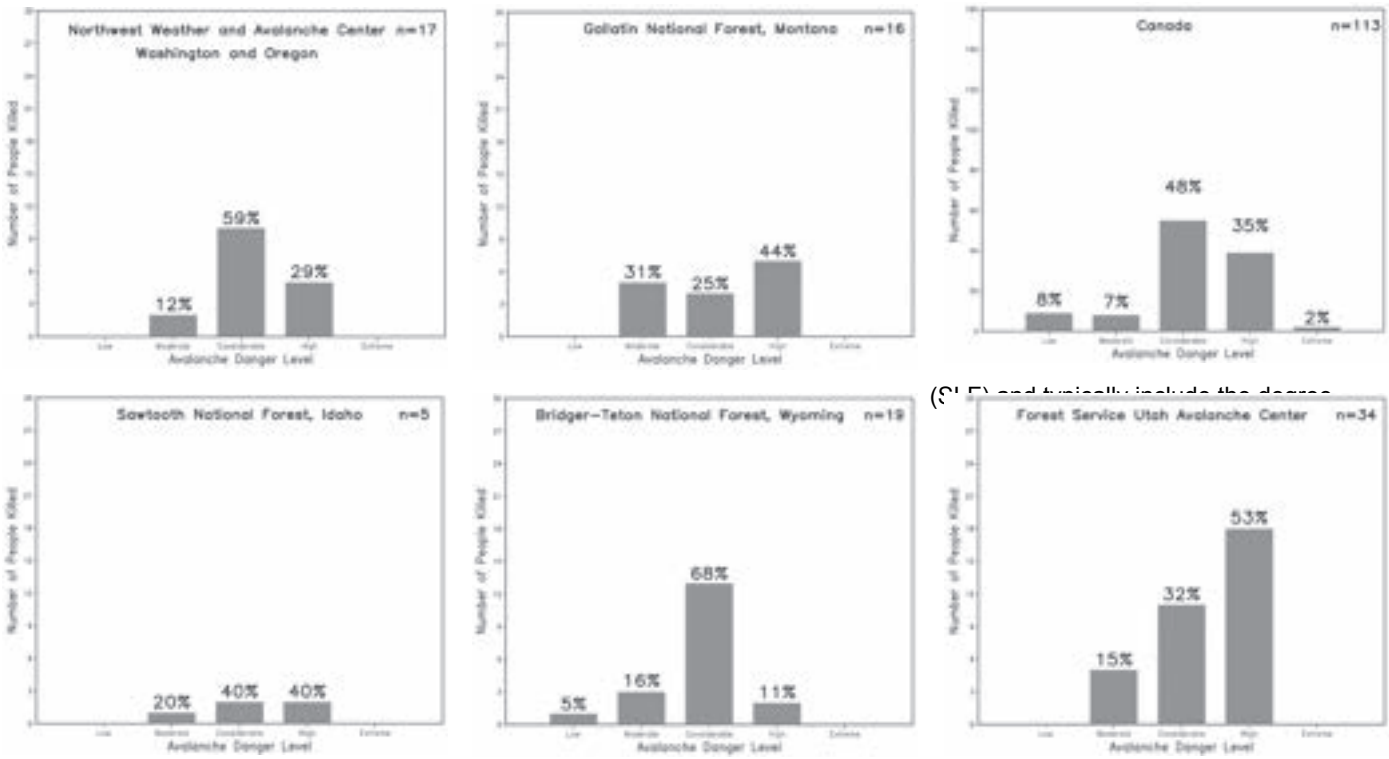

Figure 1: Regional distribution of fatalities by forecasted danger level in the United States. Avalanche centers with five or more fatalities in their forecast area between the summer of 1996 and summer of 2006 are displayed.

the normalized distribution does not include data from Parks Canada or Kananaskis Country.

4.3 Switzerland

The Swiss dataset includes all known avalanche fatalities that occurred between the fall of 1996 and the spring of 2006. Within this dataset there are no recreational snowmobiling accidents as this activity is widely prohibited in the Alps. The people killed during a Low or Moderate danger were all involved in recreational activities. At higher danger levels, in addition to recreational activity, people were killed while driving, walking on paths or residing in buildings. Non-recreational fatalities most often occurred during periods of High avalanche danger.

The Swiss Alps are divided into about 100 forecast areas. The forecasts are issued by the Avalanche Warning Group at the Swiss Federal Institute for Snow and Avalanche Research of danger (one out of five) as well as a description of the most dangerous areas. About 5% of the bulletins during this period did not include a danger level and some (12.6%) of the avalanche fatalities occurred on days with no forecast. We did not include either case in the dataset.

During the winter of 1996/97 avalanche bulletins were not yet issued on a daily basis. In most cases, however, the forecasted danger level for the area where fatal accidents happened was documented. In two cases with five fatalities in 1996/97 the danger level was uncertain. These accidents are not included in the dataset.

The Swiss dataset may be misleading at High and Extreme danger levels. This aspect of the data is due to one accident where 12 people were killed in 1999. The avalanche danger was forecasted as High, but later verified as Extreme. Without this accident there were 13 people killed during High danger and 2 people killed during Extreme danger. When

Table 3: Fisher Exact test results for the different U.S. avalanche centers.

	Bridger-Teton NF(WY)	Colorado Aval. Info. Cntr	Gallatin NF (MT)	NW Aval. Cntr (WA & OR)	Utah Aval. Cntr
Bridger-Teton NF(WY)	-	0.02	0.02	0.51	0.01
Colorado Aval. Info. Cntr	0.02	-	0.22	0.03	< 0.01
Gallatin NF (MT)	0.02	0.22	-	0.17	0.41
NW Aval. Cntr (WA & OR)	0.51	0.03	0.17	-	0.21
Utah Aval. Cntr	< 0.01	< 0.01	0.41	0.21	-

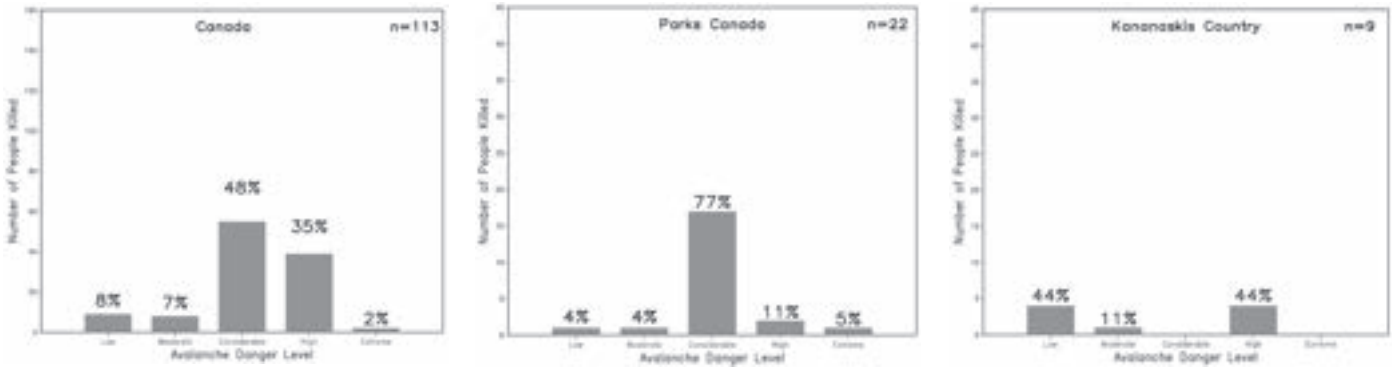

Figure 2: Regional distribution of fatalities by forecasted danger level in Canada. (These are just place holders until I paste in charts that look like the rest).

this accident is included under the forecasted danger level the numbers change to 25 for High and 2 for Extreme. The inclusion of this accident, which occurred during an under-forecasted event, into the High rather than Extreme bin drastically changes the distribution.

4.4 France

The French dataset represents the period from December 1996 through June 2006, and includes all regions within France where an avalanche fatality occurred and a corresponding avalanche danger rating was available. The source of the information on avalanche accidents is the annual report of the ANENA (Association Nationale pour l'Etude de la Neige et des Avalanches). Fifty fatalities were not included because they occurred in an area or time period when no avalanche bulletin was available.

The French Alps, Pyrénées and Corsica are divided in 34 forecast regions. Avalanche bulletin are issued daily by nine local meteorological centres from Météo-France in the afternoon. It includes a brief description of the weather forecast for the day after and a more precise description of the snow stability, avalanche type and most dangerous areas. One degree of danger is also included for each forecast region, sometimes two degrees in case of different situations with altitude or time evolution. We include all the forecasted danger levels in this dataset.

