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The journal of Canada's avalanche community

FINE LINE

CONVEYOR METHOD

CWSAA 40th,
Avalanche Awareness Days,
Snowpack warming and more!

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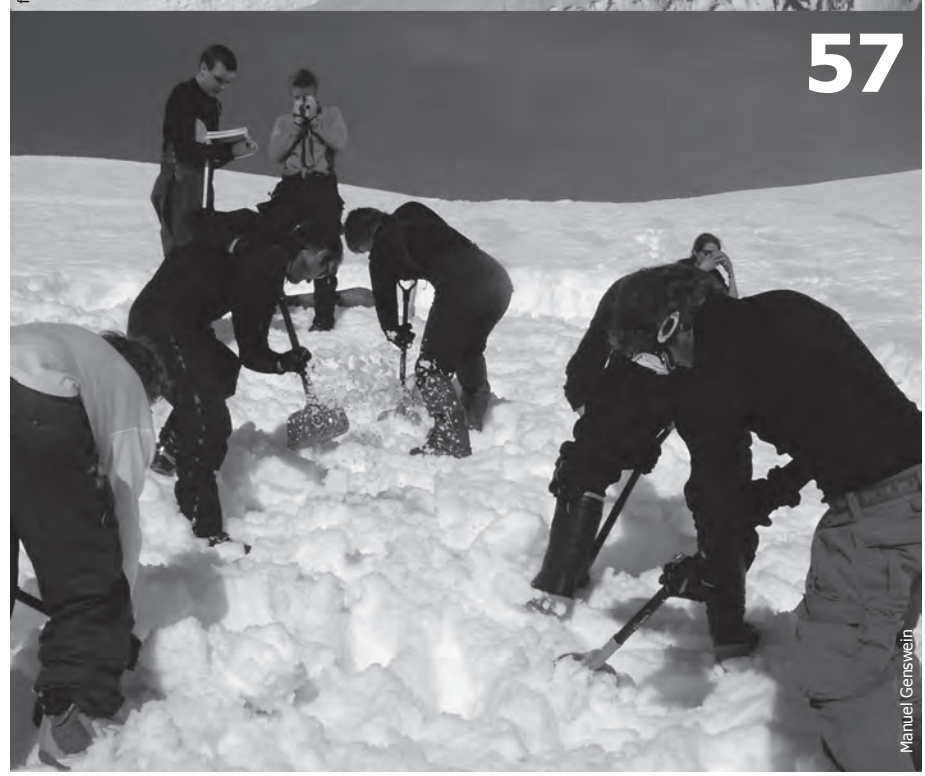

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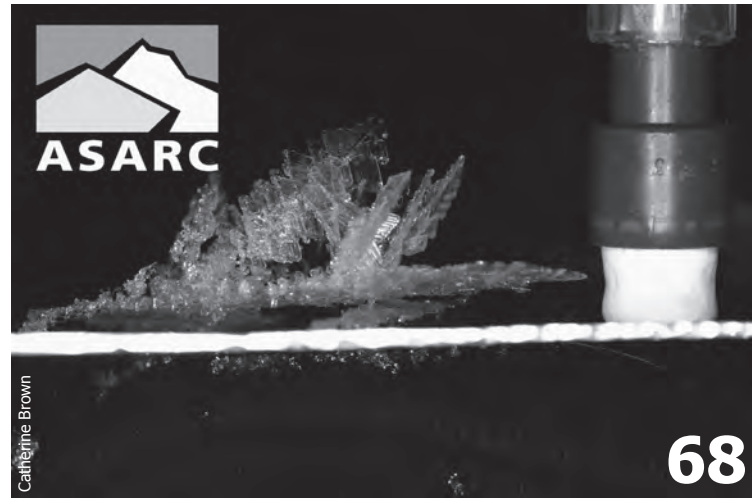

failure plane

In the last issue of *avalanche.ca*, CAA/CAC President Steve Blake introduced the Enterprise Conflict Avoidance Policy. In that article, the Avaluator was listed as intellectual property of the CAC. The inclusion of the Avaluator on this list is by no means an attempt to claim rights to Dr. Ian McCammon's Obvious Clues Method (OCM). The integration of the OCM into the Avaluator was done under a licence agreement with Dr. McCammon, in which he retains ownership of the OCM, while allowing the CAC to use this method as an integral feature of the Avaluator. Our apologies for any confusion.

>>Members of the CAA & CAC Board of Directors

In the last issue of *avalanche.ca*, I co-authored an article on avalanche triage. When writing the article I felt that all of the technical information was good but it needed a real story about triage to draw the reader into the meaty bits of the article. I used what I thought was a great story about avalanche triage from the Connaught Creek accident. In that story, as is commonly told in our guiding community, two guides assist at the scene of a large avalanche involving a group of school children, and maximize the survivors by implementing triage.

After the article was published, I received an email one of the teachers who was with the students that fateful day. This person was near the back of the group and participated in the rescue, as well as its painful aftermath. He told me that some elements of the rescue story in my article misrepresented what really happened.

When the avalanche struck, the group of 17 students and teachers were moving in pairs, spread-out along the trail just above the valley bottom. The teacher informed me that when the avalanche stopped, he and three others were near the surface and just stood up, contrary to my article which states that all 17 were "critically buried (head below the surface) with only a few visual clues on the surface to aid the search."

These four people—two students and two leaders—immediately went into action. The leaders proceeded up the slope and directed the students to search using their beacons and surface clues. One of the students found two others through surface clues and helped them self-rescue. A leader and a student rescued another through beacon searching.

In the article, I implied that the guides were responsible for rescuing all the survivors that day. Clearly, that is not the case. The students had all been trained to a very high standard in avalanche rescue and the survivors acted very impressively, making some terrific decisions and eventually saving the same number of lives as the guides did.

The two guides responded near the top of the debris. They, along with one of the teachers, were faced with the challenge of deciding that a three-metre burial was too deep and moving on to another subject. This single act of triage probably saved a life. Had they not reallocated their limited resources, the second subject likely would not have made it. This is where the story of triage came from, and I am sorry that the events of that day were not more accurately depicted in my article.

>>Ken Wylie

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This journal 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.

We 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:

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This is old text please ignore this...

As I write this, the winter solstice is almost upon us. These long, snowy nights are always conducive to reflection, a good time to be thinking of the year that was. 2007 was the CAA's 25th anniversary year, a milestone by anyone's measure and a proud point of achievement for a little organization run for years by volunteers.

Of course, that little organization is all grown up now, and taking on roles and responsibilities the founding members could only dream of. This journal is an interesting reflection on our association's growth and success. I have a collection in my office of the original Avalanche News, from Volume 1 all the way through to the present. It's quite the read—sometimes humourous, sometimes moving. The constant thread throughout are the voices of good people, doing good work.

Even when the Avalanche News was barely five pages folded together, the reader still gets the feeling significant work was being accomplished. There's a sense of maturity in those earliest issues that belies the newsletter's modest look. It seems everyone involved with the association believed in their work, and that commitment shows through. While much has changed over the years in this publication's appearance, the commitment to avalanche safety remains constant.

When I compare our more recent issues with those older ones, I'm struck by the steady increase in volume of ideas, innovations, plans and projects. This is a much bigger publication simply because there's so much more going on. We strive to bring you a good cross section of the news relevant to professional avalanche workers, with a priority on information that directly affects you, now or in the future.

This issue is a good example of those priorities in action. This fall, two documents were written that have the potential to impact a wide range of members, and your board of directors wants to hear your opinions on both of them. On page 12, CAA President Steve Blake writes about new recommendations for avalanche worker qualifications. These recommendations are still in draft form, and are the result of extensive consultation with a wide variety of industry stakeholders. You can find this document on the "members only" section of the CAA website.

The other priority document is a policy on "Enterprise Conflict Avoidance" and you can read more about that on page 17. This policy is the result of months of discussion and debate, and was approved by the board in mid-October. We've published it in its entirety in this issue, as well as posting it on the "members only" section.

This is where your commitment to your community and your association comes in to play. Your board of directors wants to hear what you have to say about both these issues. Steve put it well when he wrote, "use your privilege as members to ask questions or challenge policy decisions."

Have a great winter.

The view from up here

Guests of Sol Mountain Touring head back to the lodge after another beautiful day in the southern Monashees. This view looks south, with Mt Baldur in the background

Aaron Cooperman

Why signals almost always overlap!

By Manuel Genswein

Editor's note: *For more on this issue, see Felix Meier's research paper on avalanche transceivers and multiple burials on page 64.*

Thomas Lund of Tracker BCA recently published a very well-written marketing paper about multiple burial problems. From a marketing perspective, the paper is excellent. From a technological and rescue technique perspective, the paper is purposely misleading, includes many errors, and the content is counterproductive to the criteria of "survival chance optimized" rescue procedures.

Lund is trying to convince the world that transmitters almost always overlap in "true multiple burial situation" so that the "mark" function of technically sophisticated transceivers becomes obsolete. Looking at the fact that Tracker BCA is the only major brand left which has, even in its most recent model – Tracker 2, no multiple burial algorithms implemented which numerically indicate the amount of buried subjects and allow the user to "mark" buried subjects which have been found by the transceiver. Such algorithms, which allow a dramatic decrease in the complexity of the search (= true "ease of use") in multiple burial scenarios cost a manufacturer considerably more than 1 million US$ in development costs.

There is one very fundamental but completely wrong assumption in Lund's paper which is tragic for Tracker BCA: If the detection of positive edges would be as impossible during signal overlap as described in this paper, all digital search modes would be close to useless in multiple burial situations and only the true acoustical, analog search could be applied. Only the fact that the digital search modes are able to track the positive edges (beginning of the signal) in the (vast) majority of all cases allows calculating and indicating a distance and direction indication. What digital-only transceivers are unable to do is to provide a *fast and reliable overview* of the scenario, but this is a different story.

By far the most reliable strategy in multiple burial situations is the use of the constant timing of the transmitter as the determining separation criteria. Most of the unreliability in the marking process as described by Lund is only seen with a specific product using signal strength as primary criteria to separate the signals of multiple buried subjects. As Lund mentions correctly, the "intelligent transmitter" (in non-marketing terms the "stupid transmitter") of the same manufacturer destroys the fundamental criteria for reliable signal separation: constant pulse rate of the transmitter.

Some important points to consider:

It may take a lot of time to find, access, and turn off the transmitter of the buried subject

This paper assumes that the transmitter of the buried subject can be easily and quickly located on the body and switched off by the rescuers. This is wrong; often it is necessary to completely free the buried subject in order to be able to switch off the transceiver. This is time consuming and might not be necessary in the early stages of the rescue. Therefore companion rescuers must be able to proceed to the buried subjects who have not been found yet while the transmitter of the already located buried subjects are still transmitting. This is equally valid for all cases in which reverse triage needs to be applied.

Times of all individual components of the entire rescue add up to the survival chance critical burial time

It is unacceptable to conclude that a search technique is low in priority just because other steps of the entire rescue chain may require considerably more time. The entire rescue process splits into several disciplines which add up to entire rescue time. The full completion of each discipline is required to proceed to the next step (e.g., a successful completion of the search is required to proceed to the excavation). Therefore all disciplines are ***complementary*** to and rather than replacing each other. Nobody is against a more systematic approach to shoveling or a more efficient organization, but those disciplines do not replace an efficient and well-structured search process.

Marking does not eliminate more than one buried subject

The comment of figure 3 on page 56 is completely and purposely wrong: Marking victim 1 with a transceiver which uses a transmit time pattern analysis would NEVER eliminate victim 2 or its signal at the same time in this case. The indicated "stop" message shows that the transceiver has recognized both victims properly, but after "marking" victim 1 it is temporarily (for the duration of the overlap) not able to lead the rescuer to victim 2 and therefore indicates a "stop" message. Listening to the analog sound at the same time would immediately *confirm* the existence of the second victim.

Signal acquisition and processing time in single and multiple burial situations

The data acquisition required to recognize the different transmit patterns (=buried subjects) does NOT slow down the distance or direction indication. In general, signal processing times of modern transceivers are so fast that no transceiver is "slower" or "faster" in the rescuer's perspective; the time differences are so marginal that they are for medical reasons not detectable by human senses (in the range of a few milliseconds). As long as the positive edges of the signal from the victim can be detected, the result will be immediately shown to the user. The positive edge detection applied for this is exactly the same as for single burials in ***all*** transceivers with distance

and direction indication. If a transceiver reacts "slowly" in a single burial situation, this is almost always an indication that a product is forced to try to cover its deficiencies by applying extensive averaging functions.

Search system dependent search strip width limitations

On page 58, Lund states: "The 3-circle method is particularly suited for large deposition areas." This statement is wrong; the truth is the opposite. The 3-circle method is the only search method for multiple burials that restricts primary search strip width to 20m (D. Stopper, Berg und Steigen). The method is therefore forcing the user to apply a very small, survival chance minimizing signal search strip width (formerly: primary search strip width)—a real problem in large deposition areas. This is a restriction which only applies to the 3-circle method; no other search system for multiple burials in close proximity is suffering from such limitations.

Consequences for teaching

The "Marking" functions of modern transceivers are capable of solving the majority of the easier scenarios as positive edge detection is in many cases still possible, even during a signal overlap. "Marking" should therefore be taught as the normal ending of EVERY search. When the rescuer has located the position of the loudest sound or the smallest distance indication in the fine search (formerly known as the pinpoint search), the shovel is placed at this position and the spiral probing applied until the buried subject is found by a probe hit. Now, as the search is finished, the buried subject always has to be "marked."

By teaching this procedure, the participants will be able to solve multiple burial problems in the same way as single burial problems. A multiple burial problem becomes nothing else than a sequence of technically separated single burial searches. The fact that Tracker BCA's Lund is against teaching the "marking" functions as a primary mean to the less trained user groups is typical for BCA's strategy—to reduce the efficiency of all avalanche rescue transceivers to meet the low performance, by today's standards, of their Tracker BCA.

The same is seen looking at search strategies for multiple burials. By their worldwide strong financial support to push the 3-circle method, they make sure that the by-far superior performance of devices with large search strip width and analog sound are cut down by a search strategy which has been designed by Stopper BCA to lower the efficiency of all devices to what digital-only units in combination with badly trained users can achieve (double filter = cut the efficiency twice).

With today's strictly survival chance optimized search systems and search processes, only the following procedure makes sense. Take advantage of the "marking" function as it represents the fastest possible way (= most survival chance optimized) to get from a found buried subject to another one which has not been marked as found yet. Only change to a search tactical approach (a search system, like the micro search strips) if the signal separation is not working properly anymore. In practice, this means for an accident with four buried subjects that you might be able to find the first three buried subjects with the "marking" strategy and only then need to switch to a more time consuming search system to locate the fourth and last victim. Thanks to the fastest possible approach for the three first buried subjects, they take advantage of shorter burial times.

The truth is inconvenient for Edgerly and Lund of Tracker BCA. Transceivers without multiple burial algorithms and marking capabilities are completely out of date in a technological and rescue technical point of view. Although these functions are not capable of solving all problems, they are capable of solving the majority of easier multiple burial situations which statistically make up the majority of all victims involved in a multiple burial situation (two to three buried subjects).

In order to be able to verify that the multiple burial algorithms work properly, listening to analog tones—the only truly unprocessed raw data—is by far the most reliable and quickest procedure. Digital-only transceivers are at a clear disadvantage in advanced multiple burial situations as well as concerning range, and therefore are an inappropriate choice for advanced recreational and all professional users.

The harder, more complex scenarios remain to be solved with search tactical systems. These situations ask therefore for search systems which are designed to work even in the most demanding situations. Therefore their homemade "3 circle method" clearly is not a good choice; instead rescuers should apply the more comprehensive and proficient "micro search strips."

Manuel Genswein is an independent avalanche instructor. He has taught courses for 15 years in over 20 countries. He writes to avalanche.ca *from the air, on his way to Islamabad in Pakistan to teach an avalanche rescue course to a completely new rescue team formed by an international humanitarian organization which belongs to the Aga Khan Foundation and the European Commission for Humanitarian Aid. He can be reached at manuel@genswein.com.*

Timeline of Change
Working together with WorkSafe BC

In November of 2006 the CAA became aware that WorkSafeBC (WSBC) was developing regulations specific to the protection of workers from avalanches. The core premise of their proposal was that a "qualified registered professional" (i.e., a professional engineer, geo-scientist or forester) would be required to specify the safety programs for all workplaces in the province where workers were exposed to unstable landforms or avalanches.

The CAA alerted the key stakeholder organizations including HeliCat Canada (HCC), Canada West Ski Areas Association (CWSAA), the Association of Canadian Mountain Guides (ACMG), the Canadian Ski Guides Association (CSGA), the BC Ministry of Transportation (BC MoT) and Parks Canada Agency (PCA) and urged them to write letters to WSBC pointing out the flaws in the proposal. In January of 2007 most of these stakeholder organizations had sent letters, singling out specific features of the proposed regulation they saw as inappropriate.

On April 25th 2007, WSBC responded with an amended regulation proposal that separated terrain assessments from avalanche assessments. But, to our collective chagrin, the proposal still contained the requirement for a qualified registered professional to conduct the analysis of avalanche-prone terrain within a workplace, and develop the operational safety plans to mitigate avalanche risks to workers. This was anathema to our community of avalanche workers and employers who contend that avalanche professionals, not engineers, geoscientists or foresters, are the only people qualified to develop operational safety plans to mitigate avalanche risk to workers in active avalanche programs.

With public hearings on the proposed regulation scheduled for June, it became clear that all stakeholder organizations needed to engage in a serious and coordinated manner. At the our annual general meeting last May, the CAA Board of Directors and membership discussed these issues at length, resulting in the following strategic directions.

1. The CAA supports development of a well-crafted WSBC regulation that will be truly effective in improving the safety of workers in British Columbia.
2. As the CAA membership and board represents the full scope of avalanche-related activities in Canada, the CAA should serve our membership and the avalanche community by

brokering positions with WSBC that are supported by all key stakeholder organizations.

3. The membership tasked the CAA Board of Directors to develop benchmark recommended qualifications and "Scope of Practice" guidance for active avalanche safety program planners, forecasters, technicians and entry level avalanche workers.
4. The CAA agrees there is an important role for qualified registered professionals in avalanche protection programs, and that the CAA should work with the Association of Professional Engineers and Geo-scientists of British Columbia (APEGBC) and the Association of British Columbia Professional Foresters (ABCPF) to jointly develop role statements and scope of practice guidance for our respective memberships.

Following the AGM, a flurry of dialogue with stakeholder organizations began. CAA Vice President Rob Rohn and I travelled to Vancouver to meet with WSBC and APEGBC officials, alerting them of the positions to expect at the upcoming WSBC public hearings, and to educate them on the rationale behind those positions. The CAA's submission to the public hearings was crafted with review and input from numerous organizations, and was then ratified by the CAA Board of Directors. When I delivered that paper at the WSBC hearings in Vancouver, the chairperson noted that another revision to the proposed regulation would likely be required. She then asked if the CAA could help to develop stakeholder consensus for the numerous issues we had collectively identified. My response to her was "That is what the CAA does."

In September we received word that the WSBC Board of Directors had withdrawn the regulation proposed on April 25th, and had tasked WSBC staff to collaborate with stakeholders to develop a regulation proposal that would be effective and acceptable to all. Collectively we had been successful in blocking a poorly crafted regulation; now we would have the opportunity to work together to get it right.

What has become known as the "Senators' Workshop" occurred October 12 – 14 in Revelstoke, when 29 senior CAA members from all sectors of the avalanche community gathered to propose qualifications for benchmark levels of operational responsibility and discuss associated scope of practice issues. The results of this weekend were compiled, then reviewed and vetted "in principle" by the CAA Professionalism and Ethics Committee and Board of Directors.

The next step was to have the Senators' proposals reviewed by the key stakeholder associations representing employers. On November 15th a Stakeholders Workshop was held in Canmore. Much of the discussion there focussed on fine-tuning the document to accommodate the diverse needs of each of the industry sectors in attendance. It was heartening to see representatives from so many different organizations sharing their perspectives on how to meet the challenges we collectively face, united in our desire to work with the WSBC regulators to improve the safety of all workers exposed to avalanches.

The Stakeholders Workshop produced minor conceptual evolutions to Recommended Qualifications for Avalanche Workers matrix that has subsequently been ratified by our Board of Directors and now stands as the board's recommendation for ratification by the membership at the AGM in May. This matrix is contained in Steve Blake's Message from the President on page x of this issue. Also shown there is a companion document titled, "Recommended Scope of Practice Guidelines for Qualified Avalanche Planners."

This is a critical juncture, as we believe the revised WSBC regulation proposal will reference the qualifications matrix and the associated scope of practice document, as well as other published CAA guidelines for conducting avalanche risk assessments. At the next round of WSBC public hearings in June it is essential for the CAA to be able to state that these documents have been ratified by the membership. The process to develop these documents has been rigorous, and I believe these credentials moves us on step further toward recognition of the professionalism of the Canadian avalanche community.

Your Vote Required

The documents below and on the following two pages are the result of extensive consultation with the entire spectrum of the professional avalanche industry in Canada. WorkSafe BC (WSBC) has asked us to develop consensus among the stakeholders in our community and this is what we have done. This is the collective wisdom of our profession on this matter and the best way to move forward.

At time of writing, we have not yet received the revised regulations and associated implementation guidance from WSBC, so these documents may be revised slightly to reflect WSBC wording for regulation proposal and associated definitions. But the spirit and essence of what we, as a community, have created will remain as you see it here.

Please take the time to read these documents carefully and fully inform yourself of this important step in the growth of the CAA. It is essential that these principles be ratified by the CAA membership prior to the upcoming WSBC public hearings in June. Your board sees this as a major step forward for our profession, enhancing the credibility and broadening the recognition of avalanche workers in Canada. This is your association at work, and your unmitigated support is a vital part of this process.

president@avalanche.ca

DRAFT Recommended CAA Scope of Practice Guidelines ROLE: *Qualified Avalanche Planner*

1. Definitions

In this document:

1.1. ***Active avalanche safety program*** means a comprehensive documented program recommended by a qualified avalanche planner and approved by the employer for monitoring daily, or more frequently if conditions warrant, the weather, snow and avalanche conditions, determining temporal fluctuations of avalanche hazards and implementing safety measures, closures or other methods to control avalanche risk that has not been eliminated through use of passive risk mitigation measures.

1.2. ***Avalanche*** means snow avalanche.

1.3. ***Avalanche forecaster*** means an individual accountable for implementing an approved active avalanche safety plan, conducting daily hazard and risk analyses, selecting and implementing protective measures, and all other operational decisions and actions pertaining to the active avalanche safety program.

1.4. ***Avalanche risk assessment*** means an assessment, done in accordance with published CAA guidelines, of the terrain in and surrounding a workplace to determine if the workplace is at risk from a snow avalanche.

1.4.1. For workplaces involving buildings, construction, logging, transportation corridors or other work areas that will be occupied by people working in the workplace on a permanent or scheduled basis, the avalanche risk assessment must be prepared by a qualified registered professional and a qualified avalanche planner.

1.4.2. For wilderness operations where people working in the workplace move over and undertake activities in undeveloped terrain the avalanche risk assessment must be prepared by a qualified avalanche planner.

1.5. ***Avalanche risk zone*** means a workplace or part of a workplace where an avalanche risk assessment determines that avalanches pose a risk to people working in the workplace and risk control measures are required to make the area safe for work to be conducted.

1.6. ***Avalanche safety plan*** means a plan meeting published CAA guidelines, specifying passive risk mitigation measures to eliminate or reduce the avalanche risk to people working in the workplace; and, any active avalanche safety program necessary to monitor and manage any avalanche risk that has not been eliminated through use of passive risk mitigation measures.

1.7. ***CAA*** means the Canadian Avalanche Association.

1.8. ***CAA guidelines*** means "Guidelines for Snow Avalanche Risk Determination and Mapping in Canada" (2002); the "Land Managers Guide to Snow Avalanche Hazards in Canada" (2002); and other guidance materials that may be developed and published by the CAA pursuant to WorkSafeBC regulations.

1.9. **Employer** means a person, proprietor, company, agency, primary contractor or legally constituted entity that is legally accountable for workplace safety within a defined operating area.

1.10. ***Passive risk mitigation measures*** means applying CAA guidelines and other relevant standards and practices in engineering, geo-science and forestry to worksite and facility planning, location, design and use to eliminate or reduce the risk from avalanches, and may include the design and construction of physical defenses against avalanches.

1.11. ***Planning team member*** means an individual holding one or more of the non-core criteria specified in the companion document *"CAA Recommended Minimum Qualifications For Workers In Active Avalanche Safety Programs"*, who assists the qualified avalanche planner in the preparation of an active avalanche safety plan.

1.12. ***Qualified avalanche planner*** means a person with at least the minimum credentials, training and experience to be a planner as specified in the companion document *"CAA Recommended Minimum Qualifications For Workers In Active Avalanche Safety Programs"* and who is;

1.12.1. a professional member of the Canadian Avalanche Association, or

1.12.2. a certified guide and a member of the Association of Canadian Mountain Guides, or

1.12.3. a qualified registered professional.

1.13. ***Qualified registered professional*** means a professional engineer or geoscientist as defined in the Engineers and Geoscientists Act, or, a professional forester or registered forest technician as defined in the Foresters Act.

2. Context

These Guidelines are intended to provide guidance to employers, planners, regulatory agencies and others regarding expectations and best practices for developing active avalanche safety plans. These guidelines should be interpreted in the context of the following companion documents, as may be amended from time to time.

2.1. CAA Constitution, Bylaws, Code of Ethics, Continuing Professional Development (CPD) policy, and other published documents.

2.2. CAA Recommended Minimum Qualifications For Workers In Active Avalanche Control Programs

2.3. Part 4.2.2 of the WorkSafe BC Occupational Health and Safety Regulation

3. Role Statement

A qualified avalanche planner may be retained as an independent consultant, contractor or advisor, or may be an employee. In either circumstance the planner's obligations are the same: to exercise prudence and expert professional judgment to plan and specify all elements of an active avalanche safety program and associated avalanche risk management practices, congruent with evolving best practices, due diligence, and all applicable laws, regulations, published operational standards, contracts, guidelines, and other known obligations.

4. Personal / Team Qualifications

The *CAA Recommended Minimum Qualifications for Workers in Active Avalanche Safety Programs* document specifies comprehensive criteria for credentials, training and operational experience for qualified avalanche planners, and it is recognized that only a few individuals may personally meet all of those criteria. For this reason the CAA advocates an "expert team" approach where:

4.1. The qualified avalanche planner that signs off the active avalanche safety plan must personally meet all specified core criteria; and,

4.2. One or more supporting members of the planning team may provide non-core criteria not personally held by the planner; so long as,

4.3. The qualified avalanche planner remains accountable for the contents of the active avalanche safety plan, in its entirety.

5. Scope of Practice Statement, *Qualified Avalanche Planner*

5.1. The scope of practice for a qualified avalanche planner includes **participating** in the preparation of avalanche risk assessments for workplaces involving buildings, construction, logging, transportation corridors or other work areas that will be occupied by people working in the workplace on a permanent or scheduled basis. In these circumstances qualified avalanche planners may **assist** qualified registered professionals by:

5.1.1. Identifying avalanche starting zones;

5.1.2. Collecting information in the field and preparing reports on the nature of terrain, slope inclines, width and run distance of avalanches in the past;

5.1.3. Compiling data of avalanche activity in the past;

5.1.4. Analyzing weather data;

5.1.5. Contributing with their experience about types, sizes, and run distances of avalanches.

5.2. A qualified avalanche planner is responsible for the preparation of avalanche risk assessments for wilderness operations where people working in the workplace move over and undertake activities in undeveloped terrain. Avalanche risk assessments for wilderness operations should include:

5.2.1. Identification of the employer's intended operational uses of the lands within the workplace: where, when, by whom, for what purpose, and under what circumstances, to determine asset vulnerability.

5.2.2. Evaluation of climate and local weather information to estimate snow supply and typical characteristics of the seasonal snow pack.

5.2.3. Identification of the extent and character of avalanche prone terrain within the workplace using the Avalanche Terrain Evaluation Scale (ATES) technical model.

5.2.4. A qualitative summary of avalanche risk zones in the workplace.

5.3. Active avalanche safety plans should be based on an operational scoping that ensures:

5.3.1. Compliance with all government regulations, and industry association standards and best practices within the Canadian avalanche community;

5.3.2. Consideration of cost / benefit and reliability of risk mitigation options.

5.3.3. Other factors necessary to optimize the design of an avalanche safety / risk management program for the workplace.

5.4. An active avalanche safety plan specifies all elements of the active avalanche safety operation for the specified workplace, including but not limited to:

5.4.1. Accountability statements for operational staff and managers

5.4.2. Staffing levels and benchmark qualifications, including ongoing training, continuing professional development and mentorship

5.4.3. Equipment and operating infrastructure requirements

5.4.4. Data collection, analysis and record keeping protocols

5.4.5. Procedures for routine and emergency operations

5.4.6. Avalanche control and explosives use procedures

5.4.7. Communications requirements

5.4.8. Annual operating and capital budget estimates

5.4.9. Mechanisms for internal and external audits, investigations and program quality assurance

6. CAA Code of Ethics Compliance: *Planner - Active Avalanche Safety Operations*

The CAA Code of Ethics contains the following statements:

Recognizing avalanche hazards for day-to-day operations and in the planning of facilities requires both knowledge of avalanches and practical experience in the collection and interpretation of information:

- *A Member of the Canadian Avalanche Association will undertake only those assignments for which he is qualified by experience. If necessary, he will state clearly his capabilities when advertising and obtaining work.*
- *A Member will engage or advise engaging other Members of the Association whenever his/her employer's interests are best served by such action.*
- *A Member must exercise all reasonable skill and must accept responsibility for his actions.*

Upon recommendation of this document by the CAA's Professionalism and Ethics Committee, approval by Board of Directors, and ratification by vote of the Membership, all persons undertaking work as a qualified avalanche planner agree and commit to:

6.1. Comply with these Scope of Practice Guidelines, the *CAA Recommended Minimum Qualifications For Workers in Active Avalanche Safety Programs*, and other guidance documents as may be approved by the CAA from time to time.

6.2. Provide any prospective employer with a copy of these Scope of Practice Guidelines and the *CAA Recommended Minimum Qualifications For Workers in Active Avalanche Safety Programs* document.

6.3. To file an annual declaration of compliance with the CAA's Continuing Professional Development program with the CAA, and to authorize the CAA to make that declaration available to any prospective employer upon request.

6.4. State in writing the qualifications the Member personally brings to the planning team, and the names and qualifications of other planning team members.

6.5. Provide the prospective employer with a curriculum vitae that includes a complete list of employers for whom the Member has provided "qualified avalanche planner" services; and,

6.6. State in writing the means by which the Member will be accountable for the active avalanche safety plan to be developed for the employer.

-30-

DRAFT CAA Recommended Minimum qualifications For Workers in Active Avalanche Safety Programs

CAA Recommended Minimum Qualifications For Workers In Active Avalanche Safety Programs

Role: Planner (Consultant) for active avalanche safety programs. See companion Scope of Practice document

Credentials, Training & Experience	Sector Specific Recommended Minimum Qualifications					
Criteria listed below in bold font are core criteria to be met by the "planner of record". Criteria in regular font may be provided by supporting members on the planning team.	**Downhill Ski Resorts**	**Mechanized Wilderness Guiding**	**Non-mechanized Wilderness Guiding**	**Highways, Railways, Buildings, Forestry & Construction Ops**	**Govt. & NGO "Public Service" Programs**	**Snowmobile Wilderness Guiding**
"Qualified Avalanche Planner" as defined in Part 4.2.2 (1) of proposed WSBC regulation	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
CAA Ops L2 course graduate, c/w Module 1	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Annual filing, CAA CPD program compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Seasons experience, avalanche operations	**15**	**15**	**15**	**15**	**15**	**15**
Seasons experience, avalanche program management / quality assurance, this sector	**3**	**3**	**3**	**3**	**3**	**3***
Professional liability insurance coverage	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Introductory avalanche mapping course	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Meteorology or avalanche weather course	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Avalanche forecasting course* **	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Advanced avalanche rescue course**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Guide certification (as per sector standard)		Yes	Yes		Desirable	Yes**
Advanced avalanche mapping course	Desirable			Desirable		
Avalanche blasting course	Yes	Yes		Yes		Desirable
Avalanche blasting ticket (valid)	Desirable	Desirable		Desirable		Desirable
Safety in winter operations course***	Desirable	Desirable	Desirable	Desirable	Desirable	Desirable
Avalanche accident investigation experience	Yes	Yes	Yes	Yes	Yes	Yes
Relevant post-secondary degree					Desirable	
University level statistics course	Desirable	Desirable	Desirable	Desirable	Desirable	Desirable

* For BC Commercial Snowmobile Operators Association (BCCSOA) members this sector experience requirement may be filled by a supporting member of the planning team due to limited capacity within existing operators. ** BCCSOA guide standards and certification process to be implemented by 2010.

*** These training programs are currently under development by the CAA, and will be available by fall, 2008.

NOTE 1: For all categories of workers described in this document, specified formal training requirements may be met through an "or equivalent" training determination under the Prior Learning Assessment Review (PLAR) process conducted by the CAA Education Committee.

Stakeholders Recommended Minimum Qualifications For Workers In Active Avalanche Safety Programs

Role: Planner (Employee) for active avalanche safety programs. See companion Scope of Practice document

Credentials, Training & Experience	Sector Specific Recommended Minimum Qualifications					
Criteria listed below in bold font are core criteria to be met by the "planner of record". Criteria in regular font may be provided by supporting members on the planning team.	**Downhill Ski Resorts**	**Mechanized Wilderness Guiding**	**Non-mechanized Wilderness Guiding**	**Highways, Railways, Buildings, Forestry & Construction Ops**	**Govt. & NGO "Public Service" Programs**	**Snowmobile Wilderness Guiding**
"Qualified Avalanche Planner" as defined in Part 4.2.2 (1) of proposed WSBC regulation	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
CAA Ops L2 course graduate, c/w Module 1	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Annual filing, CAA CPD program compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Seasons experience, avalanche operations	**10**	**10**	**10**	**10**	**10**	**8***
Seasons experience, avalanche program management / quality assurance, this sector	**5**	**5**	**5**	**5**	**5**	**3***
Introductory avalanche mapping course	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Meteorology or avalanche weather course	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Avalanche forecasting course* **	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Advanced avalanche rescue course* **	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Guide certification (as per sector standard)		Yes	Yes		Desirable	Yes**
Advanced avalanche mapping course	Desirable			Desirable		
Avalanche blasting course	Yes	Yes		Yes		Desirable
Avalanche blasting ticket (valid)	Desirable	Desirable		Desirable		Desirable
Safety in winter operations course**	Desirable	Desirable	Desirable	Desirable	Desirable	Desirable
Avalanche accident investigation experience	Yes	Yes	Yes	Yes	Yes	Yes
Relevant post-secondary degree					Desirable	
University level statistics course	Desirable	Desirable	Desirable	Desirable	Desirable	Desirable

* For BC Commercial Snowmobile Operators Association (BCCSOA) members this sector experience requirement may be filled by a supporting member of the planning team due to limited capacity within existing operators. ** BCCSOA guide standards and certification process to be implemented by 2010.

*** These training programs are currently under development by the CAA, and will be available by fall, 2008.
NOTE 2: Plans prepared by a planner (employee) should be peer reviewed by a commensurately qualified individual from another organization in the same sector prior to being accepted and implemented by the employer.

Stakeholders Recommended Minimum Qualifications For Workers In Active Avalanche Safety Programs

Role: Avalanche Forecaster. Typical workplace titles include Senior Lead Guide, Public Safety Specialist, Snow Safety supervisor, Senior Avalanche Technician, CAA ITP Course Leader. These individuals are accountable for implementing an approved active avalanche safety plan, oversight of day to day hazard and risk analyses, implementing protective measures, and all other operational decisions and actions pertaining to the organization's active avalanche safety operation. See companion Scope of Practice document.

Credentials, Training & Experience	Sector Specific Recommended Minimum Qualifications					
Criteria listed below should be held by the avalanche forecaster of record, the person accountable for on-site active avalanche safety and risk management on behalf of the employer.	**Downhill Ski Resorts**	**Mechanized Wilderness Guiding**	**Non-mechanized Wilderness Guiding**	**Highways, Railways, Buildings, Forestry & Construction Ops**	**Govt. & NGO "Public Service" Programs**	**Snowmobile Wilderness Guiding**
CAA Professional Member, or, for wilderness guiding operations, certification and current membership in a registered guiding association meeting industry & sector standards	Yes	Yes	Yes	Yes	Yes	Yes
CAA Ops L2 course graduate, c/w Module 1	Yes	Yes	Yes	Yes	Yes	Yes
Declaration of assn CPD program compliance	Yes	Yes	Yes	Yes	Yes	Yes
Seasons experience, avalanche operations	5	8	5	5	5	5
Seasons experience in this sector	3	5	1	1	1	1
Introductory avalanche mapping course	Desirable			Desirable	Desirable	
Meteorology or avalanche weather course	Yes	Yes	Yes	Yes	Yes	Yes
Avalanche forecasting course***	Yes	Yes	Yes	Yes	Yes	Yes
Advanced avalanche rescue course***	Yes	Yes	Yes	Yes	Yes	Yes
Guide certification (as per sector standard)		Yes	Yes		Desirable	Yes**
Avalanche blasting course****	Yes	Yes		Yes	Yes	Yes
Avalanche blasting ticket (valid)****	Yes	Yes		Yes	Yes	Yes
Safety in winter operations course**	Desirable	Desirable	Desirable	Desirable	Desirable	Desirable
80 hour first aid course (or OFA as applicable)	Yes	Yes	Yes	Yes	Yes	Yes

** BCCSOA guide standards and certification process to be implemented by 2010.

*** These training programs are currently under development by the CAA and will be available by fall, 2008.

**** For operations approved to use explosives for avalanche control purposes
Note 1. Criteria shown are for operations with challenging or complex terrain as per the Avalanche Terrain Evaluation Scale (technical model). Operations with only simple avalanche terrain should staff to criteria specified in a plan prepared by a qualified avalanche planner and signed off by the employer.

Stakeholders Recommended Minimum Qualifications For Workers In Active Avalanche Safety Programs

Role: Avalanche Technician. Typical workplace titles include Team Leader, Ski or Assistant Guide, Public Safety Warden or Ranger, Professional Ski Patrol – Route Leader, CAA ITP Course Full Instructor. These individuals are typically first level supervisors responsible for conducting assigned avalanche related duties and overseeing the safety of one or more staff, in accordance with direction provided by the avalanche forecaster on duty.

Credentials, Training & Experience	**Sector Specific Recommended Minimum Qualifications**					
Criteria listed below should be held by all avalanche technicians in active avalanche safety operations.	**Downhill Ski Resorts**	**Mechanized Wilderness Guiding**	**Non-mechanized Wilderness Guiding**	**Highways, Railways, Buildings, Forestry & Construction Ops**	**Govt. & NGO "Public Service" Programs**	**Snowmobile Wilderness Guiding**
CAA Active Member, or, for wilderness guiding operations, certification and current membership in a registered guiding association meeting industry & sector standards	Yes	Yes	Yes	Yes	Yes	Yes
CAA Ops L2 course graduate, c/w Module 1	Yes	Yes	Yes	Yes	Yes	Yes
Declaration of assn CPD program compliance	Yes	Yes	Yes	Yes	Yes	Yes
Seasons experience, avalanche operations	3	3	2	2	2	2
Seasons experience in this sector	1	1	1	1	1	1
Advanced avalanche rescue course***	Yes	Yes	Yes	Yes	Yes	Yes
Guide certification (as per sector standard)		Yes	Yes		Desirable	Yes**
Avalanche blasting course****	Yes	Desirable		Yes	Desirable	Desirable
Avalanche blasting ticket (valid)****	Yes	Desirable		Yes	Desirable	Desirable
Safety in winter operations course**	Desirable	Desirable	Desirable	Desirable	Desirable	Desirable
80 hour first aid course (or OFA as applicable)	Yes	Yes	Yes	Yes	Yes	Yes

** BCCSOA guide standards and certification process to be implemented by 2010.

*** These training programs are currently under development by the CAA and will be available by fall, 2008.

**** For operations approved to use explosives for avalanche control purposes

Note 1. Criteria shown are for operations with challenging or complex terrain as per the Avalanche Terrain Evaluation Scale (technical model). Operations with only simple avalanche terrain should staff to criteria specified in a plan prepared by a qualified avalanche planner and signed off by the employer.