In most cases the people killed were involved in recreational activities but some people were killed while walking on paths or residing in buildings. These accidents most often occurred during periods of High avalanche danger due to heavy snow falls. For the Extreme danger level, only three fatal accidents occurred during the studied period and the large number of avalanche fatalities is mainly due to one accident where 12 people were killed in their house in February 1999. Only one person was killed in the majority of the avalanche accidents that involved people in recreational activities. The most terrible accident occurred in January 1998 where 11 young people were killed when they snowshoed up a slope.

The number of people killed by year in avalanche accidents in France varies from 16 to 50 during the study period. More fatal accidents occurred when the danger level was considerable than high, though this trend has changed for the last two winters.

Table 4: Fisher Exact test results for Comparisons between different Canadian avalanche centers.

	Canadian Avalanche Center	Parks Can.	Kananaskis Country
Canadian Avalanche Center	-	0.02	< 0.01
Parks Canada	0.02	-	< 0.01
Kananaskis Country	< 0.01	< 0.01	-

4.5 Statistical Comparison

To statistically test for differences between the distribution of fatal accidents and forecasted danger level, we use the non-parametric Fisher Exact test (Daniel, 1990). The Fisher Exact test determines, with respect to a tolerance value (α), if there are non-random associations between categorical values. By simultaneously testing a series of categorical values we can test if the distributions are from the same population. We chose $p < 0.05$ for our level of significance, so we consider a $p < 0.05$ to be good evidence that the distributions are different, while higher values of p suggest the populations are not significantly different.

To compare the different distributions, we conducted paired tests on all of the data sets. For tests that require comparisons of multiple data sets, we applied the Bonferroni correction to the α-value (Miller, 1991). The Bonferroni correction reduces the α-value by the number of data sets being compared. Thus if we compare data sets from the United States to those from Canada, Switzerland and France an α-value of 0.05 is reduced to 0.017.

5. Discussion

5.1 Regional Differences within North America

The avalanche forecast centers in North American cover

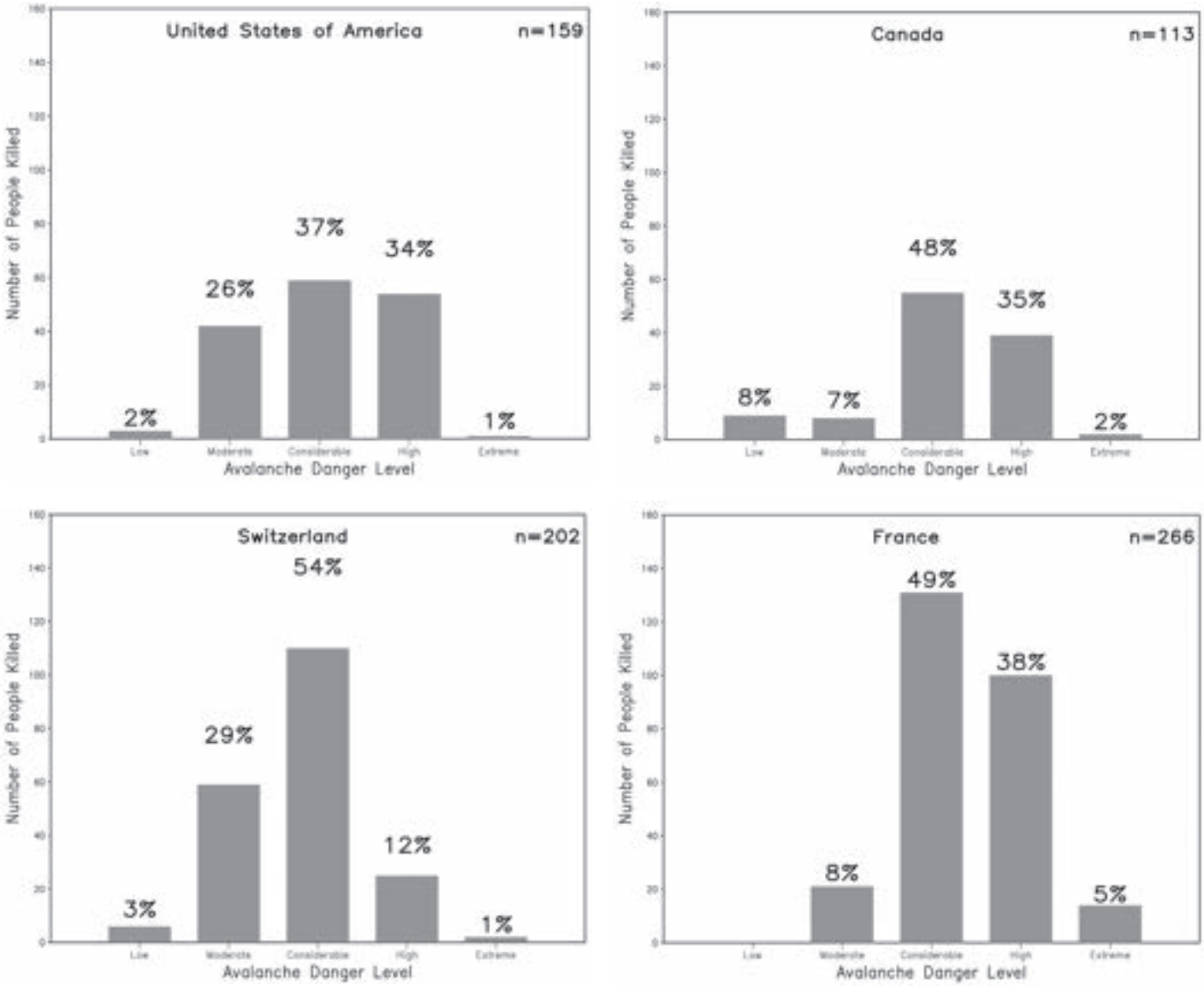

Figure 3: Number of fatal avalanche accidents at each avalanche danger level.

areas that are diverse in topography, snow climate and population. Figure 1 shows regional variations in the distribution of people killed at each danger level in the United States. Colorado and Utah have the largest number of fatal accidents, but the distribution of these accidents through the danger scale is very different. There is a pronounced right-skew to the data from Utah, while the data from Colorado is skewed to the left. In all regions, fatal accidents are concentrated in the Moderate, Considerable and High categories, but there is no consistent pattern within these three categories across the different regions. The results of the Fisher Exact test (Table 3) suggests that the data from the Forest Service Utah Avalanche Center (FSUAC) and Colorado Avalanche Information Center are from different populations. However, there is evidence that all the other data sets compared in Table 3 have non-random associations ($p<0.013$). Since all of these data sets are quite small ($n<50$) the results are not conclusive. The FSUAC and CAIC are the two largest data sets of the group. By visual examination it appears that all of the regional distributions (Figure 1) are quite different from the national distribution in Figure 3.

Significant regional differences also exist in Canada (Figure 2). In areas covered by Parks Canada (PC) and the Canadian Avalanche Center (CAC), most fatal accidents occur when the danger is rated Considerable. However in Kananaskis Country (KC) the maxima occur in the Low and High categories, though this region only has nine fatalities. The results of the Fisher Exact test (Table 4) shows no evidence

Table 5: Fisher Exact test results for different countries.