Stakeholders Recommended Minimum Qualifications For Workers In Active Avalanche Safety Programs

Role: Assistant Avalanche Technician. Typical workplace titles include Assistant Avalanche Technician, Assistant or Tail Guide, Park Warden or Ranger, Professional Ski Patroller, CAA ITP Course Assistant Instructor. These individuals conduct assigned avalanche related duties under supervision in accordance with direction provided by an avalanche technician or forecaster.

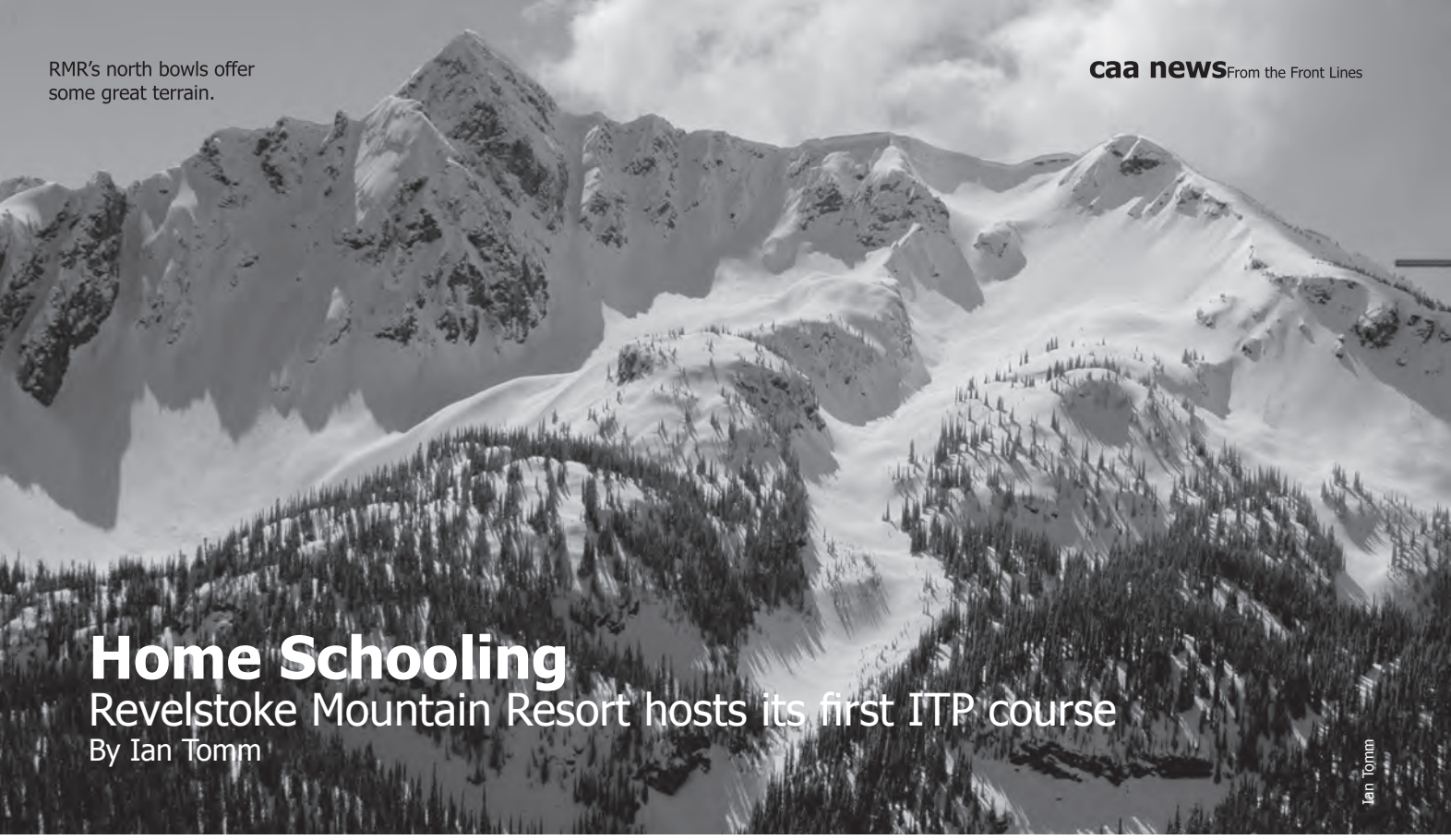
Credentials, Training & Experience	**Sector Specific Recommended Minimum Qualifications**					
Criteria listed below should be held by all assistant technicians in active avalanche safety operations.	**Downhill Ski Resorts**	**Mechanized Wilderness Guiding**	**Non-mechanized Wilderness Guiding**	**Highways, Railways, Buildings, Forestry & Construction Ops**	**Govt. & NGO "Public Service" Programs**	**Snowmobile Wilderness Guiding**
CAA Affiliate Member, or, for wilderness guiding operations, certification and current membership in a registered guiding association meeting industry & sector standards	Desirable	Desirable	Desirable	Desirable	Desirable	Desirable
CAA Ops Level 1 course graduate	Yes	Yes	Yes	Yes	Yes	Yes
Guide certification (as per sector standard)		Desirable	Desirable			Desirable**
Avalanche blasting course****	Desirable	Desirable		Desirable	Desirable	Desirable
Safety in winter operations course***	Yes	Yes	Yes	Yes	Yes	Yes
Advanced avalanche rescue course	Desirable	Desirable	Desirable	Desirable	Desirable	Desirable
80 hour first aid course (or OFA as applicable)	Yes	Yes	Yes	Yes	Yes	Yes
High competence, over snow travel skills, to the satisfaction of the employer	Yes	Yes	Yes	Yes	Yes	Yes

** BCCSOA guide standards and certification process to be implemented by 2010.

*** These training programs are currently under development by the CAA and will be available by fall, 2008.

**** For operations approved to use explosives for avalanche control purposes

Note 1. Criteria shown are for operations with challenging or complex terrain as per the Avalanche Terrain Evaluation Scale (technical model). Operations with only simple avalanche terrain should staff to criteria specified in a plan prepared by a qualified avalanche planner and signed off by the employer.



RMR's north bowls offer some great terrain.

Ian Tomm

Home Schooling

Revelstoke Mountain Resort hosts its first ITP course

By Ian Tomm

The summer of 2007 in Revelstoke was a time of immense change and activity. The new ski resort development seemed to propel this quaint little mountain town into hyper drive and everything from local trades to the local coffee shop were operating at maximum capacity. During this time Clair and I had the very fortunate opportunity to meet with Revelstoke Mountain Resort's (RMR) new Chief Operating Officer Rod Kessler, to explore potential partnership opportunities between our respective organizations.

RMR has already established a partnership with the CAC. Last year, the resort initiated onated $5000 to youth education in Revelstoke, a commitment that has been renewed for this winter season. In our conversations with Rod, we discovered that RMR also has a keen interest in training the avalanche workers of tomorrow.

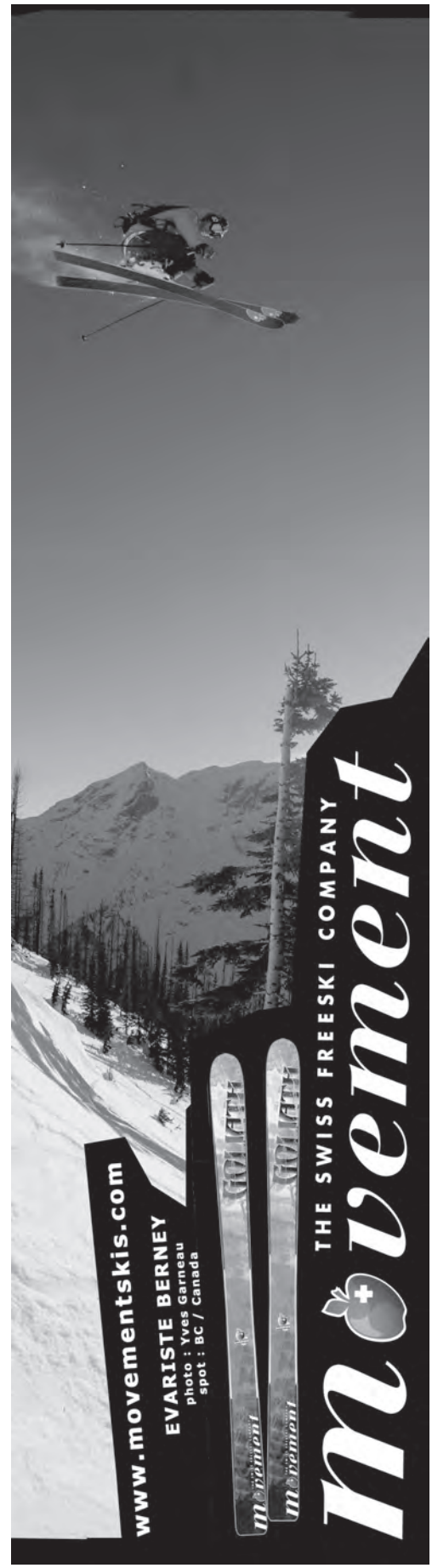
After a couple of meetings we decided a good place to start would be a pilot project, running a CAA Avalanche Operations Level 1 programs out of the new ski resort. It wasn't long before Thompson Rivers University (TRU) was on board as well as Selkirk Tangiers Heliskiing (STHS). As our initiative grew and gained momentum it became very apparent that Revelstoke was quickly turning into a new venue for the CAA's Industry Training Programs.

The success of the CAA's Industry Training Programs, in particular the Level 1 and 2 programs, is in large part due to the exceptional support we receive from industry. While we have used Revelstoke in the past for some of our courses, we have always lacked quick and easy access to alpine field study locations. With a world class ski resort now firmly entrenched in our community that has changed. RMR has remarkably good terrain for our avalanche programs, making it a natural fit for the CAA to bring a Level 1 to town.

I am happy to report that the first CAA-RMR-TRU-STHS educational partnership pilot project was a resounding success. The new resort area offers ample terrain and study locations. The classroom, at Selkirk Tangiers' base of operations at the Hillcrest Hotel, is one of the best we have access to across all our venues. The support given by both RMR and STHS made the experience for our students an extremely positive and rewarding one. It's not every Level 1 that gets a heli-assisted day of ski touring, and Eriks Suchovs at STHS should be thanked by all for his efforts to make this a reality during this course.

What's next? All parties have agreed there are ample reasons to move forward. At this time we're planning on running two Level 1s based out of Revelstoke and RMR next year. One course will continue to be run in conjunction with TRU's Adventure Travel Guide Diploma Program and the other will be open to general enrollment. Discussions are ongoing as to other unique and innovative partnership opportunites between the CAA, CAC and RMR into the future and I'm looking forward to developing this relationship further with our new friends in town.

Of special note I'd like to thank Rod Kessler for his vision and Eriks Suchovs of STHS for his support in making a heli-assisted ski day a reality for this program. Last but certainly not least, CAA Members Steve Parsons, Sylvain Hebert and Troy Leahy, all of whom are employed by RMR, played a vital role in making this program a resounding success. Stay tuned for more CAA ITP action at RMR.



eTraining Project Team at the University of Calgary

By Susan Crichton

The question of how people learn, and what motivates an individual's learning process, is a complicated one with no ready answer. However, the team of educators and researchers at the University of Calgary who are part of the CAA's eTraining project are hoping to shed new light on that question, while also aiming to take on-line learning to new heights.

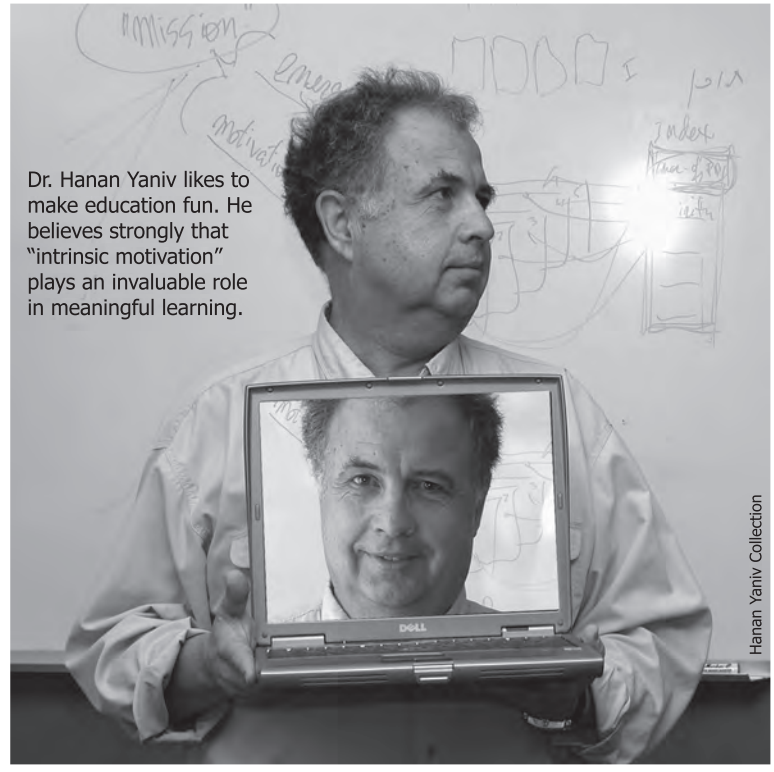
Drs. Hanan Yaniv and Susan Crichton are leading the U of C project team. Together, they are building on work initiated in the Collaborative Technologies Virtual Research lab, which is an on-line centre for open source educational research. Susan and Hanan have collaborated extensively on a number of projects, including the development of the Knowledge Harvesting process used in the earlier stages of this project. Information, rich with experience and insight, is shared by the SMEs (subject matter experts) and assimilated by the project team for use in scenario development.

Dr. Yaniv leads the development team and brings expertise in simulated learning environments from his work with Museum of Regiments in Calgary. For that work, Dr. Yaniv developed a multi-decision point maze environment in which participants wrestle with moral and ethical decisions based on actual events that occurred during WWII. This work has informed the development of the unique instructional design model—SAIL (Simulated Adventure Interactive Learning) environment—which now guides the development of the CAA environment.

Dr. Crichton leads the research team, and brings expertise in eLearning environments and project implementation and research Her PhD work focused on computer-mediated distance learning and, throughout her tenure as an educator, she has been an instruction designer, courseware developer, administrator and innovator in the intersecting realms of curriculum and technologies.

Three PhD students are also directly involved in the project:

- Lynn Moorman – expertise in spatial knowledge / GPS and GIS technologies
- Gail Shervey – expertise in eLearning and adult learning
- Yossi Soussa – expertise in collaborative technologies
- Lance Hanlen is a former student from Computer Science developing both the user interface and game engine. Two additional Computer Science students will contribute on the project as their skills are needed.



Dr. Hanan Yaniv likes to make education fun. He believes strongly that "intrinsic motivation" plays an invaluable role in meaningful learning.

Hanan Yaniv Collection

>>Susan Crichton is Assistant Dean for the Graduate Division of Educational Research at the University of Calgary

Working with Canada's Best

Avalanche Education for the Department of National Defence and the Canadian Forces

By Ian Tomm

After one group experienced a whumpf, the team got together to dig a series of profiles to explore the spatial variability in this terrain.

Ian Tomm

One of the most interesting things about working for the CAA is the diversity of people and organizations that approach us for help and expertise with all things avalanche. Over the course of the last two years I have had the pleasure of working with the fine folks at the Department of National Defence (DND) in the development and implementation of avalanche training for various departments and personnel of the Canadian Forces. This year marked the second year in a row we were able to run the CAA's Avalanche Operations Level 1 SAR program for these students and I am pleased to report to the membership that our relationship with the various agencies and departments involved with winter mountain travel in DND is growing and diversifying.

Unfortunately we had our first Level 1 – SAR course cancelled at the eleventh hour this year and special thanks need to go out to instructors Randy Stevens and Mark Bender, as well as Tom Morgan and the staff of Monashee Powder Snowcats for their understanding. A sudden reallocation of resources at the administrative level within the SAR Tech program resulted in the last-minute cancellation of this November course.

Thankfully, we were able to reschedule for the New Year and the program ended up at White Cap Alpine, a small backcountry hut in the southern tip of the Chilcotin Range, run by Ron and Lars Andrews. We took 12 DND students from Ottawa up to White Cap Alpine for a week and ran through a modified version of the CAA's Avalanche Operations Level 1 curriculum. The weather couldn't have provided a better learning opportunity for the students, with a strong pacific frontal system hitting us on the second night resulting in poor stability, easy test results and high avalanche danger just in time for field travel to start. Thankfully, and as is often the case on the coast, change happened quickly and good stability returned to the area in time for the last few days of the course.

As has been the case with past courses put on for DND, we continue to be impressed by the dedication of the students on the programs, their skill level in mountain awareness and their interest in the CAA's programs and expertise with the avalanche phenomena. The terrain at White Cap Alpine is about as ideal for avalanche education and the Level 1 curriculum as it can get with immediate, right-out-the-front-door access to avalanche terrain and a great variety of aspects and elevations within easy travel of the hut. There were a couple of things that stood out on the course that I think are worthy of communicating to the readers of this publication. Please understand that

the following is not an endorsement of any particular product or technique; rather, it is a simple observation of students with little to no previous experience and their skill development throughout the week.

Avalanche Search & Rescue

The Level 1 standard for avalanche search and rescue is a simple beacon exam. Two beacons are buried 50-70cm deep under targets roughly 40cm x 60cm in an area 30m x 30m. Both beacons are left on during the entire exam. The exam involves searching for the beacons and probing until a strike is made. Once a strike is made, students immediately move on to the second beacon. The timer stops when the second probe target is struck. To get 100% you must find both beacons in less than two minutes. After two minutes, one mark is deducted for each additional minute. A failing mark is five minutes or greater.

All students on this course used the same beacon—the Barryvox Pulse. All beacons buried for the exams were purposefully not Pulses, to remove the capabilities that Pulses have when searching for their own kind. At the start of the week no student had used a transceiver before. Within the first hour of instruction, each were reliably finding both shallow and deep (>2 m) burials. The next step was to introduce multiple beacons. By the end of the second hour most students could reliably find multiple transceivers, including close proximity deep burials (we buried up to five in close proximity). I was astonished.

Some of this success is due to equipment. With the refined technology currently found in today's digital beacons and the spiral probing method, beacon work has become a skill even novices can master quickly, with well structured learning and ample practice.

However, while technology may have played a role, attitude was the star. These students were dedicated to "getting it right" and learning the proper techniques and strategy conducive to success, right out of the gate. To this day the 12 students on that course were the 12 best students I have ever had on a Level 1 course in terms of avalanche transceiver search skills. For those interested, best time for both beacons was 41 seconds, worst was 3'15" = mean time 1'48".

Ian Tomm

Track setting and route finding in avalanche terrain was a core component of the field work on this course.

While not an evaluation component of the Level 1, the value of the newly introduced V-Shaped Conveyor Method for shoveling (see page xx in this issue) can't be understated. I, along with several other professionals this winter, have had our eyes opened to the value of structured and organized shoveling techniques. If you haven't learned this new technique yet, do so right away. There is simply no better way that I am aware of to quickly extricate a burial victim. We practiced a fair bit on the Level 1 course with DND and just three strong shovellers could dig more than two metres in under five minutes and have a ramp and hole big enough to easily extricate an injured subject.

Terrain

A couple of years ago the CAA's Level 1 program adopted Parks Canada's Avalanche Terrain Exposure Scale (ATES) as a primary means of teaching students the fundamentals of avalanche terrain. Since that time, its use in the ITP program has evolved to the point where it is even used on the Level 2 program. We used a modified curriculum for the DND Level 1–SAR program, and the ATES system serves as a core component of the terrain aspects of the course—both classroom and field-based.

Students are given the tools to evaluate terrain (both at a micro slope scale and a macro trip scale) to come up with possible terrain ratings. More importantly, the ATES system—along with other tools introduced during the week-long course—is used for route finding. While the 12 DND students we had this year came from strong alpine mountaineering backgrounds, with technical ice and rock climbing experience, the Level 1 – SAR tools provided them with valuable knowledge and skills to navigate in avalanche-prone terrain in winter. Numerous students commented on the value of the ATES in helping them decide where to go, given a particular piece of terrain, because the technical model's matrix helped them to identify hazards and chose "simpler" terrain when given the option.