	CA	CH	USA	FR
CA	-	*< 0.01*	*< 0.01*	
CH	*< 0.01*	-	*< 0.01*	<0.01
USA	*< 0.01*	*< 0.01*	-	<0.01
FR	<0.01	<0.01	<0.01	-

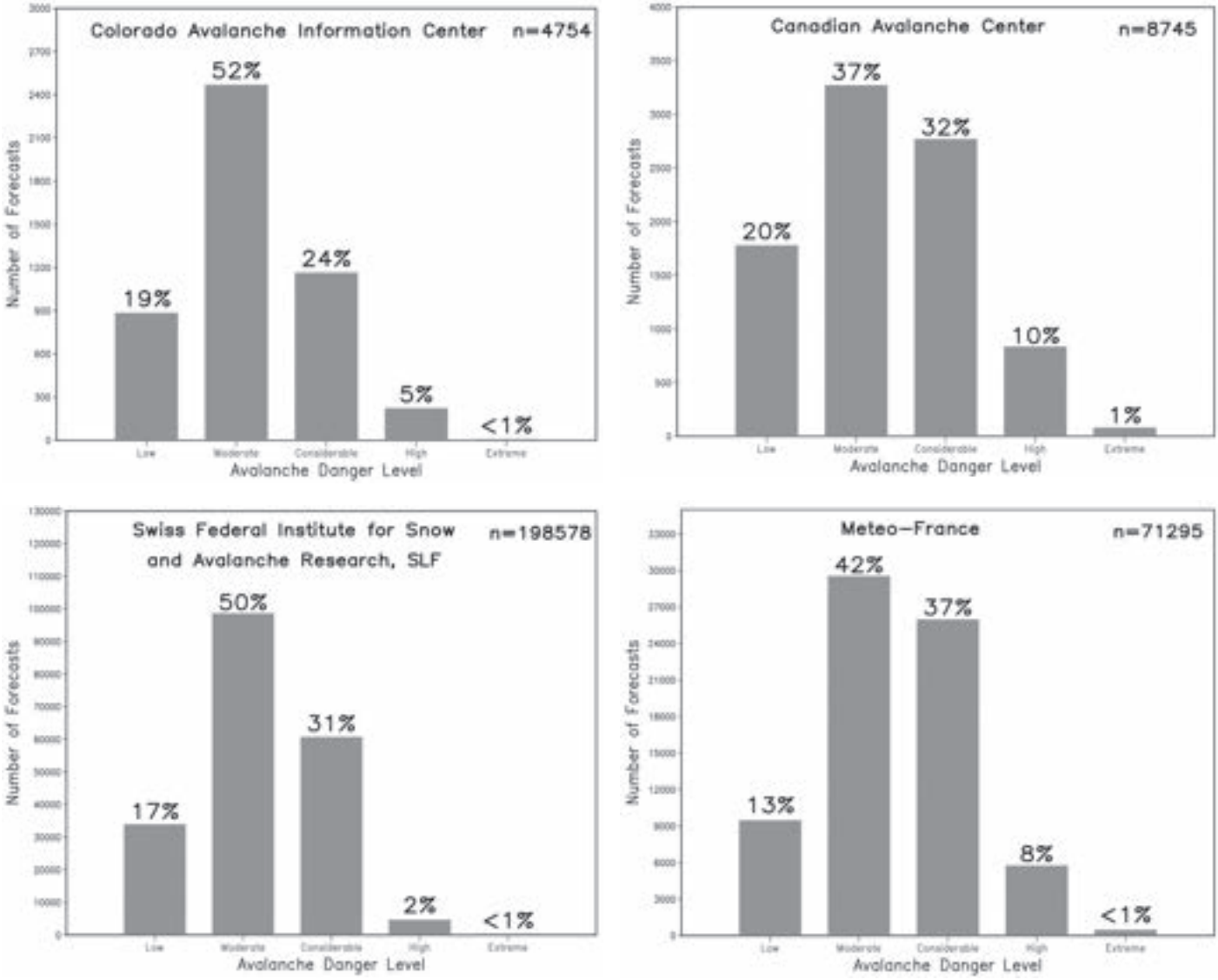

Figure 4: The forecasted danger level frequency.

that the data sets are from the same population. However, both the PC and KC data sets are quite small.

5.2 International Differences in Fatality Rate by Danger Rating

In all of the countries examined in this study, most fatal accidents occur when the avalanche danger is rated Considerable (Figure 3). This peak is most pronounced in Switzerland. The greatest increase in fatal accidents also occurs between Moderate and Considerable in Canada and France, but between Low and Moderate in the U.S. and Switzerland. In Switzerland, more people are killed at Low and Moderate than High and Extreme. In the U.S. most deaths occur during the middle three danger levels (Moderate, Considerable and High), with a relatively even distribution between these three levels. In Canada and France most fatal accidents occur during periods of Considerable and High avalanche danger with very few occurring at Low, Moderate or Extreme. The Fisher Exact test (Table 5) suggest that all of the distributions are from different populations.

Table 6: Fisher Exact test results for the normalized data, with Extreme removed, from different countries.

	CAC	SLF	CAIC	MF
CAC (CA)	-	0.25	< 0.01	0.02
SLF (CH)	0.25	-	0.18	0.03
CAIC (USA)	< 0.01	0.18	-	< 0.01
MF (FR)	0.02	0.03	< 0.01	-

5.3 International Differences in Danger Rating Frequency

It is difficult to draw any conclusions about the number of fatal accidents at each danger level without knowing how often each danger level is used. Figure 4 shows the number of times each danger level was used in products issued by the CAIC, CAC, SLF and MF forecasting groups. Moderate is the most common danger level at all four offices. The CAIC and SLF

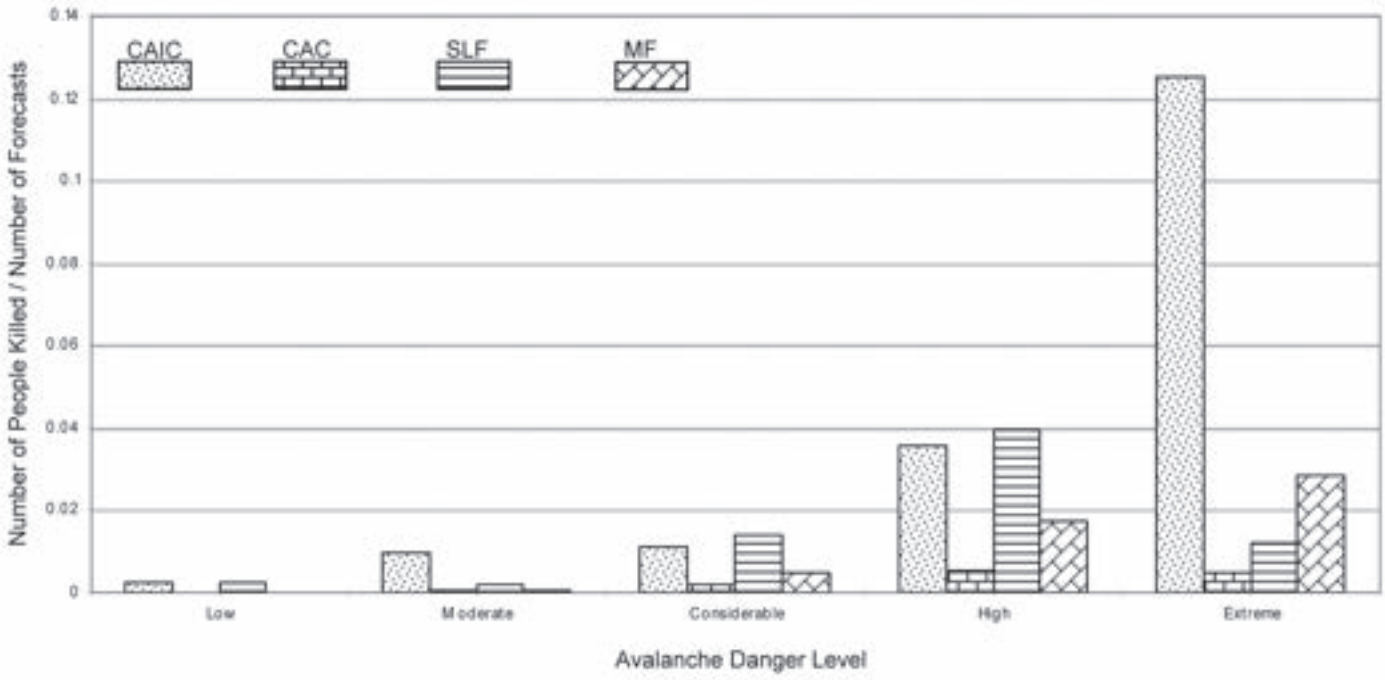

Figure 5: Normalized avalanche fatality distributions.

distributions are quite similar even though the total number of forecasts differs by more than a factor of 40. The pattern of a maximum at Moderate and second peak in Considerable is also clear in the CAC and MF frequency data. However, by proportion MF and the CAC use Considerable much more often than either the SLF or CAIC.

5.4 Normalized Fatality Rate by Danger Rating Distributions

We normalized each accident frequency distribution by dividing it by the danger level frequency data. Our intention was to remove any biases in the accident distributions that were due to systematic differences in snow climate or forecast culture. The normalized distributions are quite similar through the first four danger categories, but the CAIC's value for Extreme is much larger than those from the other groups (Figure 5). This is most likely due to both the low number of forecasts and fatalities at this danger level. The results from the Fisher Exact test for the normalized distributions were the same as the International Comparison (p values not shown). When the Extreme category is included in the analysis there is evidence that all of the normalized distributions are different. However, when Extreme is excluded from the analysis (Table 6) the data from the United States is different from all but the Swiss data ($p < 0.017$). The test suggests that rest of the distributions are from the same population.

6. Conclusions

The purpose of this study is to examine when fatal avalanche accidents occur in relation to the forecasted danger level. We believe that this type of investigation can lend some insight into how we use avalanche danger scales to communicate with the public and how the public uses bulletins to make avalanche safety decisions. The number of human avalanche involvements may be a better metric for avalanche safety decisions. However, avalanche involvement data is always incomplete and in parts of North America it is so incomplete that any analysis would be almost meaningless.

The distribution of fatal accidents through the avalanche danger scale shows that in general, we are effectively communicating with the public. Less than 20% of fatal accidents occur during periods of Low avalanche danger when avalanche can only be triggered in isolated areas or with a large force. Public warnings are generally heeded as no more than 10% of fatal accidents occur when the avalanche danger is Extreme. When the Extreme category is excluded, the normalized distributions from the MF, CAC and SLF are statistically similar and the CAIC is similar to the SLF. Thus there is some level of consistency in how international groups use avalanche danger scales to communicate with the public. As more avalanche centers collect forecast frequency data, we will be better equipped to compare the regional distributions.

Avalanche danger is strongly influenced by topography, recent weather patterns and snow climate. Forecasted danger levels are influenced by these same factors as well as human interpretation or "forecast culture". Clearly some of the differences are due to different snow climates and probably real differences in avalanche danger. However, if all forecasters used the danger scale identically and the public used the bulletins in a similar fashion to make decisions about avalanches, we

should see similar distributions fatal accidents in each country and region. Thus there are real cultural differences in how the danger level is being forecasted and used. Unfortunately we cannot separate the human and physical influences within this dataset.

In this study we considered the two avalanche danger scales to be equivalent. This is certainly a limitation of our analysis, but selecting the danger level in either scale is partially a subjective process. The regional distribution of fatal accidents suggests that the variation in how the two scales are used is as significant as the difference between the two scales. The most important commonality between the two scales may be that they both divide the continuum of avalanche danger into five levels.

A standardized method for determining and communicating avalanche danger might benefit both the public and professional avalanche community. However, avalanche forecasting relies heavily on the experience of the forecaster as well as their ability to interpret quantitative data analyses. LaChapelle (1980) showed that a group of forecasters could generate similar forecasts for given conditions by using different methods and emphasizing different data. Given the current state of avalanche forecasting it may be best to rely on a diverse and skilled forecasting group to determine the avalanche danger (McClung, 2002).

7. Acknowledgements

Canada: Thanks to Pascal Haegeli and the Canadian Avalanche Centre and Pascal Haegeli for providing us with access to the Canadian Avalanche Incident Database to check against our database. Thanks to Clair Israelson, John Kelly and Greg Johnson from the Canadian Avalanche Centre for helpful discussions. United States: The staff at all of the avalanche centers in the U.S. contributed to collecting these data. Dale Atkins, Doug Chabot, Bob Comey, Janet Kellam, Kenny Kramer, Chris Joosen, Evelyn Lees, and Spencer Logan helped a lot. Robbie Scribner helped compile the forecasted danger level data. Laurie Porth and Rudy King helped with the statistical analysis.

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In late February of this winter, the avalanche hazard had taken a turn for the worse throughout much of BC. Reports of close calls and involvements were coming in daily. This one was first posted on Biglines.com. Many thanks to Scott Kells for sharing this amazing story.

A Series of Almost Fatal Decisions

By Scott Kells

Big mistakes. Inspecting the almost-deadly fracture line on Mount Cheops.

Scott Kells Collection

Today my ski touring partners and I made a series of decisions which could have easily ended with fatal consequences. I am sharing this debrief of our incident in hopes that others will avoid a scenario like the one that unfolded for us today. I thought that I was going to lose a good friend in the mountains today, and that was absolutely the scariest moment of my life!

After a day of shredding excellent pow at Kicking Horse on Wednesday, Brandon, Anthony, Steve and I planned on a day of touring at Rogers Pass. We discussed options the night before and vaguely set a plan to possibly ski Napoleon Spur or McGill Shoulder. This was mistake #1 in my mind, as we had set a destination without considering all of the variables affecting stability.

At the Rogers Pass Info Centre we inquired about a permit and were informed that there had been a lot of recent activity below tree line, generally on north and northeast aspects. Upon gaining this info we decided it would be reasonable to poke around on more southerly aspects. Mistake #2, we assumed that southerly aspects were not as reactive.

We drove down the Trans-Canada to scope the run and to drop a vehicle for a shuttle at the end of the day. As we looked at our slope of choice we discussed some safer options to stay in the thicker trees along the shoulder and to stay away from any funky rolling terrain. At that time, I for one blocked out the fact that there were old fracture lines on the lower steeper slopes which probably occurred during the most recent storms—mistake #3.

> **“I couldn’t help but be angry with myself for the way I’d let the day unfold…I’m ashamed for ignoring such obvious warnings.”**

Having a somewhat safe line spotted we proceeded to skin up some east-facing trees on Cheops. As we reached a bench below a steep alpine face we peeled off our skins and began to ski down while picking our way around the shoulder looking for our route down. We quickly realized that we had put ourselves in a bad area where the slope rolled away steeply below us into a series of gullies—mistake #4. We should have never been in this kind of terrain with a questionable surface hoar layer releasing large slabs in previous days. We know better than this!
We all grew inpatient as we tried to find a mellower way down around the gully features. Finally we spotted a way around and into a wider gully with a lot of funky unsupported terrain features. That was BIG mistake #5.

Now this is where we really began to make a series of bad decisions. We dropped in one at a time sticking to the guts of the gully. As we started to feel more comfortable we started to get up on to some of the unsupported rolls and pillows beside the gully. I pulled up along the right of the gully, spotting a nice pillow rib. As I skied down the rib I jumped off a pillow and turned back into the gully. A fracture ripped down the rib and every unsupported roll released, running about 100 m down the gully until the slope mellowed. This was a huge warning sign that we were not in a good spot but we are in the heart of it now.

We quickly discussed where to ski down to a safe spot, and never really discussed the overall situation and how to best deal with it—mistake #6. As we skied out of the gully a broad, lower-angle slope opened up and we had some excellent pow turns down to the next big clump of trees. As we poked out from the clump of trees we came to a large opening that appeared to roll over below us. We made quick comments about there being no where to hide, and that it was a wide open slope but still did not put together a plan to avoid it. Mistake #7 and shit hits the fan!

Brandon pulls up on top of a roll and says he's going to ski down to a slope break below and film. At this point we all ignored the screaming voice on our shoulders telling us this was SKETCHY! As Brandon dropped over the roll I heard a clump of tree bombs release on the other side of the opening. As I turned to look I watched in disbelief as a large convex feature 15 m above Brandon zippers and releases! Holy SHIT…SLIDE…SLIDE!!

Steve, Anthony and I watch in horror as the slab hits Brandon and pushes him over the slope break and over another convex roll where he disappears. We all start yelling and one at a time move down to the slope break. As I ski up to the roll where he disappeared my heart sinks as I see how large the slide released and how big of a slope it pulled out with him in it!