The Future of DND Training

With good relationships now in place with the Air Force's SAR Tech program and other departments of DND, it is certain that the CAA will offer these programs annually and upon request to students in the Canadian Forces. We will continue to work on the curriculum to ensure that it is applicable to the winter mountain environments these personnel will experience, and work hard to give them the tools and knowledge to safely travel through terrain.

I hope to engage DND this spring on a more in-depth review of the curriculum and our objectives for this specific student body. I anticipate that we will run at least one and possibly two Level 1 – SAR programs for DND in 08-09, and I think this program will continue to grow into the future, to 2010 and well beyond.

>>Ian Tomm is the Operations Manager of the CAA

IN ORDER TO WIN ONE OF THESE...

Marmot
Pounder Plus
Sleeping Bag

Eider
Volano
Jacket

AND OTHER GREAT BOOTY!

YOU HAVE TO SEND US ONE OF THESE.

Didn't you say you had some great photos? Well then why not enter? Check out avalanche.ca for more info.

caa/cac fifth annual photo competition

categories

Members at Work: People working in the avalanche patch.

Avalanches: The white dragon itself!

People's Choice: Best overall image selected by the membership at the AGM. All entries will be submitted automatically.

prizes

There will be awards (first place, second place and special mention) in each of the four categories listed above.

1st Place: Marmot Sawtooth Sleeping Bag
total prize value $250

2nd Place: Eider Volano Jacket
total prize value $130

Special Mention: Great Booty TBA

rules

Entries: Contest is open to all members of the CAA and the CAC.

Entry Deadline: Entries must be received by April 29, 2008.

How to Enter: Each person may submit up to a maximum of three (3) images. Only one entry form is required per submission (available online at avalanche.ca). You must be able to supply a signed release from any person(s) appearing in the photograph, but do not send with submission.

Specifications for Accepted Formats: 35mm slides (transparencies), unmounted prints up to 8 x 10 inches and high resolution digital (300dpi or 1200x900 pixels minimum). No digitally altered images will be accepted. Images must be JPEG, TIFF or RAW format only; all other formats will not be accepted. Digital images may be received on CD, DVD and e-mail.

Publishing Agreement: CAA/CAC reserves the right to reproduce and or publish (in print and on the CAA/CAC website) in various not-for-profit uses supporting educational and public awareness efforts. Photographer will be credited with caption on any images used.

Return of Images: If you want your images returned, you must include a self-addressed stamped envelope with sufficient Canadian postage (stamps only). We can not return submissions that are accompanied by US or other international postage.

Responsibility: CAA/CAC will take due care in handling all entries. However, CAA/CAC is not responsible for any loss or damage to entries, regardless of the cause, or for any delays in receipt of entries.

Judges: Images will be judged in terms of their appropriateness to the category theme, creativity and technical quality. Decisions of the judges are final.

Blurring the Line

Avalanche Professionalism in Japan

By John Buffery

Throughout Japan, intricate engineering works very well in keeping public out of harm's way when it comes to exposure through avalanche terrain. Snow sheds for tens of kilometres, tunnels through buttresses, elevated road viaducts, efficient train systems and snow-retaining structures are all very commonplace in the rural areas of snowy Japan. It is an amazing place to venture with avalanche eyes.

However, over this past decade a younger magazine-reading public has broken out of these safety net compounds to discover a taste for the forbidden white flour, and Japanese recreationists are taking their education seriously. It used to be that I would know nearly everyone starting to hike up from the top of the ski lifts. About three years ago I began to notice an exponential increase in users, all carrying the essential safety equipment and armed with a positive attitude, soldiering into the mountains and touring with their snow shoes.

The Japanese Avalanche Network's (JAN) Level 1 avalanche course is the daughter of the CAA Level 1and has graduated well over 100 students into the Japanese outback. Many of these students have joined JAN in support and are part of a strong community, using JAN's website and exchanging observations of what they are discovering in their mountain travels. This shift in attitude and growth in education has been so remarkable that I would say Japanese recreationists are more educated in avalanche phenomenon than the men and women who work in avalanche terrain, such as the professional ski patrollers in the cordoned periphery of ski areas.

There are conflicts between these two parties when the educated recreationists bend the parameters of terrain guidelines and are confronted by the pro patrol. I've listening to some spectacular scolding for travelling in dangerous avalanche terrain.*Most ski areas don't have a proactive avalanche forecaster, but do have occasional incidents. Even the self-educated pro patroller has minimal influence with avalanche control measures during an avalanche cycle.

After this past work stint in Japan this winter, I was touring around the southern prefecture, winding up at Cortina ski area. During an avalanche cycle in early February, a colleague of mine employed as a pro patroller found herself perplexed in the opening and closing of in-bounds ski runs. Three size 2 skier accidentals had occurred within one hour after the runs were opened. She is the only educated avalanche professional on the patrol. The patrol does not have a position for an avalanche forecaster.

During that same cycle at an adjacent ski area, an avalanche incident resulted in two deaths. A team from JAN was on-site and offered their snow stability evaluations skills in assistance to the rescue team. The pro patrol turned the team away.

On a completely different island to the north, a new complexity exists. Four years ago a ski area in Niseko was purchased by an Australian company. The result—a plethora of Australian recreationists moving into town with no understanding of the intricate Japanese culture of obedience to your elders. Signage and run closures were arenas for many a feud between the new Gijans and the Japanese establishment. These ski areas eventually started staffing the common exit points from the top of the lifts during storms to keep keen kangaroo-crazed carvers from cutting closures and killing themselves.

Japanese ski areas are at a cross-roads in the issue of mitigating avalanches and controlling recreationists in and on the perimeter of their ski areas. Up until now, all of JAN's courses have taken place on the south island along the Japanese Alps. Currently, there are plans to evolve JAN's footprint to the north island of volcanoes, offering courses in hopes of spreading the good word of the avalanche phenomenon. As well, Chris Stethem has been consulting to the north island resort of Higashima this past season, trying to establish new procedures for opening avalanche terrain.

The Japanese way takes much diplomacy, time and consideration to advance into new terrain, where established colloquial ways have long been practiced by local guides and pro patrollers. Much painstaking work has gone into increasing the profile of JAN and expanding avalanche professionalism. Last year the Association of Canadian Mountain Guides sent an official letter to the Professional Mountains Guide Association of Japan supporting JAN as the primary source of avalanche education for their guides.

JAN has also taken it upon itself, using its own nickel (or yen), to visit areas with notable incidents for the purpose of cataloging and summarizing the conditions, for anyone to review. JAN is privately run with no external financial support or recognition from government or industry in Japan. The operation of JAN comes solely from the energy and commitment of Asuza Degawa san. He is a great man with a clear vision of a safer mountain environment for Japan, and is doing this work undaunted by the many obstacles in his path. We don't know how he does it, but he does it well.

Preaching the good word of avalanche safety will take some time in Japan, probably more time than it has in Canada. We influence student by student. In time, each may show their newfound ways to another student. When one doesn't speak a language, one listens louder. I am learning to let go of my ways in an attempt to understand this ancient society's approach to communication and harmonious living. A couple of years ago I found this inspirational writing on a washroom wall in a Japanese Shinto Temple.

"Time flies like the wind. Fruit flies like bananas." Exactly.

You can tell John Buffery has carried a pack on his back professionally for the past 29 years. Professional ski patrol for eight years, tele-guide in the Rockies for eight years, heli-ski guide for four years and snowboard guiding for nine years has left him under 5'6". Buff has been a professional member of the CAA since 1989.

*Witness Larry Stanier's run-in with the Pro Patrol Director after a tour outside the boundaries of the Tsugaike ski area in 2003. "All I could do was just keep bowing," says Larry.

CAA/CAC Annual Spring Conference May 5-9, 2008

Below is a DRAFT schedule for the CAA/CAC AGM and Spring Conference. Please keep checking www.avalanche.ca as some schedule changes are pending.

Monday, May 5th

8:30am - 12:00pm CAA ITP Level I Workshop
12:00pm - 1:00pm InfoEx Advisory Group Lunch Meeting
1:00pm - 3:00pm CAC Bulleting Writers Workshop (invitation only)
1:00pm - 3:00pm CAC Avalanche Roundtable Meeting
1:30pm - 5:00pm CAA ITP Level 2 Workshop
7:00pm - 9:00pm InfoEx Subscribers Meeting
7:00pm - 9:00pm CAC Public Snowmobile Avalanche Safety Programs

Tuesday, May 6th

8:00am - 9:45am SnowInfo PLUS Subscribers Meeting
8:30am - 9:15am CAA Affiliate Meeting
8:30am - 9:15am CAA Associate Meeting and CAC Supporter Director Election
10:00am - 12:00pm CAC Annual General Meeting
1:30pm - 5:00pm CAA Annual General Meeting
5:30pm - 6:30pm CAC Youth Avalanche Education Meeting
6:00pm - 9:00pm Tradeshow and Pro Purchase Seminar

Wednesday, May 7th

8:00am - 9:00am CAA/CAC Sponsor Breakfast
8:30am - 12:00pm CAA CPD
1:30pm - 5:00pm CAA CPD continued
6:00pm - Member Social, Summit Awards, Photo Contest and Silent Auction

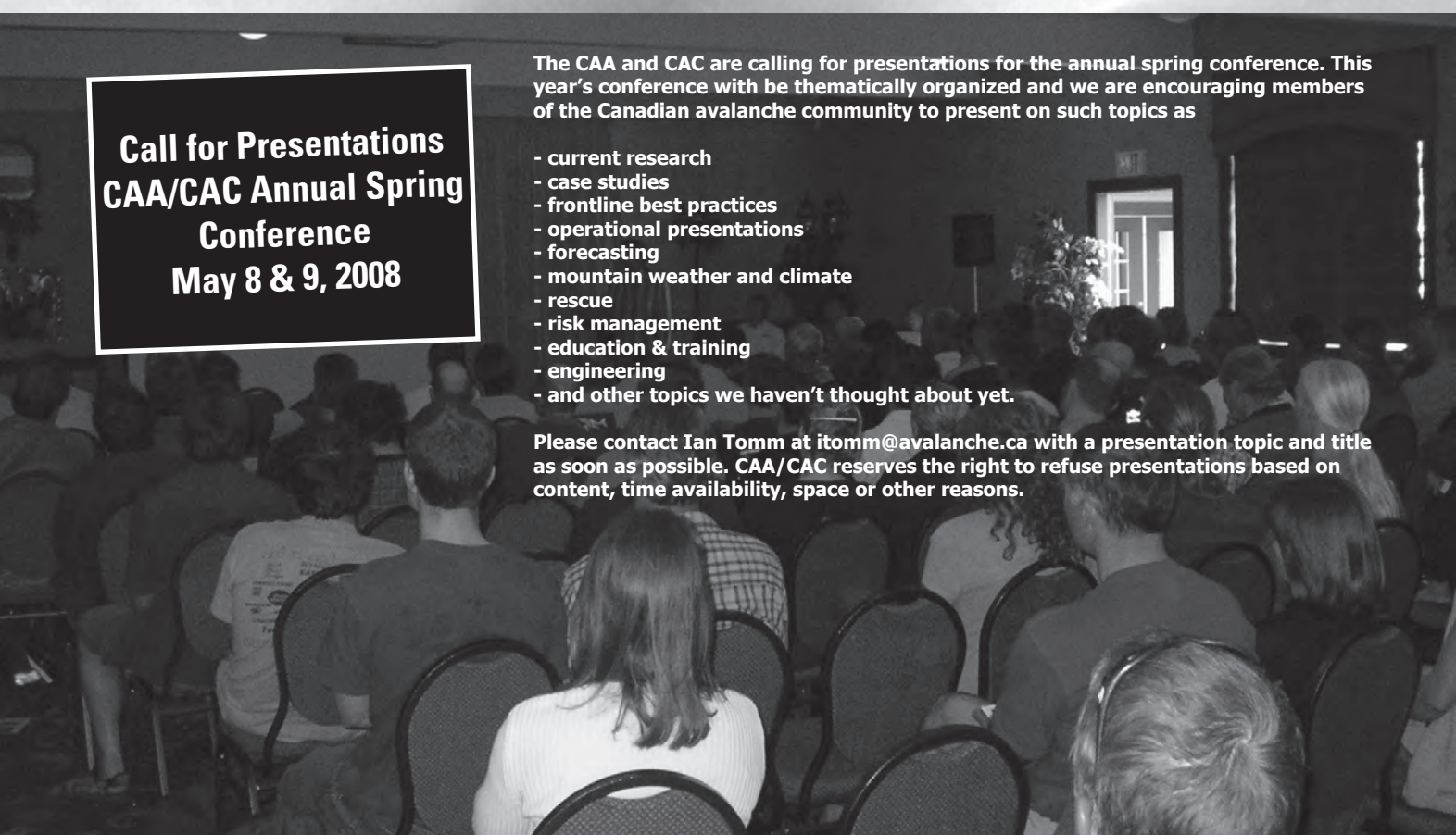
Thursday, May 8th

8:00am - 10:00am CAA Weather Meeting
9:00am - 12:00pm CAA/CAC Spring Conference (public invited)
12:00pm - 1:00pm Canadian Avalanche Foundation AGM
12:00pm - 1:00pm CIL Orion Avalauncher Meeting
1:30pm - 5:00pm CAA/CAC Spring Conference continued (public invited)
6:00pm - 9:00pm Board of Directors Meeting
7:00pm - 9:00pm ISSW Planning Meeting
7:00pm - 9:30pm CAC AST Meeting and Curriculum Review

Friday, May 9th

8:30am - 12:00pm CAA/CAC Spring Conference (public invited)
1:30pm - 5:00pm CAA/CAC Spring Conference continued (public invited)

May 7th CPD: $60 for Members; $120 non-members
May 8-9th Spring Conference: CAA/CAC Members: Free; non-members $40 for 2 days or $25.00 for one day



Call for Presentations CAA/CAC Annual Spring Conference May 8 & 9, 2008

The CAA and CAC are calling for presentations for the annual spring conference. This year's conference with be thematically organized and we are encouraging members of the Canadian avalanche community to present on such topics as

- current research
- case studies
- frontline best practices
- operational presentations
- forecasting
- mountain weather and climate
- rescue
- risk management
- education & training
- engineering
- and other topics we haven't thought about yet.

Please contact Ian Tomm at itomm@avalanche.ca with a presentation topic and title as soon as possible. CAA/CAC reserves the right to refuse presentations based on content, time availability, space or other reasons.

Avalanche Awareness Days Community Events

Shames Mountain, Terrace BC

Reported by Duncan Stewart
Mt. Remo Backcountry Society

Once again the Mt. Remo Backcountry Society hosted the CAC's Avalanche Awareness Day up at Shames mountain ski area. We set up as per norm at the top of the Tee. Thanks a heap to all of the local avalanche professionals, (Rod Gee, Shelly Jackson, Shane Spencer and Rich Forget) who volunteered their time and expertise at our information booth. Shelly ran her CARDA dog, Kelsey at the bottom of the chair and made a successful live recovery! Thanks to all of the MRBS'ers who lent a hand over the course of the day, and a big thanks to the CAA, Azad Adventures, Ruins Board Shop and All Season's Sports for donating some great prizes. The biggest thanks to everyone who took some time and stopped by the info Hole-O-Dome.


Brent Strand

Panorama, Invermere BC

Reported by Greg Longtin
Panorama Pro Patrol

We held our Avalanche Awareness Days events up at the summit, close to the entrance of Tayton Bowl and next to our avalanche safety bulletin board. As skiers and boarders walked through, they had the chance to learn about the importance and relevancy of the safety bulletin board, how to use a beacon, shovel, probe in a companion rescue and a demonstration of our unique Panorama snow pack in our walk-through profile pit. On Saturday, we had Solo demonstrate his CARDA skills in a mock recovery scenario. On Sunday night we held a power point presentation on avalanche safety in the Great Hall room followed by a good old-fashioned Q&A period to top off the weekend.

All in all, I feel we were able to talk to around 150 people. The people we did have contact with were truly interested in learning more, and I think the impact of the weekend will have a lasting effect on those who participated. Thank you for all the hard work you do.

Castle Mountain, Pincher Ck. AB

Reported by Tom Ross
Castle Mountain Safety

I would say that our Avalanche Awareness Days were a success. We were quite impressed with some of the times on our beacon search contest—several came in with times of two minutes or less for a two beacon search. The best attended event was an explosive control demo on a smallish slope that produced a good size 2 result. We did a running narrative of procedures and practices, planning, expense etc. that goes into a control mission, and it was an eye-opener for those in attendance. The dog demo was great, especially for the younger crowd, and the package you sent was greatly appreciated. We did get good local news coverage to help spread the word as well.

Quartz Creek, Golden BC

Reported by Aaron Bernasconi
Golden Snowmobile Rentals

Once again we put on a low key event at Quartz Creek snowmobile area. For the past two years we just try and help voice the importance of avalanche awareness and the tools available to the general public. As an event organizer and a business owner we try and push the www.avalanche.ca website as much as possible, just to get people in the habit of checking it, and using more tools then simply word of mouth.

Our event at Quartz Creek is a BBQ which works great as a focal point for people learning the capabilities of their own equipment. We also make sure they are wearing equipment and we use your prizes, along with local sponsor prizes, to help outfit people with gear or at the least help educate them on what they should be wearing. Our event is really casual with, at this point in time, no official presentations or in-depth demonstrations. We do show people grid patterns and instruct them on how to use witness feedback to help determine the starting points for searches. However, what we stress mostly is simply having gear and wearing it at all times when entering the backcountry.


Brent Strand

Red Mountain, Rossland BC

Reported by Harry Allard
Rossland Mountain Adventures

Our Avalanche Awareness Days was full of attraction and events. We had the Search and Rescue Trailer/ Rescue Command Centre at the base of Red Mountain Ski Hill with all the gear on display all morning, and great snacks and juices were provided by Subway Subs in Rossland. There were ongoing snow profile/test demos with local gurus and ski patrollers Andre and Allie, and Guy and Crazy Dave showed the crowd a few snow tricks.

We finished the day with our crazy race! Teams run up the


Brent Strand

hill, solo shovel/bum race back down, transceiver search and final toboggan rescue slide back to the finish line.

Solid Rossland fun was had by all, with lots of knowledge sharing and education—an overall huge success! Thanks to the CAC for their continued support in our community, especially during a challenging year in the Kootenay Boundary region.

Apex Mountain Resort, Penticton BC

Reported by Sonia Schloegl
Apex Pro Patrol

We had a great weekend for the Avalanche Awareness Days and thank you for the items that you sent to us. We promoted avalanche awareness for the entire weekend. During the day we had demos, information sessions, videos and beacon searches at the top of the mountain. This was based out of the Billy Goat Hut (formerly our high altitude snack shack) and worked really well. Aside from our own patrol, we had CAA Professional members Finbar O'Sullivan and Steve Portman join us.


Brent Strand

Search and Rescue had a presence and this year the CSPS took a very active part. Tim Horton's supplied coffee and hot chocolate and the A&W gave us hot dogs and buns. With these goodies at the top we were able to lure people into our venue and involve them where they might have just skied by otherwise. We also gave prizes for the fastest beacon search each day.

Après ski we had a silent and live auction in the Gunbarrel Saloon. They are very generous in letting us use the space to promote this event every year. Apex Mountain Resort donates various packages and local businesses help us out a lot. As a result of those donations and participation, we were very successful in our fundraiser. The monies we raise go to CAC, Search and Rescue, and the rest we use for our own program. This year we will be buying new headlamps and more probes for our rescue packs. The money has also been used to send two members of our team for their Avalanche Operations 1 course. We thank the CAA and CAC for holding this event and although it is a lot of work for us, it is also a lot of fun and every year more and more of our local people are involved and become more aware.

Revelstoke Mountain Resort, Revelstoke BC

Reported by Danyelle Magnan
Park Warden, Mount Revelstoke and Glacier National Parks

Parks Canada was well represented at Avalanche Awareness Days at RMR. The event was a huge success, and will hopefully only get better in upcoming years! Our Communications Officer Doreen McGillis was set up in the day lodge and was busy all day letting people know what events were being held and providing the public with all sorts of information on safe travel in avalanche terrain. Verena Blasy organized an avalanche poster contest for students in 5, 6 and 7. The posters were displayed in the day lodge and a winner from each grade was chosen at the end of the day by a panel of tough judges (Verena Blasy, Alice Weber, Ken Gibson and me). Winners received super cool hats!

At the top of the gondola Alice, Verena and I set up a single burial for coaching first-time beacon users as well as a beacon challenge where we also did a great deal of coaching. Approximately 100 people came through the multiple burial scenario, with 32 entries in the challenge. The winning times were 1:31 best overall (Julie Beauce of Revelstoke), an equally impressive 2:32 in the beginners category (Doug Martin, Revelstoke) and an astounding 2:33 in the kids category by Revy's Cole Smith! I was able to award prizes to the top three kids' times, giving the top two each a shovel, third place a small profile kit and all three a copy of Freeriding in Avalanche Terrain.

The Friends of Mt. Revelstoke and Glacier National Parks donated copies of Glacier Country and Murray Toft's map of Rogers Pass was awarded to the other winning times. Jim Bay demonstrated the use of the Recco while Ken Gibson and Vivian Mitchell spoke with people about terrain awareness, the use of the Avaluator, interpreting the avalanche bulletin and skiing in the trees, while enticing people with the hot chocolate and cookies organized by Doreen.

Zuzana Driediger and her CARDA dog in training Hero charmed the crowds. Alice also spoke with the local paper and gave a pack contents demonstration. RMR staff did a great job of demonstrating a profile at the bottom of the quad. They were able to set up in a thinner snowpack where the Dec 5th crust was visible and compression tests clearly demonstrated a collapse at ground in depth hoar (I hadn't seen depth hoar in a while!) and a few shears above the crust. At the top of the quad, Troy Leahey and Brent Strand harassed skiers into sharing what they were carrying in their packs as well as surveying them about their out-of-bounds skiing


Brent Strand

habits.

Evening events were held at the Regent, where RMR snow safety team members Troy Leahey and Joe Lammers spoke about the ski hill, their program and ski area boundaries. CAC forecaster Greg Johnson spoke about touring in general and continually thinking while we do so. Gregg Hill inspired people with a few slideshows of traverses he has done, and a very driven auctioneer (Brent Strand) raised money for the CAA. There was so much going on I most likely forgot something but it was a great event. Thanks to everyone who put their time and energy into making it such a success!

Mt Baldy, Oliver/Osoyoos BC

Reported by Matt Koenig
Patrol and Risk Manager, Mount Baldy Ski Corporation

Although we were unable to host a full AST course, our Avalanche Awareness Day was a definite success. We hosted a pit just off the top of the lift and had a beacon search plot nearby; we rotated our pro patrol through the stations which helped with their knowledge as well. Due to the recent avalanches there were a lot of new skiers stopping in to see what we were talking about. I would like to thank all the sponsors for providing prizes and everyone else who contributes to making this event happen

Banff Centre, Banff AB

Reported by Deb Smythe\
Mgr, Banff Mtn Film Festival

The 10th annual Avalanche Awareness Night at The Banff Centre was another huge success. Well over 300 people packed the Max Bell Auditorium, listing to speakers, watching films from the Banff Mountain Film Festival, and visiting booths in the trade show featuring the latest in safety equipment. There were door prizes galore, and several lucky recipients won AST 1 courses courtesy of the event sponsors. Yamnuska Mountain Adventures provided one comp course. We (Banff Mountain Film Festival) purchased one from them with the money we received from the Banff Community Foundation Grant, and a third was provided from one of the local ski areas. Glad we could participate again this year. Keep in touch!

Jasper National Park, Jasper AB

Reported by Garth Lemke
Park Warden, Jasper National Park

The winter of 07/08 was a huge success for Jasper's avalanche awareness program sponsored by Marmot Basin, Parks Canada, and Canadian Avalanche Association. The program started with the avalanche awareness kiosk at the annual Jasper ski-swap in November. Many young people were keen to learn more with numerous requests for Avalanche Skills Training courses as well as just starting the "buzz" for the season. On January 4, a well attended "Avalanche Professionals'" guest speaker night took place at the museum. Bruce Jamieson, being the guest speaker, left many of the local avalanche professionals' grey matter well massaged.

On January 26, Marmot Basin (Tim Ricci) hosted Avalanche Awareness Days at the ski hill. During the day, people took part in avalanche beacon, avalanche search dog, and explosive demos. Marmot Basin had also installed a beacon basin for public use that has been very well received.

Phil Hein

And finally, the "Avalanche Guest Speaker Night" took place at the D'ed Dog Bar on February 21. The keynote speaker was Will Gadd, extreme extraordinaire. The night was filled with free food, door prizes, an outdoor recreation video and photo competition, and a presentation from Will. The bar filled to capacity of 180 people and many were turned away from the door at 6:30 pm. Thank-you to all the sponsors for helping to make these events happen: Marmot Basin, Parks Canada, Canadian Avalanche Association, Astoria Hotel, Arc'teryx, Dynafit, Crescent Spur Heliskiing, Caribou Cat skiing, CP, Marmot, Backcountry Access, Kelley's Sports International and to any others I may have missed.

Fernie Alpine Ski Resort, Fernie, BC

Reported by Jeni Sugiyama
Events Coordinator, Fernie Alpine Ski Resort

The event catered to all ages and knowledge levels, as the focus was on education and safety training. Various programming activities targeted certain demographics, such as the live auction in the Griz Bar (for ages 19 plus). We had many children and ski school students as young as eight participate in the transceiver search demos, indicating a desire to learn about backcountry safety at a young age.

There was a snow pit demo running at the top of the Bear Chair during the day on Saturday, for skiers to stop by and learn about as they unloaded off the chair. Having demo running from 10am to 2pm instead of just at one specific time meant more people could participate as they didn't need to stick to a schedule.

The CARDA dogs drew in the largest crowds of the day! We got a couple of smaller children to volunteer from the audience to be buried in a snow cave and the dogs did a search and found them. They also demonstrated their obedience training as another member of our pro patrol provided the commentary!

The old Avalauncher in the Basin area was a great visual and helped to draw in curious people all day long. The t-shirt launching was a huge hit! Patrol members were extremely helpful and vital at ensuring everything ran as it should. The staff was keen to share their knowledge with guests, some who had never even held a transceiver before. Thanks to the CAC, Canadian Pacific, Columbia Brewery, Marmot, BCA, the Guides Hut, Straightline Ski and Bike, and Oasis Spa.

Avalanche Awareness Days National Event

By Jennifer George

This year our Avalanche Awareness Days National Event was held at Sunshine Village Ski & Snowboard Resort on 11-13, 2008. Sunshine Village with its long and proud history of avalanche safety was an enthusiastic host for this year's event. This weekend was coincidentally the finish of a two-week flurry of avalanche activity which resulted in numerous fatalities. This year's events focused on understanding terrain—"when the snowpack is the problem, terrain is the solution."

For our media day and press conference we included three speakers who told their personal stories of very close calls in the backcountry.

Aaron Beardmore: Aaron is an internationally-certified mountain guide and a Mountain Safety Program Specialist for Banff National Park. While his training and experience put him in a different league than most of us, the story of his close call underlines the powerful effect that human factors can have on anyone's decision making process.

Kevin Seel: Kevin is an avid backcountry recreationist with many years of ski touring experience. In early January of 2006, he and his wife Amanda were doing some exploring in Banff Park. Kevin's story of their near-miss offered interesting insight into how mistakes happen.

Rick Tams: Rick is a snowmobiler with more than 40 years of experience in the backcountry. In April, 2007, he was completely buried in an avalanche near Radium, BC. The story of how he survived was both moving and educational.

This combination of the first person real-life stories and excellent on-hill demonstrations served to underline our important safety messaging and make this our most successful Avalanche Awareness Days event. We had exceptional attendance from local and national media outlets including the Discovery Channel. We were excited at the overall media interest in this year's event, particularly the snow science demonstrations with Dr. Bruce Jamieson. It was clearly our best media day ever. We have followed up with several media outlets to invite them to learn more about snow science that was demonstrated.

Others speaking at the press conference included: Sunshine Village CEO and President, Ralph Scurfield; Sunshine Village Vice President and General Manager, Ken Derpak; CAC Executive Director Clair Israelson; and Avisualanche President, Pascal Haegeli. Pascal is the manager of a federally-funded project to create better decision-making tools for backcountry users. One focus of that project is to better understand what motivates skiers and boarders to venture outside ski area boundaries. Pascal and his team conducted surveys of out-of-bounders at Sunshine over the weekend to include in their research.

Immediately following the press conference, the media fixed their cameras and microphones on Rick Tams, Aaron Beardmore and Kevin Seel for one-on-one interviews. Representatives from Sunshine Village, Kananaskis Country, Parks Canada, University of Calgary, and other community partners also made themselves available for media interviews.

John Kelly

More than 20 media outlets kept Drs Dave Gauthier and Bruce Jamieson in this pit for over an hour, demonstrating the propagation saw test for the cameras.

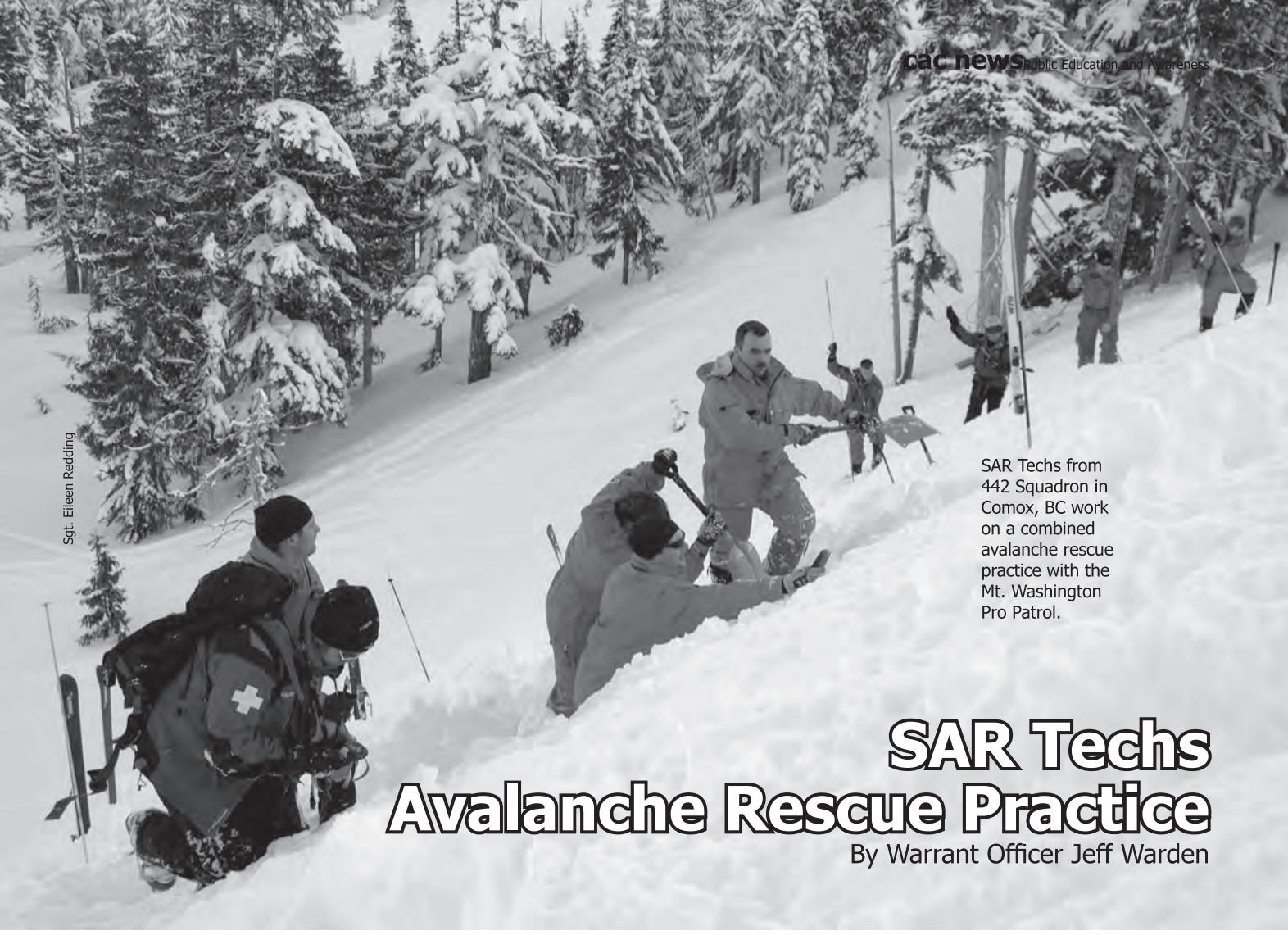
Later that morning, Sunshine's Ski Patrol headed by Tom Riley and Jeremy Cox showcased their team's experience and professionalism during the on-hill events such as the explosives demonstration, and simulated dog rescue. A camera person from Edmonton Breakfast TV volunteered to be buried and found by newly certified CARDA dog Chinook and his handler Sean Rothwell.

After the lunch, many media outlets stayed late in the afternoon to see Bruce Jamieson and Dave Gauthier's demonstrations of the Saw Propagation Test. Bruce and Dave spent well over an hour at the top of the WaWa chair demonstrating this test individually for each media camera. This was clearly the most interest we have seen from media on snow science topics.

In the evening we followed up with our Silent Auction Fundraiser Party at the Elk & Oarsman in downtown Banff. Thanks in part to the Kokanee donation by Columbia Brewery and the fine food, we raised approximately $2,500 for CAC public avalanche safety products and services.

The public events on Saturday and Sunday were well attended by enthusiastic skiers and boarders. Sunshine's ski patrol manned the busy snow pit and BCA Beacon Basin demonstrations. A shoulder to shoulder crowd watched the CARDA mock rescue performed by Atar and his handler Mike Henderson from Parks Canada.

>>Jennifer George takes care of Marketing and Special Events for the CAC



Sgt. Eileen Redding

SAR Techs from 442 Squadron in Comox, BC work on a combined avalanche rescue practice with the Mt. Washington Pro Patrol.

SAR Techs Avalanche Rescue Practice

By Warrant Officer Jeff Warden

On January 12, 2008, with boots buckled, skis secured to their waist and probes securely packed, Search and Rescue Technicians (SAR Techs) from 442 Squadron in Comox, BC boarded their deHavilland Buffalo en-route to a rendezvous with the Mt. Washington Pro Patrol. As January 13-14 were designated Avalanche Awareness Days throughout the province, and with a little help from the weather gods, SAR Techs felt this would be an ideal day to showcase their backcountry avalanche rescue capabilities.

Working in conjunction with the head of Mt. Washington's Pro Patrol Jesse Percival, the exercise was conducted in real time in an out-of-bounds area adjacent to the ski hill. The location was chosen so members of the media and the public could view the activities.

Once the eight orange parachute canopies opened up above the avalanche exercise scene, a "Code Alpha" (avalanche) was called out over the patrol radios. Within a span of two minutes, two pro patrol members showed up on scene, seconds before the SAR Techs landed above the site.

On-scene command was given to Patroller Curtis Belsham. He met the SAR Techs once they shed their chutes, assembled probes and checked their beacons. The first SAR Techs were dispatched to conduct a hasty beacon search. Another two proceeded, probes in hand, to an article of clothing that, shortly after, turned out to be the first victim.

As the remainder of the SAR Tech's assembled with gear, a lined probe search was assembled and, with the aid of beacons, the second victim was discovered. At the same time, the third victim was located within a 1.5 metre radius area. However, due to the depth of burial (2.4 metres) the discovery time took a little longer. The buried victims were manikins, so the realism of extracting them from the snow and transporting them to the awaiting Cormorant helicopter proved to be a great learning curve.

The Mt. Washington patrollers were also treated to a Cormorant familiarity flight at the completion of the exercise. With a few minor hiccups to be rectified for the next time, all in all the joint exercise was a great success, and much was learned by both parties. In an ongoing effort to showcase the backcountry avalanche response capabilities of military SAR Techs, the media provided great coverage to the local community and, in the process, heightened the awareness of all avalanche rescue responders.

>> Jeff Warden is 442 Squadron's Deputy SAR Tech Leader

A Map of Avalanche Incidents in Western Canada

By Peter Marshall

The winter of 2007/2008 has been a very active and high-profile avalanche season throughout North America. The wild winter weather has left its mark on the snowpack throughout most of BC and Alberta. As a result, there are many avalanche incidents being reported to the Canadian Avalanche Centre (CAC). At the time of writing (February 28) the avalanche death toll has reached 14 in Western Canada. These tragic events receive widespread media attention but it may be the unreported near-miss incidents that tell the full story of the season we are having.

Using Avalanche Incident Reports from the CAC discussion forums as a primary source of information, I have created a map of incidents using Google Earth. This map includes avalanche fatalities in Canada, near-misses and notable natural avalanches, and nearest neighbor fatalities from across the border. The incidents are broken down further into whether or not the avalanche failed on a persistent weak layer (PWL). As you will see, PWLs are known or suspected to be the cause behind 11 of 14 avalanche fatalities to date. Please refer to Persistent Weak Layers and the Winter of 2007/2008, by Karl Klassen, for a detailed discussion of PWLs.

Incident Summary

As mentioned, there have been 14 avalanche fatalities in western Canada to date. In addition, 43 notable incidents or natural avalanches have been reported to the CAC with on-line avalanche incident reporting. Incidents have been mapped on Google Earth with a place mark at the approximate location of the incident. Incidents are mapped using coordinates from the incident report or the general geographic area. The place mark is an estimate and is not intended to show the exact slope where the avalanche occurred. Each place mark gives a brief description of the incident and provides a link to the incident report on the CAC discussion forum (where available). The break down of avalanche incidents is as follows:

- 11 of 14 avalanche fatalities failing on a persistent weak layer
  - o 5 fatal avalanches suspected to have failed on the Dec. 5 facet-on-crust weakness
  - o 5 fatal avalanches suspected to have failed on basal weaknesses from October or November
  - o 1 fatal avalanche failing on a surface hoar layer buried in early December
- 38 of 43 avalanche incidents failing on persistent weak layers, including surface hoar, facets, or depth hoar.
- 85% of all reported avalanches during the 2007/2008 winter season have failed on persistent weak layers.

This map is intended to give a visual representation of areas where avalanche incidents have been more frequent and highlight areas where snowpack weaknesses are more prevalent. However, there are several limitations to this. First, the map may simply highlight areas of high traffic. Second, the information is often based on second- or third- hand reports. There may be discrepancies in the avalanche information provided, primarily the failure plane. Also, there is no requirement for expertise in evaluating incidents. Finally, there are certainly many incidents that go unreported. The gaps in information may be relatively consistent or there may be certain areas where incidents occur but reports are not submitted.

Despite the limitations, the snapshot of avalanche incidents posted on a map view of western Canada gives a fascinating overview of the avalanche season and certainly provides food for thought. I look forward to the discussions that will certainly take place about how we can use visualization like this to inform and educate on one hand, and to assist forecasters to focus in on hotspots on the other. In general, I believe this map is valuable as a broad overview of the avalanche season in western Canada. This is a work in progress that will evolve throughout the year. Your feedback would be greatly appreciated.

The map is available on the CAC website by clicking on "regional discussion boards" under the Discussion tab. Google Earth is required in order to view the map. A free download is available at google.earth.com

>> Peter Marshall is an Avalanche Technician at the Canadian Avalanche Centre

Reflections on Avalanche Incidents

Winter 2007-2008

By Colin D. Johnston

For many years commercial backcountry operators have participated in a daily information exchange on snow stability and avalanche activity administered by the Canadian Avalanche Association (CAA). Now, thanks to the initiative of the forecasters at the Canadian Avalanche Centre (CAC) who set up website discussion forums chronicling reported incidents by region on www.avalanche.ca , there is an information exchange mechanism for recreational backcountry users. Its success of course depends on getting avalanche incident data from those involved, and undoubtedly not all incidents are reported because some people may be reluctant to publicly acknowledge a bad decision or simply don't know how or to whom to report.

Nevertheless this winter has yielded reports for about 70 incidents, and thanks must go to the many individuals who responded to the CAC forecasters or who, on their own initiative, supplied the information needed to complete the incident reports. This substantial data set representing much of the winter can be analyzed in the hope of discerning certain common factors or trends from which lessons may be learned. To meet publication deadlines, this article includes incidents reported up to March 8, 2008.

What Happened

Recreational avalanche incidents started early in winter 2007-08 on or soon after Nov.11. To date they comprise about 67 groups totaling well over 200 individuals of whom 87 are reported as involved. The incident reports are sometimes unclear about numbers of people in the group and occasionally about the numbers actually involved in the avalanche event either as triggers, victims, or both.