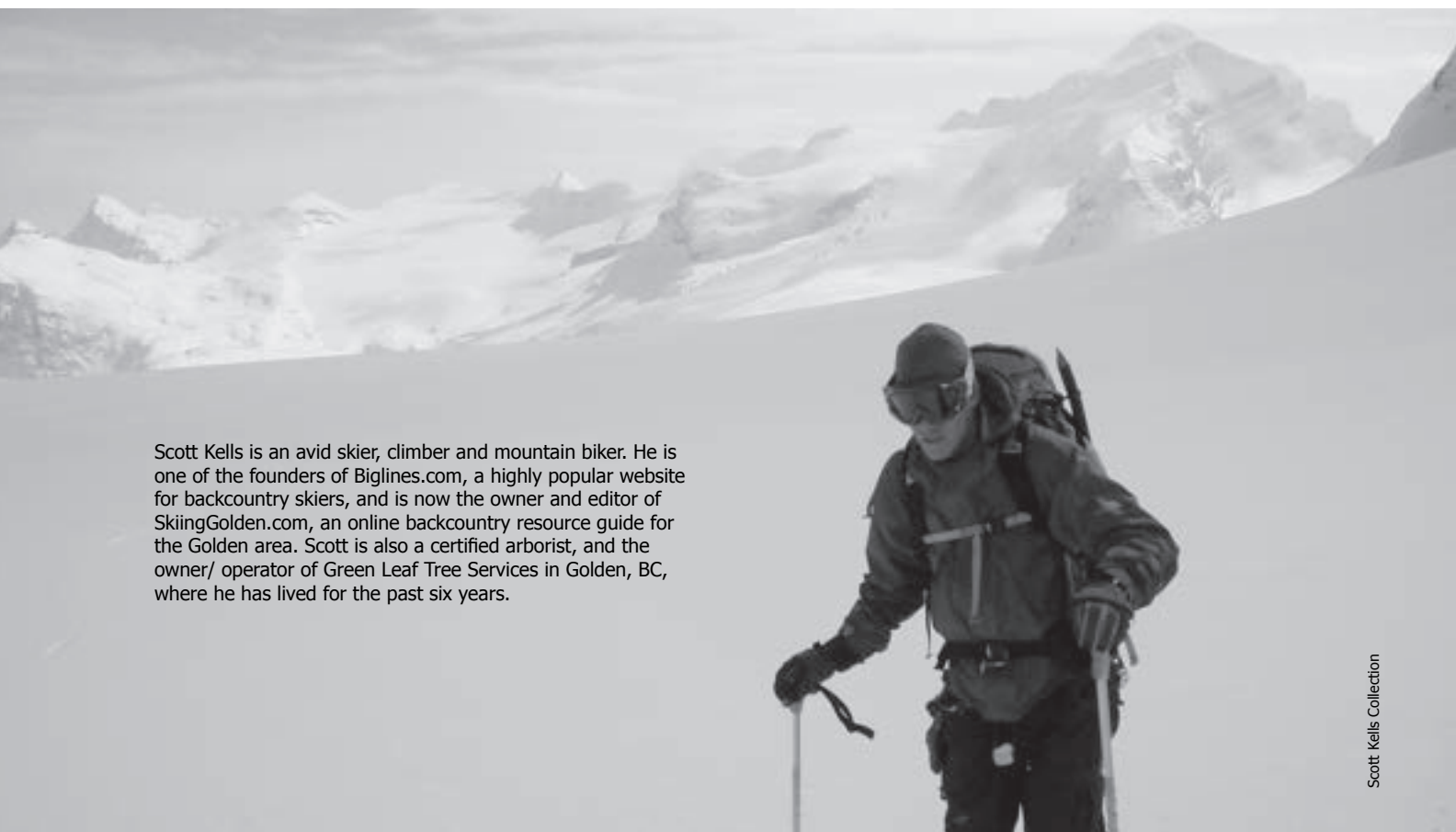
Scrambling to pull my shovel and probe out I have to tell myself to slow down and act methodically. This is so hard to do in this situation. As Steve and I prepare to start fanning out on the track, Anthony skis ahead to see if he could spot him. To all of our relief we hear him yelling from about 200 meters below us in the trees. The slide had split into two as it pushed over the slope break. The right side picked up a substantial amount of mass through a more open track and triggered another meter-deep slab on the lower slope. Brandon managed to fight his way into the left track that didn't pick up as much mass and pushed him through a tight, treed gully where he managed to pull up on top as the slide came to a stop.

He had lost both skis, poles and a glove. Thankfully we were very close to the valley bottom and the truck. Anthony and Steve hiked back up to have a look at the crown while Brandon and I made our way down through the debris and bullet-proof bed surface to the valley bottom. The crown was one metre deep and about 40 metres wide. In total it ran about 300 metres and stopped at the toe of the slope. It triggered slabs on the lower slope from unsupported features along the edge of the main path.

Back at the truck we sat sipping beer, discussing how very differently this could have turned out. Watching the terrifying event unfold before my eyes, I definitely did not think we'd be sitting together having a beer talking about life. We made a lot of bad decisions today, and got extremely lucky.

As I drove back to Golden I couldn't help but be angry with myself for the way I'd let the day unfold. This was a very humbling experience in my ski-touring career which has spanned almost 15 years. I'm left feeling ashamed for ignoring such obvious warnings. As a good friend always told me, "Read the damn bulletins, follow what they say to a T, and 90% of the time you'll be fine."

I read the Glacier Park bulletin when I got home, where it explicitly warned in detail to stay away from challenging to complex terrain below tree line. Play safe folks, this surface hoar is likely to be a problem for a while. Mistakes like the ones we made today is something I never want to repeat, ever.



Scott Kells is an avid skier, climber and mountain biker. He is one of the founders of Biglines.com, a highly popular website for backcountry skiers, and is now the owner and editor of SkiingGolden.com, an online backcountry resource guide for the Golden area. Scott is also a certified arborist, and the owner/ operator of Green Leaf Tree Services in Golden, BC, where he has lived for the past six years.

Scott Kells Collection

Too Close for Comfort

By Rick Tams, with help from Dave Ure

My name is Rick Tams, and I've been snowmobiling for over 40 years. I'm writing about this incident and sharing it with you for two reasons. The first is to hopefully bring more attention to avalanche safety and discuss some of the hazards we face as sledders. The second reason is to recognize and thank the 11 people that literally saved my life.

The events in my story took place on April 22, 2007. I'd arranged to take my Dad on a one-day snowmobiling trip into the Forester area near Radium, British Columbia. He's 71 and also an avid rider but, as a Canadian snowbird, he hadn't had a chance yet this year to get out riding. My cousin and his 17-year-old son came with us as well.

The trip from Innisfail, Alberta to Radium was uneventful, and we were unloaded and on the trail by late morning. We rode up to the cabin at Forester where we stopped and had our lunch, with the thermometer there indicating a noon-hour temperature of 8°C. It had been slightly overcast that morning with some flat-light conditions, so when we saw the sun poking out on an adjacent mountainside, we proceeded in that direction. As we rode into the area, we came across a small, and seemingly safe-looking bowl, which I immediately began to ascend.

It was not a particularly difficult climb for the M7 I was riding and I knew I had certainly climbed many areas much more challenging and intimidating then this. At about the half-way point up the bowl I decided to turn around, and it was then I noticed something about three quarters of the way up the hill. It was hard to detect at first but very quickly a large fissure began to form that made me realize an avalanche was happening. My first thought was to look for snow from a cornice or overhang that had broken off further above and could start coming down at me. However I quickly determined the failure of the snowpack marked the start of a large slab avalanche that I was now positioned directly in the middle of!!

I estimate the slab of snow that broke free was about three hundred yards wide, and that I was about a hundred to a hundred and fifty yards from the top of it. When something like this happens to you, there unfortunately isn't a lot of time to analyze the situation and choose a game plan from a long list of options. I was still pointed up the hill and moving forward so I decided my best choice was to try and climb up and over the top of the fracture to safety.

> "The forward momentum I had momentarily achieved by hitting my throttle was being rapidly erased by the speed of the avalanche…"

I quickly pinned my machine, which at first enabled a very smooth and rapid climb towards the edge of the broken slab. I kept thinking, "C'mon, I can make this," but very quickly that massive, angled sheet of smooth white powder was turning into a fast, churning river of snow. The forward momentum I had momentarily achieved by hitting my throttle was being rapidly erased by the speed of the avalanche, propelled by the exact same gravity I was trying to overcome. Although the snowmobile was wide open with all of the available track speed at my disposal, I began to feel like I wasn't getting much closer to the top.

At about that point, I hit a two to three foot tall ridge of snow that had been created by the shifting slab, which quickly and harshly shot me to the left. With all of my years of experience and skill being called upon to get me out of this situation, the speed and power of the avalanche had become much more than I could even begin to control. So now instead of heading straight up the hill, I was pointing more to the 10 o'clock position. That slight shift in direction again allowed me to gain some forward momentum with my machine, which in case you hadn't guessed, was still pinned wide open. Afterwards, those who witnessed the incident would tell me I likely reached 40 to 50 miles per hour in this new angled direction under the power of my machine. However, at the same time the avalanche was still carrying me and the snow I was on, straight down the hill at about 50-60 miles per hour.

The regained forward speed of my sled on this river of snow, even against the overall descent of the avalanche, had now taken me to within 20 feet of the edge of the slide in this 10 o'clock direction, and I really thought I had been able to succeed in my plan to climb off the edge of it to safety. However the final barrier to this goal was about the strike me from out of nowhere. As the avalanche continued to take everything, including myself, downhill at a very rapid rate, my machine struck a large boulder on the downhill, or left side of my sled. Although it felt like I was making progress relative to the edge of the broken slab, the flow of the avalanche was still moving everything down the side of the mountain, moving overtop of everything underneath it, including this large protruding piece of rock. The impact violently catapulted me off my machine and into the air about 30 feet.

As soon as I landed and hit the snow, I felt myself being completely buried while still being carried down the hill. As I became covered by the force of the rushing snow, I suddenly felt myself pop up on top of the avalanche, being carried head first down the hill. At that point, my machine, which had been launched in the same direction as I was after striking the boulder, caught up with me and struck

Alan Harder

the back of my legs. That impact drove my feet and legs deeper down into the snow causing my body to slow just enough to immediately and completely be buried again. Just as the avalanche appeared to come to a complete stop, my head again emerged out of the snow, and the words rang in my mind: "Thank God, I've survived."

But seconds later, one last rush of snow from above hit the back of my helmet like a ton of bricks and buried me completely one last time. My final resting spot was face down on my stomach, with my body inclined towards the bottom of the hill. The snow that entombed me was very wet and heavy, and I remember checking to see if I had space to breathe in and out, which I did. Looking up through the opening in my helmet, I could see daylight penetrating through the layers of snow on top of me, which made me think I wasn't buried very deeply.