Region	# Incidents	# in Group	# Involved	# Injured	# Deceased
Northwest BC	5	21	4	1	0
South Coast	7	14	7	1	1
N. Columbia	11	57	23	3	4
S. Columbia	7	19+	10	3	1
Koot. Boundary	8	23+	11+	2	2
South Rockies	11	40+	11	1	1
Central Rockies	18	42+	21	3	5
TOTALS	67	216+	87	14	14

Why These Incidents Happened

At the May 2007 CAA annual meeting, CAC forecaster Ilya Storm reported that the 2006-07 winter offered unusually stable conditions. Early and frequent storms gave good bond between each storm deposit and there was an absence of persistent weak layers (PWL's), at least until early February. What a contrast to this winter!

Winter 2007-08 started with widespread PWL's at or near ground as described in detail by CAC forecaster Karl Klassen in a very informative paper dated Jan. 30 and available on www.avalanche.ca. Ideally, early-season snow falls on unfrozen ground and bonds to it. The weight of successive and frequent heavy snowfalls deposited on top promotes further bonding.

This winter, rain was a major detrimental influence with several rain-on-snow events to 2000m or more in most of the mountain terrain in BC and Alberta. Klassen identifies three such events by date (Oct. 31, Nov.24 and Dec.5) and their regional extent, all of which have resulted in a form of PWL called "facets on crust." Basically, the rain-soaked snow freezes into a crust. Subsequent snow falling at cold temperatures converts to crystals lacking cohesion called facets which have an effect akin to ball bearings.

Klassen's paper states that these PWL's are known or strongly suspected as the cause of nine of the 11 fatalities reported up to Jan.16. Unfortunately, these PWL's persist for weeks and even months and, as they get buried more deeply, create the potential for ever larger avalanches. While they may appear dormant for a time during the mid-winter cold, they have the potential to reawaken as spring temperatures and solar heating penetrate deeper into the snowpack. Klassen's paper notes that a Feb. 18 fatality incident in north Kootenay National Park on a south-facing slope, which released a slab with an average thickness of 2 metres, likely involved failure on the Oct.31 or Nov. 24 layers formed at least 12 weeks previously.

Adding to the early-season "facets on crust" PWL's are two more PWL's of a different type dated Jan. 26 and Feb.25. Klassen describes them in detail in a Feb. 27 update to his paper also on the website. Suffice to say that they involve surface hoar, which is hoar frost that forms on surfaces during clear cold windless nights, facets, and in some locations crusts formed by solar or wind effects on which the facets or surface hoar are deposited. This has resulted in a complex, geographically variable snowpack that is very difficult for the recreational user to assess.

What Can Be Learned

To date, 85% of the incidents and 11 of the 14 fatalities reported to the CAC are known or suspected to involve PWL's. So, one of the main causes is clear, but remedies that may help the recreational user stay safe need to be discussed. Klassen quotes some of his mentors who in essence say that **when the uncontrollable factor, snowpack stability, becomes too complex and difficult to assess reliably in a slope-specific sense, the recreational user must make choices related to the controllable factor, terrain selection.**

This winter CAC bulletins have repeatedly urged staying on "simple," "gentle" or "low angle" terrain. Analysis of 60 incidents with slope angle reported (U means unknown) confirms that slope angle is a major influential factor.

Trigger	Events	Slope-U	Slope <30	Slope 30-34	Slope 35-39	Slope 40+
Natural	2					2
Skier/rider	45	2	2	5	20	16
Snowmobile	13	5		2	2	4
TOTALS	60	7	2	7	22	22

For slopes less than 30 degrees, the two of 60 or 3.3% in the above data is quite consistent with the 4% reported in The Avalanche Handbook (McClung & Schaerer, 1993, The Mountaineers, Seattle WA) for fracture line measurements at 200 slab avalanches. Likewise, for slopes of 35 degrees or more, the 44 of 60 or 73% in this season's data is uncannily close to the 75% for the 200 data set. **Clearly, choosing slopes less than 30 degrees and avoiding exposure to steeper slopes above greatly decreases the risk of avalanche involvement.** Fortunately, slope angle is the easiest of the terrain factors to measure accurately. The cost of a pocket compass with inclinometer is less than one fifth that of a transceiver, so purchasing one and learning to use it in terrain selection, if you have not already done so, may help manage your risk of avalanche involvement.

Several other less easily quantifiable but nevertheless selectable terrain factors can be chosen or avoided to reduce risk. Slope convexity is mentioned in 10 of the 45 skier-triggered events above. Slope aspect can be a dominant factor due the effects of strong wind or sun. For example, strong solar effect on a south aspect likely triggered the Feb. 18 fatality incident in north Kootenay National Park. Website photos of several of this winter's reported incidents confirm the experience of professionals that fractures often start from thin snowpack areas directly beneath or sometimes well above the human trigger, for example near ridgelines, rock outcrops or boulder fields as in the Jan. 6 fatality incident on Mt. St. Piran in Banff National Park.

From the backcountry recreational user's perspective, slope angle, convex features, unfavorable aspects and thin snowpack areas are all selectable terrain factors that can be chosen or avoided to reduce risk. For a more informative and detailed discussion of how to manage risk in the context of this winter's PWL's, Karl Klassen's paper at www.avalanche.ca is strongly recommended. In it he observes that, "This season's snowpack is currently a complex risk management problem and will likely remain so for some time to come." In his opinion, "The most important factor in managing risk in the current circumstances is understanding and utilizing terrain effectively."

>>Colin Johnston is Professor Emeritus in Civil Engineering at the University of Calgary, and the former supervisor of the Applied Avalanche and Snow Research program.

New Bulletin Format

By Ilya Storm

The Canadian Avalanche Centre rolled out a new format for their Public Avalanche Forecasts in early February. Although the goal is to make incremental changes to the bulletins' look and content while maintaining continuity with the past, significant changes were accomplished. And, more improvements are still to come.

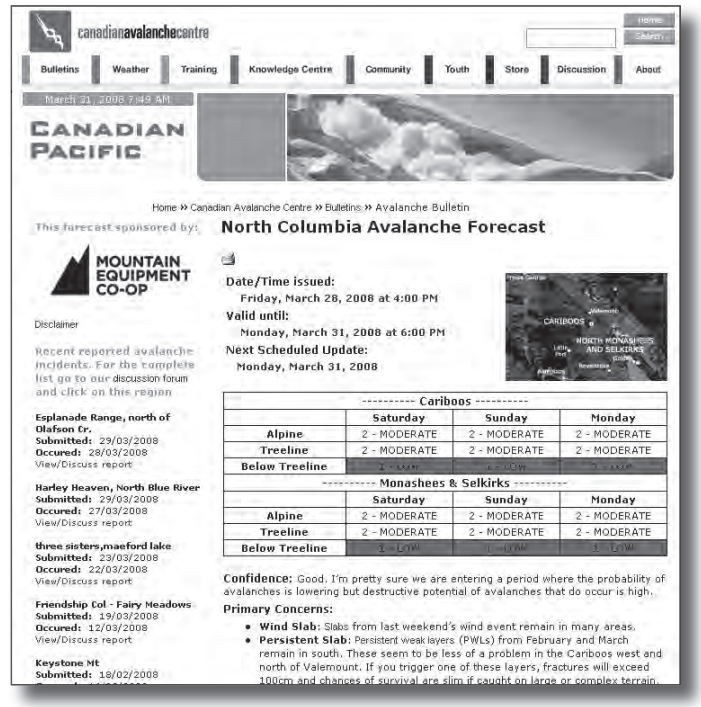
The catalysts for redesigning the public forecasts include a desire to maximize support for Avaluator Users (see avalanche.ca Vol 81 Summer. 2007, p. 28 – 33), taking to heart the insights from Dr. Jamieson's Amateur Snowpack Observations and Bulletin Verification research (Avalanche News, Vol 74, Fall, 2005). We were also pondering the opportunities and challenges associated with new communication technologies, and reflecting on the ideas and initiatives of other public avalanche bulletin programs within our Canadian community and internationally.

Changes implemented in this first phase include:

- Dividing the large regions with their diverse set of conditions into smaller, more homogeneous, sub-regions. This allows us to issue canger ratings at a sub-regional scale.
- Providing a "statement of confidence" where the forecaster can identify their level of uncertainty and comment on why. Examples could include issues around data (quality, quantity, bias), weather forecast (challenging weather patterns, localized variation in precipitation, timing issues, differences and divergence in numerical model solutions, etc.), spatial variability, and difficulties in forecasting what a likely scenario means to an existing snowpack structure.
- A section for "primary concerns" where a maximum of three bullet points provide a snapshot view or summary with the "take home" message.
- A clickable map to help users, especially visitors, locate themselves in the regions.
- Although invisible to the user, the entire bulletin system is built on a new and greatly improved infrastructure. The new architecture and robust database structures will help us in the quest for high reliability.

The re-structured forecast allows for a variety of future developments. Most prominent, and next to be implemented, are planned changes to the avalanche activity and weather sections. We are beta-testing a process for automatically extracting and summarizing avalanche and field weather observations from the CAIS, which includes InfoEx data.

This is the first time the CAIS will be automatically queried with the avalanche and weather information automatically inserted into a webpage. This creates an opportunity to provide both "hard data" for advanced users and, by including forecaster comments, orientation for less sophisticated users, assisting them with data interpretation. Additionally, we hope that by working with the Meteorological Service of Canada it becomes possible to automate the weather forecast section of our avalanche information products. The combination of automation and forecaster interpretation could allow production of daily sub-regional danger rating, primary concerns, avalanche activity, and weather sections.



Future Goals

We clearly see this as the first phase of a larger initiative that includes several threads for future development. Four of the themes we're working on are:

1. Incorporating graphics and visualization tools to improve understanding and help people remember the information in a forecast.
2. Embracing new technologies like text messaging and podcasting to distribute avalanche safety information. One possible implication of new delivery formats is that the traditional "one size fits all" bulletin won't work. Hmmm, this raises all kinds of interesting questions about who is the target audience, what is the most important information, what gets discarded, and how can we harness good graphics to convey a thousand words.
3. Seeking communications expertise to ensure new products incorporate best practices and improve the odds that we achieve our goals of effective safety messaging. We need to know that people understand our messages, remember them long enough to take with them into the field, and are able to use them to improve their choices and decisions while out enjoying the mountains.
4. Grow consistency among the different agencies that issue public avalanche bulletins. This is not to say every agency's products need to be identical or look the same. But a common approach to the general structure and content of public avalanche forecasts serves everyone—especially visitors who travel far and wide roaming through the mountains of Canada, the USA, and Europe.

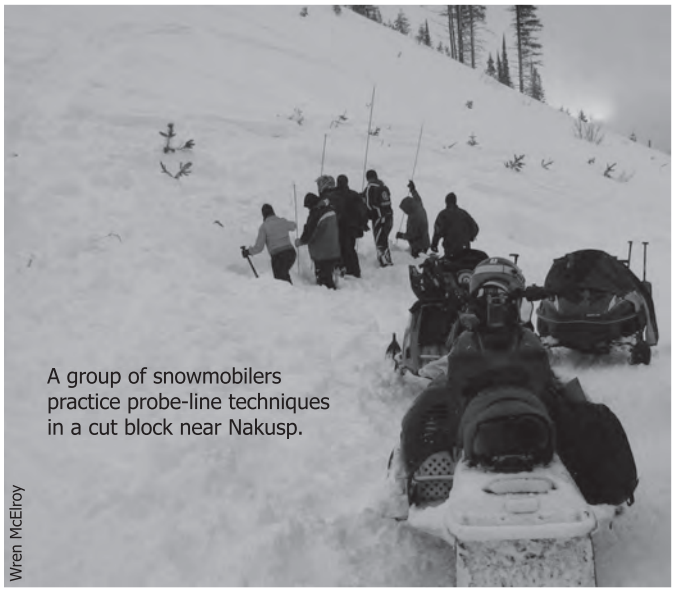
Your comments and suggestions are welcome. Please let us know what you think of the new format, and the directions we're moving in. You can email me at istorm@avalanche.ca or call the CAC Forecasting Office at 250-837-2141 x230.

>>Ilya Storm is a Public Avalanche Forecaster at the CAC

Gaining Insight

Bringing avalanche awareness to a Kootenay snowmobile club offers lessons for the teacher as well as the students

By Wren McElroy



A group of snowmobilers practice probe-line techniques in a cut block near Nakusp.

Wren McElroy

Scott Graham had a knowing smile on his face. After trying to get an avalanche course going in Nakusp for two years, the Arrow Lake Ridge Riders were finally learning about avalanche.ca, practicing with transceivers, digging snow profiles and participating in a rescue scenario. Scott had waited a long time for this moment.

In early December 2007, I went to Nakusp to give a presentation to the public about avalanche awareness. Scott was the only member of the Arrow Lake Ridge Riders to come to the talk. When I asked him where the rest of the sledding community was, Scott replied, "they all think they're experts."

That attitude changed in early January when one of the area's talented younger riders was caught in a large slide while high-marking on a steep slope. As the avalanche slowed, he hit a tree and was popped up to the surface of the debris. He ended up only partially buried and was able to dig himself out, despite a badly bruised arm that he thought was broken.

The rest of the group had moved on to ride another area and didn't see the slide. When a member of the group came back to get him, he found his $15,000 Turbo sled mangled and wrapped around a tree, but the rider lucky to be alive. A trip to the hospital and x-rays later revealed that he had broken his neck. Kris Scott was a member of that party and a friend of the victim. He immediately went out and bought a transceiver, probe and shovel.

That particular accident, along with many others this winter, caught the attention of other riders in the area. The Nakusp Search and Rescue group found some funds to put six members of the Arrow Lakes Ridge Riders through and AST Level 1. This group has also raised enough funds to purchase a brand new 4-stroke Bearcat and a rescue toboggan that sits on a trailer, ready to assist in search and rescue efforts if needed. Chris Faint of Selkirk College has to be commended for helping subsidize the course as well. There was even more interest, but some of the members including the young man who had broken his neck—were away working when the course ran.

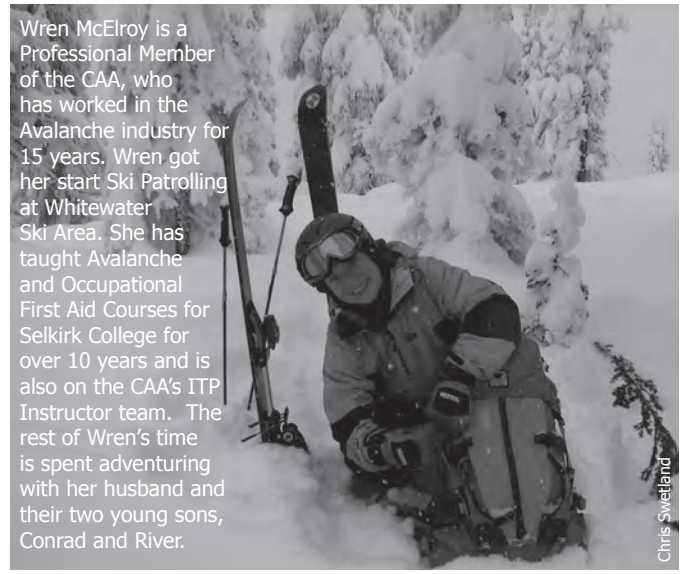
On February 8, I drove to Nakusp with the potential for the biggest cycle of the winter looming. Up to 30 cm of new snow was expected, along with high winds and rising freezing levels. The forecast was dancing circles in my head.

The group consisted of a wide range of demographics—ranging from an older couple from Trout Lake, a 14-year-old, and some of the area's very skilled riders.

Saturday morning I woke happy to see snow and not rain in town. We started the day with transceiver practice with snow falling at 3 cm/hour. A 9 km sled ride up the Summit Lake Forest Service road brought us to a low angle cut-block. There we dug a profile and the 080126 SH layer popped out as they shoveled. The compression tests were great as the results were obviously sudden.

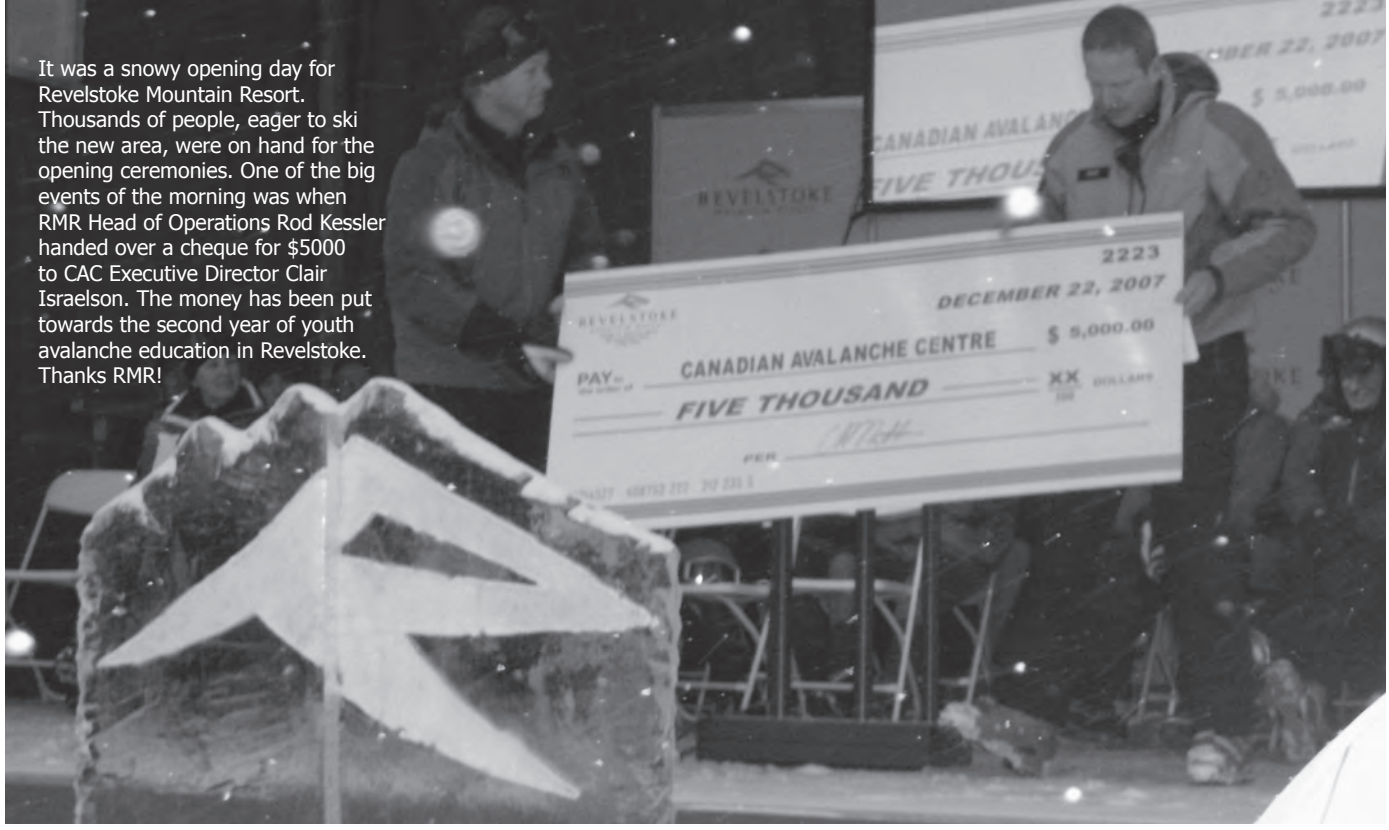
All in all, it was a great weekend. For me, I gained insight into the sledding community. For the group, they gained insight into basic safety precautions and ways to manage their risk. Only one of the seven members of the group knew about the CAC's website and the information available. They were very excited to learn how easy it was to access so much information.

At the end of the weekend I asked Kris Scott, one of the area's amazing riders in the group, if he thought the weekend was beneficial. He replied, "It definitely was. I got a lot out of it. Now I know what to look for, and this spring I will look at the weather, check the bulletins and dig a snow profile before I head up those steep chutes."



Wren McElroy is a Professional Member of the CAA, who has worked in the Avalanche industry for 15 years. Wren got her start Ski Patrolling at Whitewater Ski Area. She has taught Avalanche and Occupational First Aid Courses for Selkirk College for over 10 years and is also on the CAA's ITP Instructor team. The rest of Wren's time is spent adventuring with her husband and their two young sons, Conrad and River.