My first instinctive reaction was to try and simply push myself up. I remember feeling shocked when I couldn't move, even just a little. I tried again, and nothing. I thought, "This is crazy, why can't I just stand up and get myself out of here?" I concentrated and put all of my strength into trying to dislodge myself, and again, nothing. The reality started to sink in that I wasn't going to get myself out.

There was no snow inside my helmet so I told myself I should have enough oxygen to breathe, and then started thinking of what else I had going for me. I had my beacon on, I had air, I didn't feel badly injured, and I estimated I must be fairly close to the bottom of the hill and near the surface of the snowpack. I also thought the other three people in my own party would have witnessed what had happened, and they would quickly be using their own beacons to find me and dig me out. Who knows, maybe my sled or part of my body may even be visible on the surface of the snow to help mark my location.

Although I knew my situation was not great, I felt confident that within a few minutes I would hear people overhead with probes and shovels moving the solid mass of snow around me. So, I relaxed and calmed myself the best I could to try and save my air and my energy. I believe I lost consciousness within a couple of minutes. The condensation and heat from my breath and body likely sealed the small space around my helmet into an airtight seal. Being in this calm and relaxed frame of mind was the last thing I remember until I heard people trying to revive me some time later.

As all of these events were unfolding, there were two snowmobilers sitting on top of a nearby ridge who witnessed the

avalanche and were able to keep an eye on me and my sled in order to have an approximate idea of where I ended up. There were also six other sledders about three quarters of a mile away who had been riding out of the area for the day, when the slide began. Luckily for me, one of these riders happened to see the avalanche and the green outline of my sled as well, and stopped the rest of his group to come back and provide assistance.

As luck would have it, all the snowmobilers who were there to respond to this incident were experienced riders who carried beacons, probes and shovels and had some knowledge of what to do. As with most other incidents and responses, there is always some learning to share, and this one was no different. We found out later that one of the responders had not switched his beacon from transmit to search mode, which resulted in a trench being dug in the wrong area while trying to locate me. Looking back, the time spent on this could have had serious consequences, given the very limited amount of time I had been given to survive after being buried alive. However, once all the beacons were in search mode, they were able to zero in on my signal and locate my approximate location. Within a short period of time, they had hit my helmet with their shovels.

With the snow being as wet and heavy as it was, people had to take turns shovelling as they tired very quickly. They first cleared the area around my helmet and noticed my face was purple and I was not breathing. They continued to dig down to my waist, and five fairly large men tried to pull me out to the surface but amazingly, could not budge me. The snow, warmed even further by the friction of the slide, had set up as hard as cement, so they dug down deeper to my knees and this time were able to remove me and place me on the surface of the slide. They laid me on my back and one of the responders performed CPR. From the heroic efforts of these brave men, I fortunately started breathing on my own, although I did not become fully conscious for another eight to ten minutes. When I finally came to, I experienced the worst headache I have ever had in my life, was sick to my stomach and my mouth was extremely dry.

My rescuers of course were conscious of the hazards that still existed in this area of the slide during the entire time they were digging me out. After all, it was a small remnant of the larger slide that buried me completely, and there was no telling how stable the three-foot thick slab of snow was that remained perched above the area of the original fissure. However, in my recuperative state, I was unable (or perhaps just unwilling) to move from my recovery position, so I was carried over to a nearby machine where I sat to help gain my composure.

Soon after, it would be my cousin who I leaned against on his sled while he drove me a short distance to a flatter and safer area. However, these brave souls were not done yet, and proceeded to locate and dig out my machine, taking yet another hour of tireless effort. Incredibly enough, my machine was in running condition and, although I still felt very sick, I concluded I would be better off riding my own machine out where I could control my own pace, rather than riding behind someone else.

That trip back to the trucks felt like the longest ride of my life, but two-and-a-half hours later, I made it back out, very thankful to be alive. By the time we got back into Radium, it had been six or seven hours since it all began. Surprisingly, with every hour that passed, I felt better and

Duane Hildebrand

better, to the point that we decided just to drive directly home to Innisfail from Radium.

I arrived home at about midnight and although my plan was just to go to bed and rest, my wife ended up taking me into the Emergency Centre at our hospital to be examined. More tests were to follow over the next couple of days, while severe headaches and discomfort almost everywhere on my body, were constant reminders of what I had been through. I feel very lucky that now, a couple of weeks later, I feel totally recovered from this incident.

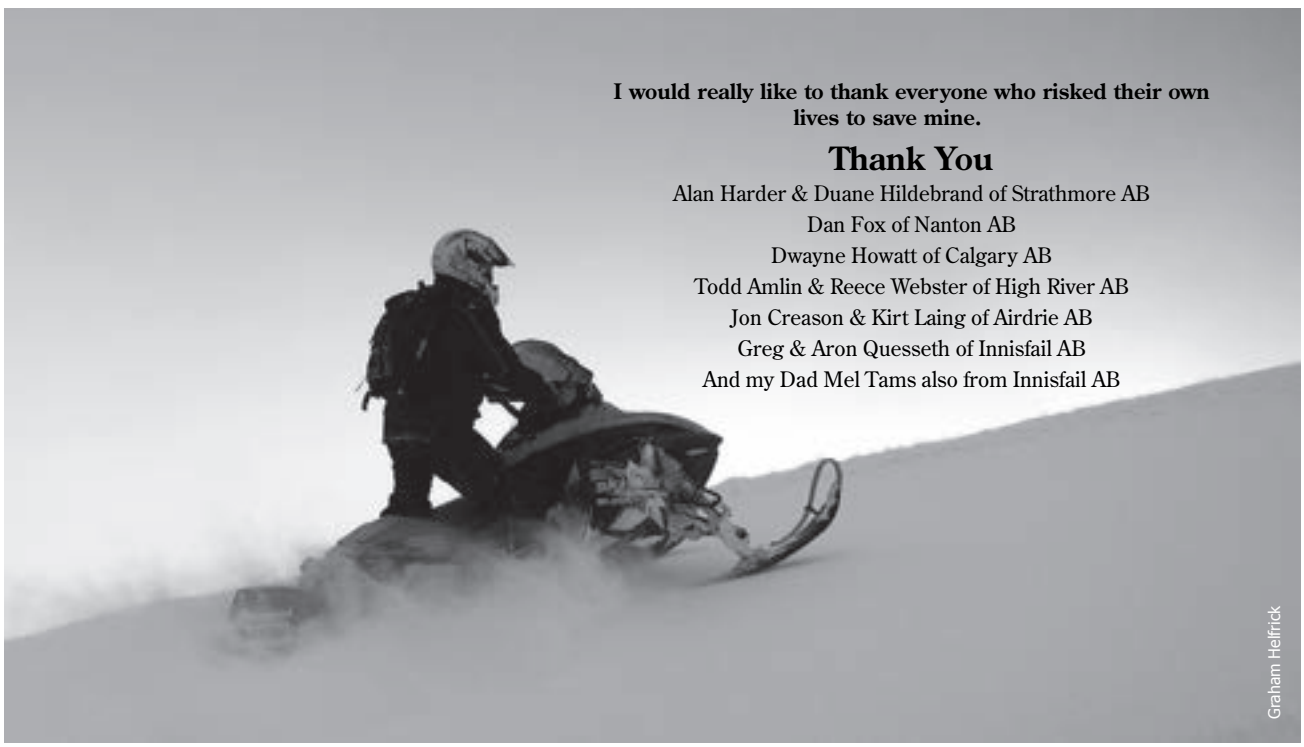
Looking back now I am amazed at how quickly everything happened and how vulnerable and powerless I felt while that wall of snow tossed me around like a rag doll. I also find it hard to believe just how quickly and easily I lost consciousness. I can assure you many of my own personal paradigms shifted that day. You can also understand my gratitude to this group of individuals who unselfishly risked their own safety to come and rescue me. Without them, I wouldn't be here today. Yet, as their own worst critics, they were reminded afterwards of how important time is in these situations. Of how important it is for someone to assume control and start directing work and taking the leadership responsibilities. Of how important it is for people to work together in a unified fashion to search and rescue effectively. For me however, they will always be true heroes, and will always be the ones who accepted responsibility to act once I found myself in a situation where I was unable to.

So what did I learn and what can I try and share with others, besides that life is fragile? Well for one thing, become educated on the risks you face in this sport. Take an avalanche safety course and become very familiar with recognizing and responding to hazards, including those less obvious. Know what to look for, and how to determine potentially high-risk conditions. Check the snow and weather conditions on the days preceding your trip. NEVER ride alone. Learn and practice CPR. Make sure EVERY person that rides with you carries a beacon, shovel and probe and knows how to use them. Take your beacons out into your yard and practice with them BEFORE you venture into mountainous areas. Have someone in your group carry a satellite phone. At least, that's a start.