Chris Swetland



It was a snowy opening day for Revelstoke Mountain Resort. Thousands of people, eager to ski the new area, were on hand for the opening ceremonies. One of the big events of the morning was when RMR Head of Operations Rod Kessler handed over a cheque for $5000 to CAC Executive Director Clair Israelson. The money has been put towards the second year of youth avalanche education in Revelstoke. Thanks RMR!

Resorts of the Canadian Rockies (RCR) has come on board as a Double Black Diamond sponsor of the Canadian Avalanche Foundation. RCR presented a cheque for $12,000 to the CAF at Fernie Alpine Resort on Saturday, January 12, as part of the ski resort's Avalanche Awareness Days event. "We support the efforts of the Canadian Avalanche Foundation as they provide a vital service to those who enjoy the mountains," said Matt Mosteller, Senior Director of Business Development for RCR. "Both organizations are committed to doing all we can so that people enjoy the mountains in an educated and safe manner."

CAF Secretary Treasurer Gordon Ritchie received the cheque on behalf of the CAF. "We are thrilled to have Resorts of the Canadian Rockies join us in promoting avalanche safety," he said. "With this new support the Foundation will be able to increase its focus on youth education, fund more public bulletins and continue to fund avalanche research in Canada." RCR has now joined ranks with Canadian Pacific, Prime West Energy Trust, and Kern Partners as CAF Double Black Diamond sponsors!

Jeni Sugiyama

Resorts of the Canadian Rockies hand over a great big cheque to the CAF during Avalanche Awareness Days at Fernie Alpine Resort. L to R: Steve Ruskay (Fernie Ski Patrol), Gordon Ritchie (Canadian Avalanche Foundation), Matt Mosteller (Resorts of the Canadian Rockies), Robin Siggers (Fernie Alpine Resort)


COLUMBIA BREWERY
Kokanee
GLACIER BEER
Kokanee
GLACIER BEER
BEER • BIÈRE
341 ml 5% alc./vol.
COLUMBIA BREWERY
BC'S
GLACIER
FRESH
TASTE

The Fine Line

A 16mm Avalanche Education Film

By Malcolm Sangster

During a high-speed conversation down the Sunshine ski out with CAF President, Chris Stethem, I learned more about the Canadian Avalanche Foundation and its inception. I was intrigued to find out that the first donation and kick-start to the CAF came from none other than rocker Bryan Adams, back in the summer of '99.

Nearly 10 years later, The Rocky Mountain Sherpas have embarked on a mission fueled by the same generosity that Adams started. The CAF has given us an amazing opportunity. Its current goals have aligned with ours and allowed us to create a youth-oriented DVD package that we're calling The Fine Line: A 16mm Avalanche Education Film.

We are so excited about the nature of this film and how it allows us to stray from the typical ski film format of which we have grown tired. The Fine Line is as facetted as the Canadian Rockies snowpack. We have been fortunate to catch up with leading avalanche professionals, guides, wardens, ski patrol, filmmakers, as well as all the recreationists involved. Skiers, snowboarders, sledders, and ice climbers from all walks of life and from different age groups get to have their part in this film. We don't have to only show the cutting edge of snow riding; the gnarliest lines, the biggest cliffs. We get to tell a story and paint a bigger picture about the mountains and the backcountry. Why we love to go there and why we have to show respect and learn about it.

After months of preparation and organization the production officially kicked off in November of 2007. Time-lapse camera mounts were placed all through out the mountains of Alberta and BC to capture the seasonal metamorphose. Snowmobile accessed action shoots soon ensued with some of the industries finest shredders. On- location avalanche safety training is being captured from the front ranges to the coast including almost every prominent backcountry skiing location in between. Kananaskis, Banff, Golden, Rogers Pass, Revelstoke, Nelson, Blue River, Coquihalla, Duffey Lake, Pemberton, Whistler and Squamish. These mountains, their snowpacks and the scenery change drastically over short distances. Change is constant in the winter and continually reassessing around every corner is a must with backcountry travel as it is with the production of this film.

As interview and shot lists get smaller we are nearing completion of production with the daunting tasks of post ahead of us. After a few spring glacial camping trips and a two-week voyage to Haines, Alaska to put the film in the end zone, we will be climbing through thousands of feet of film and terabytes of digital footage. The edit can be maddening, but ascending the granite cracks outside our edit bay in Squamish, BC should prove to be a healthy respite. To check out a little taste of what's to come go to *www.rockymountainsherpas.com* and view The Fine Line teaser. Thank you everyone for you amazing support.

>>Malcolm Sangster is a producer and co-owner of the Rocky Mountain Sherpas.

CAF Gala in Whistler

By Sharon Audley

The Canadian Avalanche Foundation Whistler Gala moved to the Roundhouse Lodge on Whistler Mountain for 2008. Riding up the gondola while enjoying the February alpenglow set the stage for Andrew Brash's presentation, "Rescue on Everest." A sell-out crowd of 190 enjoyed the presentation and meal, as well as the opportunity to reconnect with mountain friends and make some new acquaintances. A wide range of auction items was donated to this year's fund raiser, including heli ski packages, clothing and gift certificates.

Andrew's show was a captivating presentation as he gave us his personal experience of Tibet, rather than the spin put on it by the western media. We wish him success as he returns to attempt the summit again this May. This event could not have been so successful without the generosity of the residents and businesses in Whistler. See you next year!

>>Sharon Audley helped organize the CAF's gala in Whistler

CAA Board Member John Hetherington with keynote speaker Andrew Brash.

Holly Adams

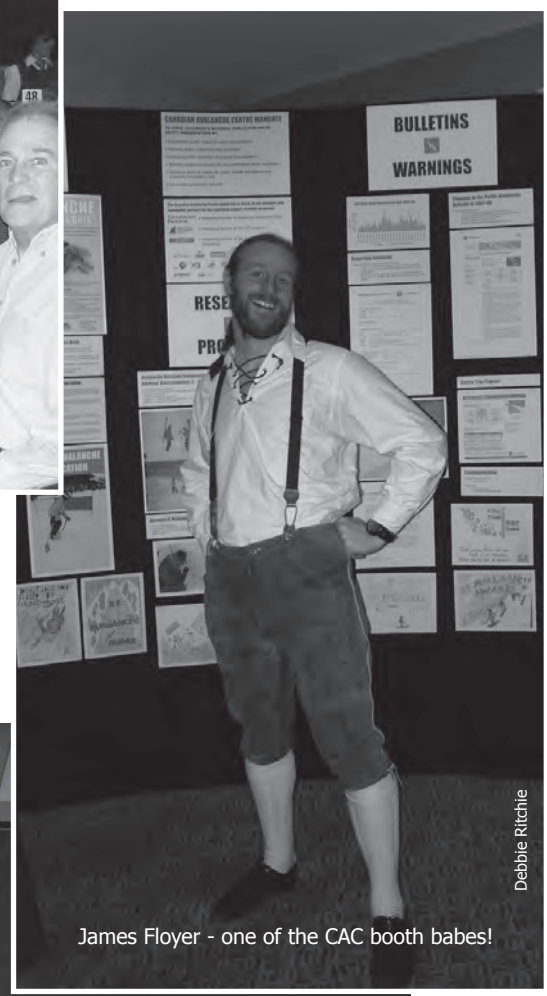
Jamie Malloy, Kelly Schmalz, Justin Trudeau, Paul Boskovich, Morgan Hincks

Holly Adams

CAF Gala in Calgary

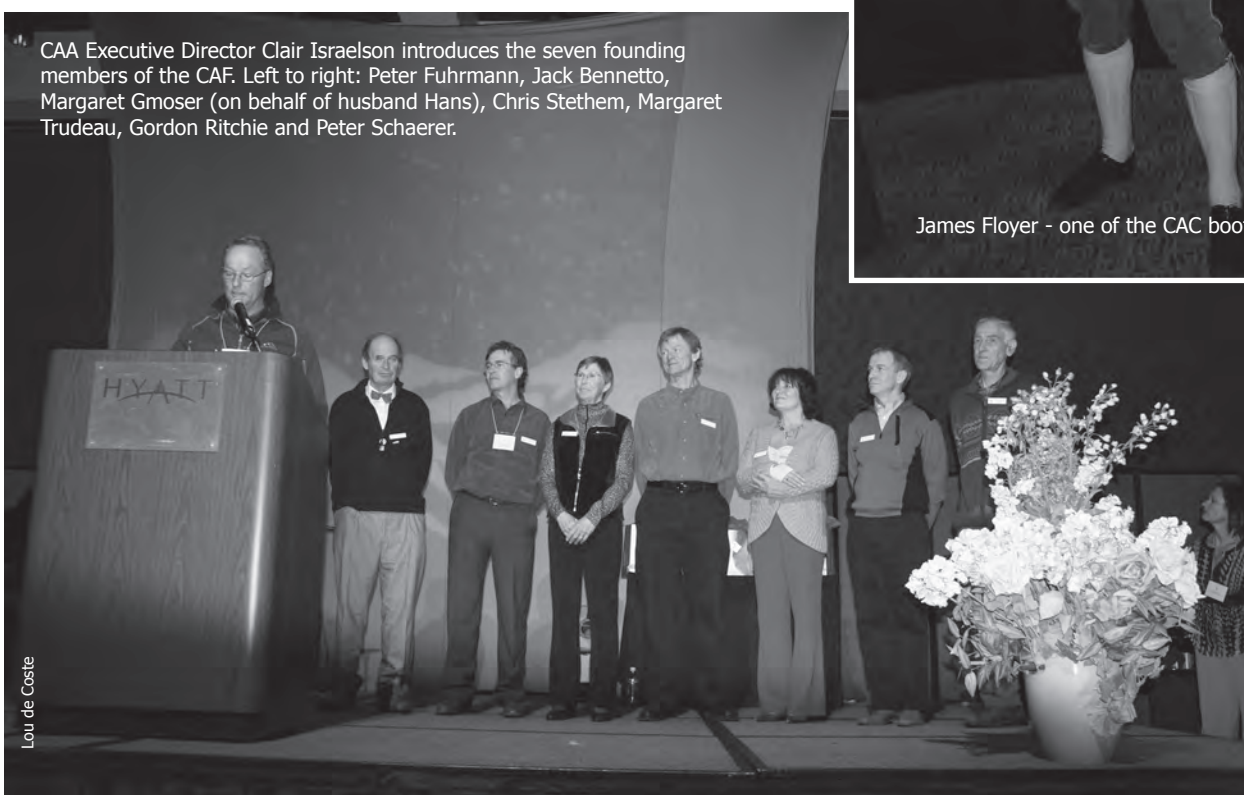
RCR table - $12,000 sponsor; seated left to right: Matt Penner, Laura Penner, Geoff Osler, Kristen Spiers, Dave Isles, Rocket Miller, Dena Miller, ?, and Dave Aitken. Missing from the picture: Dan McLellan and Eleanor Culver.

Debbie Ritchie



James Floyer - one of the CAC booth babes!

Debbie Ritchie



CAA Executive Director Clair Israelson introduces the seven founding members of the CAF. Left to right: Peter Fuhrmann, Jack Bennetto, Margaret Gmoser (on behalf of husband Hans), Chris Stethem, Margaret Trudeau, Gordon Ritchie and Peter Schaerer.

Lou de Coste

Who's Playing in the Backcountry?

Using science to better understand non-professional backcountry recreationists

By Albi Sole

In 1997 the CAA released Canada's first avalanche safety curriculum for non-professionals (the RAC courses) and I left the world of heli-skiing to work for the University of Calgary's Outdoor Centre teaching those courses. In the process I left the world of expert decision making so well described by Laura Adams in previous issues of this journal (*Avalanche News* vols. 74, 75 and 77). Now I had to teach to an audience that had none of the three pillars of expert decision making—detailed knowledge, extensive experience, and a lot of data. Based on that model of decision making, non-professionals should be splattered all over the wilderness like bugs on a windshield, but they weren't. Clearly, while I had much to teach them, they had something to teach me about survival in a very risky environment that, on the surface, they didn't have skills to manage.

> **"Based on that model, non-professionals should be splattered all over the wilderness like bugs on a windshield..."**

A search for answers is difficult since we don't really know very much about these people. Most existing research focuses on specific groups within the larger population, skiers at Rogers Pass for instance, or those people who have ended up in the accident record. This research has given us some important insights, but the nature of such special populations means that not all the findings can be extrapolated to the general population. For instance 26% of people who answered Pascal Haegeli's Rogers Pass survey had CAA certification, while we know that for the average backcountry traveler, the proportion must be much lower.

Last year I took the plunge and enrolled in a master's program at the University of Calgary under the guidance of Dr. Carolyn Emery in the Sports Injury Prevention Group at the Faculty of Kinesiology. One thing I figured out pretty quickly is that this type of research is incredibly hard to do well. However, after a brutal eight months of skills upgrading, we had a survey ready. Now we needed some help to get it administered. A key would be getting as good a cross-section as possible and then I needed some manpower to actually administer the survey.

A survey of my AST students last winter told me that 100% of skiers and climbers, and 90% of boarders shop at the Mountain Equipment Coop. With the help of CAC Operations Manager John Kelly, and the great relationship between the CAC and MEC, the survey was launched this fall in MEC stores in Vancouver and Calgary. Surveying is hard work of the tediously tiresome type, but the staff members at the MEC stores were just incredible for their patience and understanding. CAC Public Avalanche Forecaster Cam Campbell took charge of the survey at the main Vancouver store for me and just before Christmas, we had the surveys in the bag.

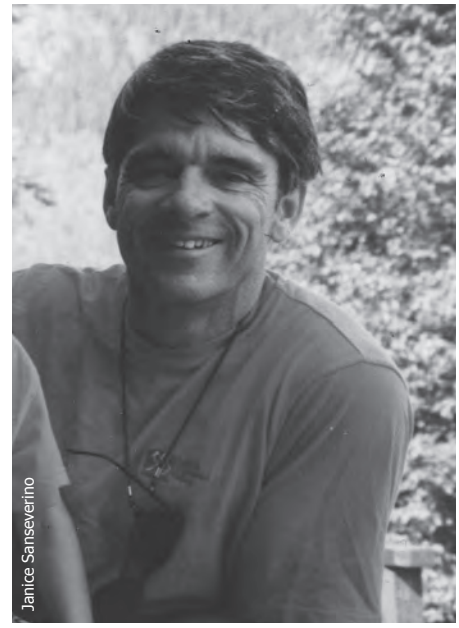
The survey should help us get a better fix on who is out there, what they are doing there, how trained they are, and how likely they are to experience an avalanche incident. Additionally, the survey investigates the degree to which our genetic risk propensity, and our motivations for doing our sport, influences our chance of being involved in an incident. Over the next four to six months I hope to complete the analysis and get some results to you in the fall.

>>Albi Sole is an IFMGA Mountain Guide and an aspiring Master of Science.

In Memoriam

Allan Drury

June 18, 1940 - January 20, 2008


Janice Sanseverino

Few lived life as fully as Allan Drury. Innovator, joker, adventurer, pioneer, businessman, spouse, father, and a great friend to so many, Allan was all of these and more. Born to Herb and Ida Drury in Barrie, Ontario, Allan was a high-school sports star and an excellent student. He studied to become a geologist and worked in the oil and gas industry in Calgary, Alberta. But a life-changing event would lead Allan and his equally adventurous and talented spouse, Brenda (Wedge), into the mountainous wilds of BC's West Kootenay region.

In the late 1960s, Allan was one of the first skiers to venture into the mountains with the iconic Hans Gmoser and his then "upstart" Canadian Mountain Holidays. A life-long skier (with a great love for freestyle or, as it was then known, "hot-dogging"), Allan's heli-skiing experience, coupled with his kamikaze spirit, led him to ask, "Why can't I do this?" As always, he knew he could.

Before long, Brenda and Allan had moved to the tiny logging community of Meadow Creek, two hours north of Nelson, BC, to start Selkirk Wilderness Skiing on Meadow Mountain in the Selkirk range, the first snow cat skiing operation in the world. Since SWS first opened its doors to skiers in 1975, Allan has influenced the lives of many—and not just skiers. His passion for the sport and his take-no-prisoners approach to the slopes (ask any who skied with him…) had even the most reluctant skiers exploring the wild and stunning terrain of the Selkirks.

The same people would come back year after year, in part for the amazing snow and the beautiful terrain, but also to be anywhere close to Allan. He was, quite simply, a magnet. Whether it was flying off a jump on "Chuck Your Lunch" (one of his favourite runs), yodelling through a powder field, or recounting the day's events in the evening at the lodge, Allan's love for life in the mountains was profound and infectious. One of his skiers described him thus: "He was a true gentleman, a man of honesty, courage, and clarity. You probably know the Yiddish word that bestows the highest possible honour to a man. The word is "mensch." Allan was a mensch and I am privileged to have known him."

Another skier describes Allan as "a man who lived his dreams, but more importantly, invited countless others in." Today, Selkirk Wilderness Skiing is known throughout the world as one of the finest commercial backcountry operators in the snow sports industry. Its family atmosphere, genuine commitment to staff, guests, and surrounding community, respect for the environment, and high operational standards, are all reflections of the man Allan Drury was. Whether he was paragliding above Meadow Creek, windsurfing on Kootenay Lake, hitting golf balls on the back nine (his field out back, mostly) or sharing time with his beloved daughters Andrea and Rachel (both accomplished skiers) doing all of the things the family loved, Allan made sure that every moment on this earth counted.

Allan had been experiencing the effects of cancer for two years, but few would have guessed it. He approached those years, and his leaving of this life, with his characteristic clarity of purpose, courage, optimism, and wicked sense of humour. He did not want his death to cause any interruption of the ski operation because, as he said the day before he died, "my spirit will be on Meadow, and I will want some company there."

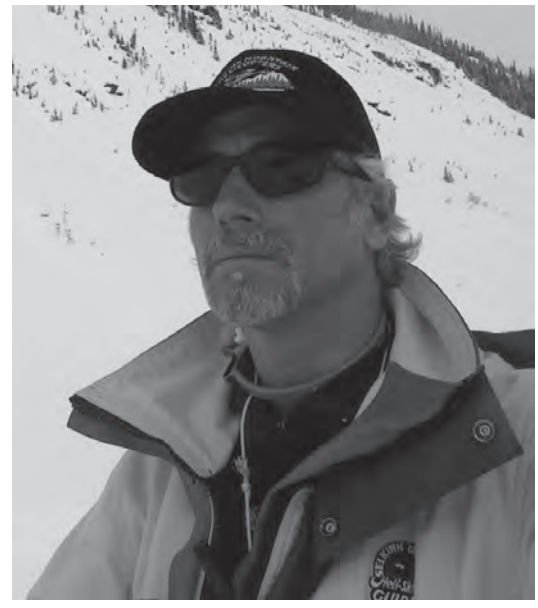
When he left us, he was at home in Meadow Creek with Brenda, Rachel, and Andrea, as well as other family members and friends. In his life beyond, we wish him endless "Rolling Thunders," another Meadow run he loved. Many helped Allan take his final jump from this world, but his family wishes to give special thanks to Dr. Phillip Malpasse, Dr. Martha Wilson, Cheryl Hicks R.N., and Rhonda Addison R.N., for their amazing care and devotion to Allan. Anyone wishing to remember Allan in ways other than doing what he loved may make donations to the Kootenay Lake Hospital Foundation Equipment Fund (www.kootenaylakehospitalfoundation.com).

A public celebration of Allan's life will be held on May 7, 2008 at the 10th Street Campus of Selkirk College in Nelson, BC. For more information, email info@selkirkwilderness.com.

In Memoriam

David West

April 12, 1960 - January 10, 2008



Excerpted from the eulogy by Rob Stenstrom

In Dave West we have lost a truly great person—friend, spouse, father, son, and brother. Dave meant something special to each and every one of us. For me, it has been a 42-year journey. Dave and I met in Grade 2 in Montreal. He and I and two other friends became the Beaconsfield junior mafia, and were inseparable.

When we were 17, Dave moved to Calgary and there was a real sense of loss for all of us. However, we saw each other frequently over the ensuing years, and had more good times than I can remember. When he worked down in the British Virgin Islands as crew on a sailboat, we visited several times. Same when he lived in Puerto Rico. When Dave moved back to Canada, despite our jobs and family, we went to great lengths to see each other regularly and I remember talking with him about that not too long ago. We agreed that, at the end of the day, it doesn't matter how much money you make, how much stuff you accumulate, or how hard you work. It's really about the important things like friends and family that matter. And this philosophy mandated that we make the effort to get together as often as we could, and I am very thankful for that.