I always felt I was usually very conscious of avalanches. I even purchased avalanche bags that blow up with the pull of a handle for my two sons to help keep them safe, although looking back I don't think I would have had time to activate the airbag on the avalanche pack even if I had been wearing it. I have been snowmobiling for nearly all of my life but I definitely misjudged this hill and the huge hazards it silently held.

As a member of the Montana snowmobile club, I ironically received their newsletter in the mail the day after this incident and in it was an article talking about watching out for the smaller bowls in the springtime. It said because they are not as steep, the snow does not slide down during the winter, but in the spring when the snow starts melting and the water starts running down the hill under the snow, the whole slab of snow has a higher probability of coming down. That can become compounded when spring rain percolates through the upper layers in the days prior to a slide, just like it had in this area before we arrived on that particular Sunday.

Had I been aware of these tips a couple of days before my incident, perhaps I would have avoided that bowl and came home unscathed, just like any other normal snowmobile trip. My hope is others can learn from my experience and help ensure they never have to go through what I did.



Guardians of the Peaks

By Kathy Calvert and Dale Portman

Book review by Scott Davis

When Mary Clayton first approached me on the street and asked if I was interested in being a tester for the journal's product review section, I had visions of shiny new skis and fancy soft-shell jackets, so of course I wholeheartedly agreed. Well, the next thing I know she asks me to review a book for my first submission. Yikes, suddenly I felt like my 14-year-old son facing an English assignment at school.

Happily, my mission was made quite a bit easier because the book was so interesting. *Guardians of the Peak—Mountain Rescue in the Canadian Rockies and Columbia Mountains* was penned by longtime National Park wardens Kathy Calvert and Dale Portman. At first glance it is a formidable read, with 314 large-format pages of text. But what I liked most about this book was that every chapter can stand on its own. I found myself enthralled and distracted by the intensity of each story whenever I picked it up and which ever chapter I chose.

The story is laid out in a roughly chronological fashion, and the introduction recounts the 1957 accident on Mt. Victoria, involving a Mexican expedition, which took the lives of four women. In the authors' words, "The event catapulted the National Park Service onto the path of developing a rescue organization that would one day be an equal member of the international rescue association founded in Europe." What follows are a series of insightful accounts of those who played, and are still playing, key parts in that development. The list begins with Walter Perren, the first Alpine Specialist in the

Parks system, and continues right up to young upstarts like Jordy Shepard who carry on the legacy today.

I, like many of you readers, know a lot of these personalities personally or by reputation. That connection made this book especially enjoyable. But even if you're not familiar with the players involved, this insiders' view of the numerous events, both tragic and humorous, that have taken place over the decades of mountain rescue in our National Parks is entertaining and educational.

The photos I enjoyed the most are the historic shots of early rescues and training schools. My favorite has to be the one of Tim Auger and Rick Kunelius, with Rick looking like someone from outer space as he is lowered in an early rescue stretcher and Tim, of course, looking very stoic.

Of special interest to the avalanche community is the "White Dragon" section that recounts the development of the Trans-Canada Highway through Rogers Pass, its world-renowned avalanche protection program and avalanche-related developments. What I personally enjoyed was the section that describes the time Noel Gardner spent in Rogers Pass. He was a true snow pioneer, and someone I've always been interested in but have never found much in print about his life.

In the end, I feel good about recommending this book to any potential readers. You will smile knowingly at tales of friends and colleagues, laugh, and maybe shed a tear for the three public safety wardens who lost their lives and to whom this book is dedicated—Simon Parboosingh, Pat Sheehan, and Mike Wynn.

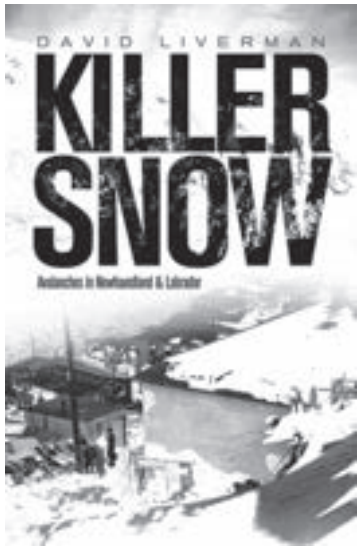

Scott Davis Collection

Scott Davis is a IFMGA-certified mountain guide and the President of the Association of Canadian Mountain Guides. He has lived in Revelstoke, BC for 23 years and is well-known for his seemingly insatiable appetite for ski touring. He feels fortunate that there are no stories about him in this book.

Killer Snow: Avalanches in Newfoundland and Labrador

By David Liverman

Book review by Mary Clayton



Even though many believe they are rare or even unprecedented events, avalanches can and do occur in Newfoundland and Labrador, sometimes with tragic results. Killer Snow makes this point forcefully, with a fascinating chronicle of avalanche accidents starting in 1782 (possibly the earliest recorded avalanche fatality on the continent) right up to March 2006.

Author David Liverman is a senior geologist for the Geological Survey of Newfoundland and Labrador, specializing in environmental geology. Back in 1990, his work took him to the nearly-abandoned community of Tilt Cove. Here he came upon an intriguing headstone, marking a grave for a father and son killed by an avalanche in 1912. This sparked a desire to discover just how many people had lost their lives the same way in a province where snow slides are not thought to be a hazard.

He and two colleagues from the Geological Survey began their search in the provincial archives. Where a date for a particular incident was known, they would scour newspaper accounts for details. However, most of the work consisted of scanning newspapers day by day, year by year, looking for stories about avalanche accidents.

As their work progressed, the three men gave talks to various audiences and published several reports. Often after these talks, a member of the audience would approach them and recount a story from their family or community history. The published reports also led to correspondence from amateur historians. Through this informal communication, many more tragedies were identified and included.

The sheer number of incidents surprised them. "Like most we had assumed that snow avalanches were mostly a problem in the mountains of western Canada, and mostly affected backcountry skiers and snowmobilers," writes Liverman in the book's preface. "Our research was telling us quite a different story—that avalanches were relatively common in Newfoundland and Labrador and often affected people in their own homes."

The view that avalanches are not significant in eastern Canada is one shared by most residents of the province.

> ***"We were too much sorrow stricken to give you a report of our sad state yesterday…. Tilt Cove has met with many sad sights but this appears to us to be the worst."***
>
> Newspaper account of the Tilt Cove avalanche, 1912

"Even the newspaper reports of avalanche deaths go to some lengths to emphasize that avalanches were very unusual in the province," Liverman writes, noting how this attitude can lead to a much bigger problem. When planners, residents and recreational users are completely unaware of the possibility of avalanche danger, the likelihood of poor and dangerous decisions is much greater.

Personal accounts of tragic events are often compelling reading, and Killer Snow is no exception. However, Liverman has an ulterior motive with this book. "One of the objectives that we've set ourselves in this project is to increase the public awareness of avalanche hazard in the province," he writes. Lack of awareness could be because fatal avalanches don't happen that often—18 in over 250 years, an average of less than one a decade. Another possibility Liverman points out is that many in the province make their living in highly hazardous professions—small-boat fishing, sailing, sealing, logging and mining—where terrible accidents have taken many lives.

Despite short-term memories or the comparison with more hazardous endeavours, Liverman highlights an interesting statistical analysis—the avalanche mortality rate. He states, "It is clear that the historical risk of dying in an avalanche in Newfoundland and Labrador is considerably higher than the Canadian average, and likely as high as or higher than British Columbia." Liverman has made a compelling argument for more avalanche safety products and services in Newfoundland and Labrador, one we hope will be heard.

Further reading: www.nr.gov.nl.ca/mines&en/geosurvey/disasters/avalanches

Transitions:

Membership Committee Chair
Ken Bibby

Ken's exposure to the avalanche industry began in 1995 when he worked as a production assistant on the avalanche awareness video "Beating the Odds"; he immediately found himself inspired by the work, community and lifestyle that working in the avalanche industry can provide and began pursuing a career as a ski guide. Since then, Ken has worked as a professional ski patroller, AST instructor and as a ski guide in mechanized and non-mechanized commercial ski operations. He is a fully certified ACMG Ski Guide and works as an instructor in the CAA Industry Training Programs. He looks forward to both contributing to and learning from his work as a member of the board of directors. Ken lives with his wife and 3 young children in Revelstoke.


Ken Bibby Collection

CAA Director for Active Members
Debbie Ritchie

Debbie Ritchie is a Registered Nurse and works as a Research Coordinator in the Cardiovascular Research Group of the Faculty of Medicine at the University of Calgary. Debbie received her basic nursing education in Montreal and her intensive care nursing training in London, England. She has a Bachelor of Psychology from Queens University, a Bachelor of Science in Nursing from UBC and a Masters in Nursing from the University of Calgary.

Debbie is originally from Trois-Rivieres, Quebec. She moved to Calgary in 1980 with her husband Gordon, to be closer to the mountains. She was an avid alpine and Nordic skier but had no backcountry skills. "I figured in order to enjoy the mountains I had to learn about avalanches," she says. "So I joined the Canadian Ski Patrol System (CSPS) in 1981 and have been a volunteer patroller at Lake Louise ever since. It was there that I met a number of CAA members including Clair Israelson and Steve Blake."


Debbie Ritchie Collection

Her avalanche education includes taking RAC and ARAC courses, "before they had those names!" She did her CAA Level 1 in 1996 and has taught the AST I course to volunteer patrollers. Debbie also volunteers with the Canadian Avalanche Foundation. "I am excited about my new role on the board," she says, "and especially the opportunity to work together with board members to keep the CAA as a world leader in the avalanche industry."

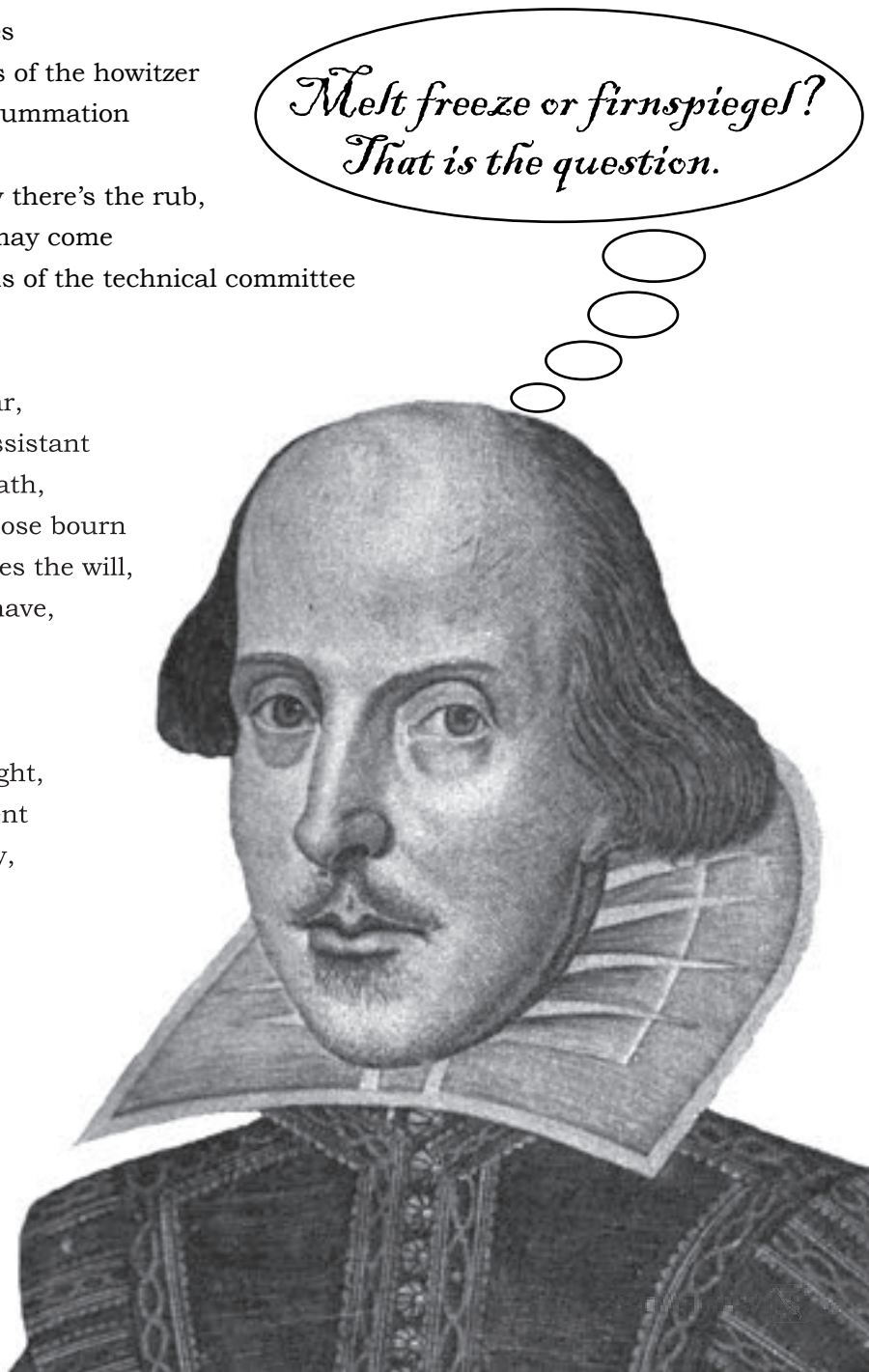
If Shakespeare Was a Snowman

By Rob Hemming

To the learned OGRS revision committee:

9 e or not 9 e that is the question
Whether 'tis formed in wet snow
Or wetted at least once near the surface
And by eying through my fogged up loupe
No more, discussions of pendular regimes
The heart-ache and the thousand shocks of the howitzer
That the polycrystal is heir to; 'tis a consummation
Devoutly to be wished to call it 6 b!
To call it 6 b and perchance to dream, ay there's the rub,
For in that sleep at death what dreams may come
For who would bear the whips and scorns of the technical committee
The insolence of AST instructors
That patient merit of th'unworthy tasks,
With bare bodkin; who would fardels bear,
To grunt and sweat on the back of the assistant
But that the dread of something after death,
The undiscovered classification, from whose bourn
No practicing professional returns, puzzles the will,
And makes us rather bear those ills we have,
Than fly with those that we know not of?
Thus crusts do make cowards of us all,
And thus the native hue of resolution
Is sicklied o'er with the pale cast of thought,
And enterprises of great pitch and moment
With this regard their currents turn awry,
Be all my sins remembered.

"This is the part where you run away"
Shrek



This Inuit song was found by CAA member Kirstie Simpson when she was researching the use of traditional aboriginal knowledge in avalanche forecasting. "I have it copied into my field book," she writes. "Whenever I switch to a new book I re-copy the poem into it."

The Father's Song

Great Snowslide,
Stay away from my igloo,
I have my four children and my wife,
They can never enrich you.

Strong Snowslide,
Roll past my weak home,
There sleep my dear ones in the world,
Snowslide let their night be calm.

Sinister Snowslide,
I just built an igloo here sheltered from the wind,
It is my fault if it is put wrong,
Snowslide, hear me from your mountain.

Greedy Snowslide,
There is enough to smash and smother,
Fall down over the ice,
Bury stones and rocks.

Snowslide, I own so little in the world,
Keep away from my igloo, stop not our travels,
Nothing you will gain by our horror and death,
Mighty Snowslide, mighty Snowslide.

Little Snowslide,
Four children and my wife are my whole world,
All I own, all I can lose, nothing you can gain,
Snowslide, save my house, stay on your summit.

Noel Gardner is up at Fidelity and it's blizzarding and the middle of the night and he's drinking whiskey and playing cards. Noel had this dog, a little mutt with long hair that looked like a mop. In the middle of this session, Noel grabs the dog, tips his chair back, pulls the door open and heaves the dog out into the blizzard. He slams the door and plays his next hand of cards, just like that. A few minutes later there's a whimpering at the door. Noel tips his chair back, opens the door, and the dog comes scampering in. He slams the door against the blizzard, picks the dog up and plunks him in his lap. Then he reaches over his other shoulder to a shelf, gets his hand lens, leans over and takes a close look at the dog's back. Noel sits back and makes the pronouncement: 'Yep, dendrites!'

Tim Auger as told to the CAA's Oral History Project

Flakes


THE Adventures of Facet & Graupel
No freezing temperatures, no-one shooting at us or trying to bomb us— let's face it facet, these drips might be on to something.
©r.buchanan
Summer Vacation 2007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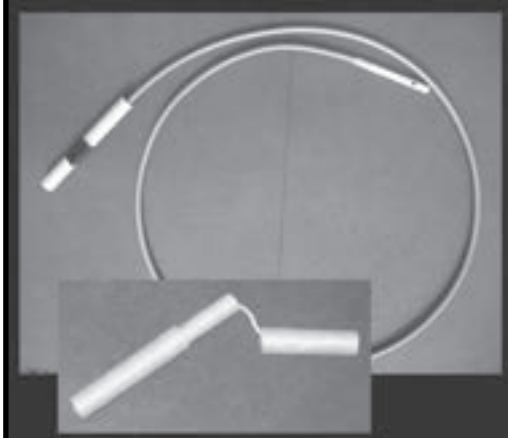

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