So here we are—Dave's life cut short at age 47 years. Far too soon, far too young. But in those 47 years Dave packed more life and life experience than any person I know. I mean, he really lived. He traveled the world, survived an avalanche, and was a caring and doting son. He had a beautiful family in Patty and Naia. He built up a successful company from scratch. When we measure someone based on their life experience rather than number of years on this planet, Dave wins. Being the ultimate alpha male, he would really appreciate that. But seriously, Dave showed us that life is truly not about the destination but, rather, about the journey.

A few days ago, soon after hearing the news about Dave, my eight-year-old son came into my room and asked why I was crying. I explained to him that one of my very best friends on the planet had died. "Is that like my best friend at school dying?" he asked. My reply was, "Well, yeah I guess, but I have had this friend for 42 years." His rejoinder really made me think when he said, "You are really lucky to have had such a good friend for such a long time."

>>Rob Stenstrom is an emergency physician at St Paul's Hospital in Vancouver and the Director of Research for the Department of Emergency Medicine

Donation to the CAA's Art Twomey Library

The Association of Canadian Mountain Guides (ACMG) has generously donated a collection of avalanche reference materials originally belonging to the late Hans Gmoser. Among his many accomplishments, Hans was a founding member of the ACMG and a founding director of the Canadian Avalanche Foundation. His dedication to safe travel in the mountains leaves a lasting legacy. Thank you Hans, and thank you to the ACMG.

Avalanche Professionals' CPD in Québec

Text by Dominic Boucher, director of the Haute-Gaspésie Avalanche Centre
English translation by Philippe Gautier, forecaster at the Haute-Gaspésie Avalanche Centre

The third edition of the Quebec professional CPD was held Dec 1-2, 2007, in the Gaspésie Provincial Park. It was organized by the Haute Gaspésie Avalanche Center (HGAC) and made possible by the financial support of Mountain Equipment Coop (MEC) and the Sépaq - Gaspésie Provincial Park.

The main objectives of this early season CPD is to serve as a refresher on standard practices as well as an information sharing platform, focusing on new developments in the avalanche community in Quebec and abroad. It is also a great setting to stimulate inter-industry contacts and promote dynamic exchanges and discussions.

About 15 people were present early Saturday morning to take in the stream of presentations. Some coffee and muffins helped Dominic Boucher warm up the crowd and get a welcome word in as he presented the HGAC's 2007-2008 proposed activities. Jean-Pierre Gagnon stepped up to the plate with a talk on applying ATES ratings to the terrain of the Chic-Chocs. Dominic followed with a brush-up on the Avaluator. Philippe Gautier then brought the morning to a close with an overview of the best practices in search and rescue coming out of the Canadian Avalanche Association's eTraining project.

This year's early winter in the Chic-Chocs allowed the group to head outside for some lunch and mountain travel. Breaking into two teams, we discussed group management, safe travel practices, terrain evaluation, snow stability, search and rescue and, of course, new gear and present and future projects.

After the lunch break we moved on to research. François Truchon from the University of Quebec in Rimouski (UQAR) gave an outline of the different academic projects going on in the Chic-Chocs by both his group and the University of Moncton. Jean-François Dubé of the Sépaq was next with a presentation of the activities and risk management protocols at the Auberge de Montagne des Chic-Chocs. Philippe brought the session to a close with an interactive case study of an avalanche incident that happened on mont Albert last winter. A great discussion followed, fueled by a few beers, chips, Avaluator and ATES scale.

Ten interested professionals were present the second morning for Stephanie Lemieux's presentation of the new AST 1 and 2 course outlines (CISA and CASA in Quebec). She skillfully used the morning to review old material, bring forth new course objectives, present the resources available as well as share teaching aids and techniques. After lunch, the group headed outside for a full-blown search and rescue simulation. This exercise, prepared by Philippe and the local snow removal crew, shed light on the complexity of deep burials and the team work necessary in large-scale scenarios. The beacon basin provided by Backcountry Access also facilitated the practice of certain single and multiple search scenarios.

The weekend ended with a group brainstorm on the future goals of this annual CPD. In general the professionals expressed positive feedback in regard to this session that allows this small community to meet, integrate newcomers, create relations and get up to speed with the development in the avalanche safety realm. Most plan to return next year. We hope to set the stage for further discussions and exchange by finding a location that would host the event for the whole weekend, including meals and lodging. The night of Saturday could possibly be livened by multi-media presentations and the always-productive late night beer-stimulated discussions.

In the name of the Avalanche Center, I would like to thank the supporting partners that made this weekend possible, Mountain Equipment Coop and the Sepaq – Gaspésie Provincial Park as well as all the participants. We'll see you next year!

Dominic Boucher

Multiple deep burial simulation with victim evacuation training.

Formation pré-saison des professionnels en avalanche au Québec

Par Dominic Boucher, directeur du Centre d'avalanche de la Haute-Gaspésie

La troisième édition de la formation pré-saison des professionnels en avalanche au Québec s'est déroulée les 1-2 décembre 2007 au Centre de découverte et de services du parc national de la Gaspésie. Cette activité organisée par le Centre d'avalanche de la Haute-Gaspésie est rendu possible grâce au soutien financier de Mountain Equipment Coop en plus de la participation de la Sépaq – parc national de la Gaspésie.

L'objectif de cette formation en début de saison consiste à créer une opportunité de mise à niveau et de perfectionnement des professionnels et des futurs travailleurs dans le domaine des avalanches de neige au Québec (prévention, intervention, recherche, formation, etc.). Cette fin de semaine constitue également un moment privilégié pour réunir les différents intervenants, créer des liens, échanger des idées et discuter des problèmes et meilleures pratiques.

Une quinzaine de personnes au total étaient présentes dès 8h00 le samedi matin pour assister aux différentes présentations et discussions à l'horaire. Une citerne de café et quelques boîtes de muffins ont permis de réveiller les participants à temps pour le mot de bienvenue par Dominic Boucher et la présentation des activités 2007-08 du Centre d'avalanche. Jean-Pierre Gagnon a ensuite présenté l'application de l'Échelle d'exposition en terrain avalancheux dans les Chic-Chocs suivie par un survol de l'Avaluateur par Dominic Boucher. Philippe Gautier a terminé la séance en classe du matin avec un compte-rendu sur les nouvelles normes canadiennes pour le sauvetage autonome découlant du projet eTraining de l'Association canadienne des avalanches.


The making of a deep burial scenario in the Chic-Chocs.

Phil Gautier

La neige était au rendez-vous cette année ce qui a permis d'inclure à l'horaire une sortie et un diner en montagne au mont Hog's Back. Les participants ont profité de cette randonnée au grand vent pour échanger sur les questions de gestion de groupe, déplacements en montagne, évaluation du terrain, stabilité de la neige, recherche et sauvetage et bien sûr nouveaux équipements et projets de tous et chacun pour l'hiver.

De retour en classe en après-midi, François Truchon de l'Université du Québec à Rimouski (UQAR) a fait le point sur les travaux de recherche en cours dans les Chic-Chocs par son groupe et celui de l'Université de Moncton. Jean-François Dubé de la Sépaq a ensuite présenté les activités hivernales et la gestion de risque à l'Auberge de Montagne Chic-Chocs. Pour terminer la journée en beauté, Philippe Gautier a animé une excellente discussion de groupe à partir d'une étude de cas d'accident survenu l'hiver dernier au mont Albert. Quelques bières et une cargaison de chips ont contribué à conserver l'intérêt des participants jusqu'aux environs de 19h00.

Une dizaine de personnes ont assisté le lendemain à une présentation et une formation par Stéphanie Lemieux sur les nouveaux plans de cours AST 1 et 2 connus sous le nom de CISA et CASA au Québec. Pendant tout l'avant-midi, Stéphanie a passé en revue les ajouts et retraits aux leçons intérieures et extérieures, indiquant le matériel nécessaire et les ressources disponibles et partageant trucs et supports à l'enseignement. Après le diner, une simulation de recherche et sauvetage avec ensevelissement profond et multiple attendait les participants. Cet exercice, préparé par Philippe Gautier en collaboration avec le service de déneigement, a permis de tester et remettre à jour les techniques de recherche avec DVA, de sondage et de pelletage, en plus du travail d'équipe en situation d'urgence. Le centre d'entraînement DVA fourni l'an dernier par Backcountry Access a également facilité la pratique de quelques scénarios de recherche simple et multiple.

La fin de semaine s'est terminée par un retour en classe sur la formation. De façon générale, les participants se disent très satisfaits de cette activité qui permet de se rencontrer, d'intégrer les nouveaux, de créer des liens et de se mettre à jour avec les développements dans l'industrie de la sécurité en avalanche. La plupart comptent bien renouveler l'expérience l'an prochain. On souhaite cependant que la formation se déroule dans un endroit où le groupe serait présent pour toute la fin de semaine incluant les soupers et couchers. La soirée du samedi pourrait par exemple être animée par des présentations sur des voyages en montagne ou des expériences de travail à l'étranger, sans oublier les discussions autour d'une bière jusqu'à tard dans la nuit…

Au nom du Centre d'avalanche, je tiens à reconnaître et remercier les partenaires Mountain Equipment Coop et la Sépaq – parc national de la Gaspésie qui ont rendu possible cette activité. Merci également à tous les participants et à l'an prochain !!!

Snowmass Misfire

By John Brennan

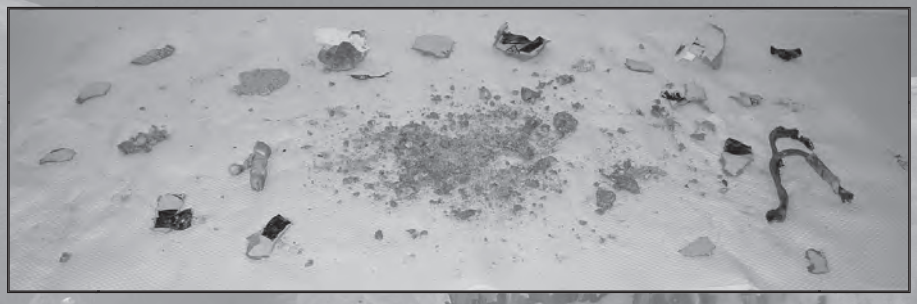
On December 18, 2007 the Snowmass ski area experienced a misfire with an Austin Powder White Cap cast booster. Better understanding of how this explosive is manufactured will lead to knowing how this misfire occurred. Basically, the bulk portion of this pre-cast booster is not sensitive to detonating from a blasting cap. The mixture is a blend of TNT with various other compounds, which likely are PETN, RDX or HMX.

To generalize, a mixture of TNT and RDX forms a common military explosive called Composition B. Some explosive manufacturers use reclaimed military explosives in their products. Because the White Cap's mixture alone cannot be detonated by a blasting cap, a sensitizing component is used. Austin Powder uses a small balloon filled with PETN for the job.

PETN, which can be ignited with blasting caps, is typically the core load in detonating cord. PETN is also used in an approximate 50/50 ratio with TNT to form the cap-sensitive cast explosive called Pentolite. Anyway, the balloon is held in place between the cardboard detonator wells by a rubber band. While it is uncommon for the sensitizer balloon to somehow relocate itself, it is not unheard of.

To discuss explosive topics and concerns, please contact me at: jbrennan@aspensnowmass.com

>>John Brennan is an avalanche and explosives specialist at Snowmass, Colorado



Material retrieved from the misfire site. Notice the PETN balloon in the left center of the photo.

The balloon that contains the sensitizing compound for the bulk of the cast shot was found about 10 metres (30 feet) from the blast crater. Notice the striations left from the rubber band.

The photo of the thawed out cap/fuse assembly clearly shows the end of the blasting caps where they are crimped to the fuses, as well as at least 4 cm (1.5 inches) of the cardboard tube detonator wells. This shows the detonators were properly installed.

Update From the States

By Lynne Wolfe, editor, *The Avalanche Review*

Hello everyone north of the border. The American Avalanche Association (AAA) has been busy over the last year working on a number of projects. The biggest project has been the revision of the ten-year-old AAA guidelines for avalanche courses. The new course guidelines are available to download as pdfs on the AAA website: http://www.americanavalancheassociation.org/education.html.

Recommendations for US Avalanche Education

In 1999, the AAA developed recommended guidelines for Level 1 and Level 2 avalanche education programs. Many course providers have successfully adopted these guidelines, but increasing numbers, diversity and interests of winter backcountry users are placing new demands on avalanche education. Recent trends include:

- Demand for avalanche skills at the introductory level is large and growing rapidly. Low-cost introductory avalanche workshops frequently fill to capacity and there is currently no guidance or standards for their instruction. Many attendees of these programs do not go on to take Level 1s, meaning that these programs may be one of the few chances to reach them with a coherent message about avalanche safety.
- There is currently significant variation in content and outcomes of both Level 1 and Level 2 avalanche programs. Students routinely come to Level 2s with marginal skills and knowledge, resulting in a net decrease in course quality among providers.
- The nature, content and outcomes of Level 3 avalanche programs (for which no formal guidelines exist) have not been consistent among providers. The result has been confusion in students' minds about what these programs are meant to accomplish.

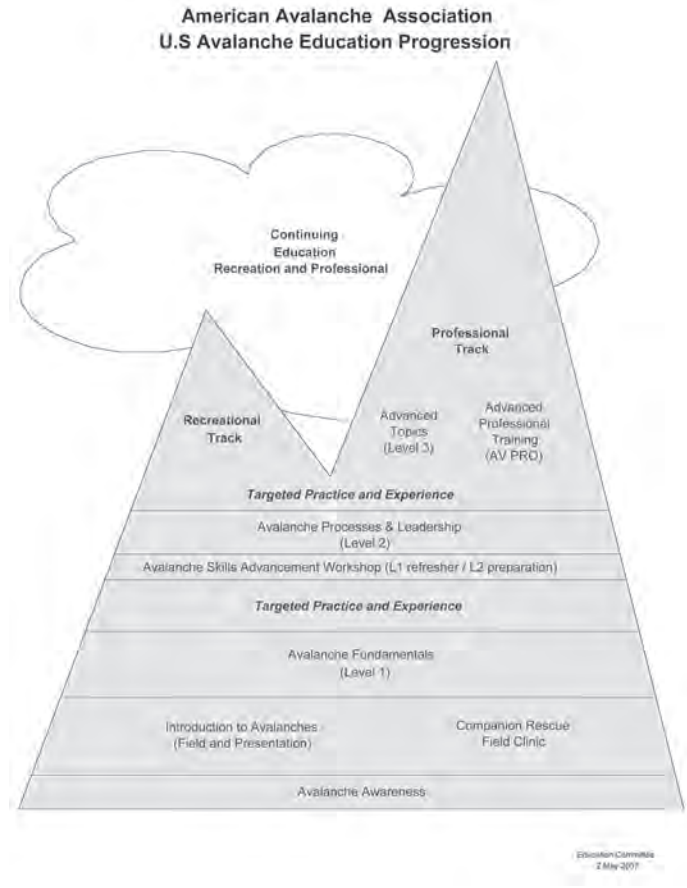
The goal of this effort has been to address these and other current issues in avalanche education in order to provide students with a clear progression of expected outcomes, and to provide instructors and course providers with a consistent yet customizable template for achieving those outcomes.

Process:

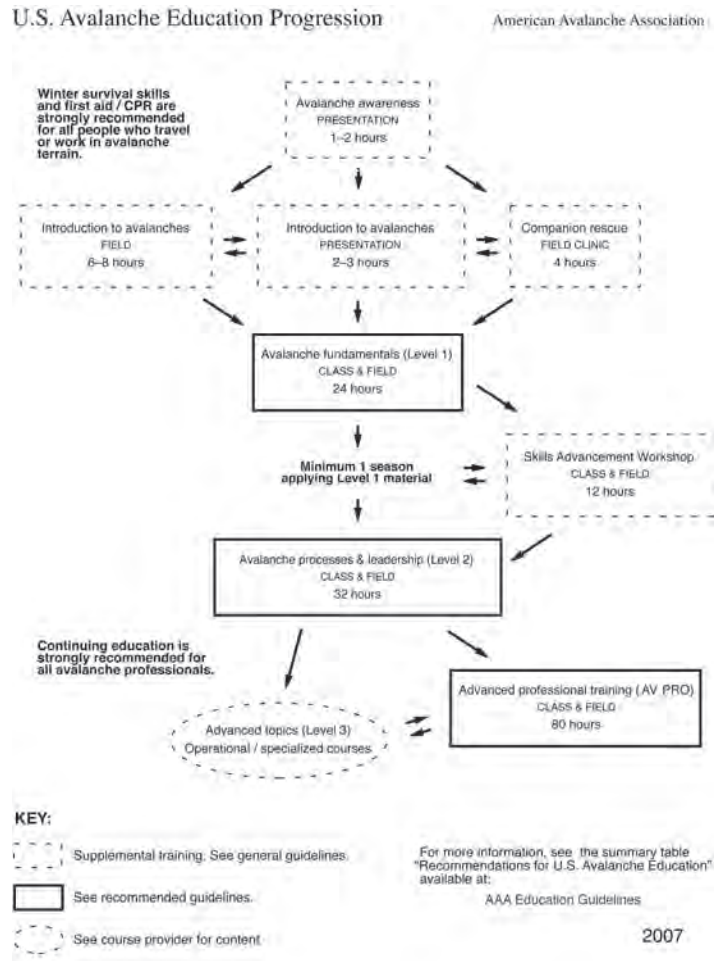
The current Education Committee (composed of 14 professional members involved in diverse educational programs) has been working collaboratively since ISSW 2006 to develop the draft recommendations. Our discussions took us back to some fundamental questions and philosophies. Two key components entered our process: "What does today's student need, not what do we want to teach them." And "What realities does a course provider face in offering programs."

Overview of new recommendations:

- Introduction to Avalanche Concepts provides entry-level avalanche information for backcountry travel in or around avalanche terrain for the general public.
- Companion Rescue Clinics teach avalanche rescue skills and provide practice for the general public.
- Current Level 1 and 2 courses meeting 1999 AAA guidelines should fit Level 1 and 2 programs with little or slight revision.
- There are no pre-requisites for Level 1's.
- Current Level 3 courses will fit into Level 2 Programs (preparation for leadership/guiding) or Advanced Skill Development Workshops (focus topics with varying time lengths and content such as Mountain Meteorology, Applied Avalanche Forecasting, Ski Guiding-snowcat, heli-ski, backcountry, Transportation Operations, Explosives Use, etc.)
- Avalanche Skills Advancement Workshop provides preparation for a 2008 Level 2 Program or a refreshing of 2008 Level 1 skills. This will not be a prerequisite for Level 2's.
- Continuing Education Programs are an important component for professional development or serious recreationists.
- Winter Backcountry Travel/Overnight Skills and First Aid are strongly recommended for any backcountry traveler but are beyond the scope of avalanche specific training.



The new product is a chart that includes: outcomes, content, ratio of classroom/field time, pre-requisites if any, performance measures, recommended instructor qualifications and instructor/student ratios.



Professional Development Seminars:

In response to these new guidelines, the AAA has sponsored two very successful Professional Development Seminars. The first, in Jackson, WY, on October 6, 2008, pursued relevant and timely themes that included Wet Snow—sluffs, slabs, and forecasting; Deep Slabs; Fracture Propagation, and in-depth views of To Swim or Not to Swim: what to do if you are caught. You may have seen articles deriving from these presentations in *The Avalanche Review* or *avalanche.ca* over the course of this winter, and stay tuned for the most recent in research on these topics at ISSW in Whistler.

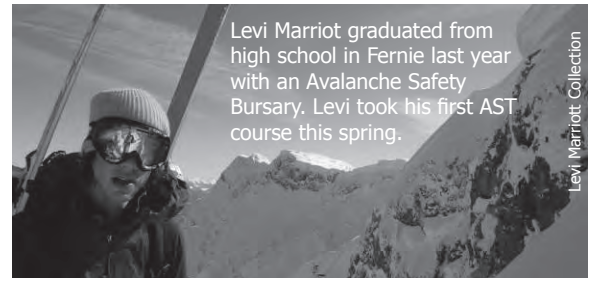
The other seminar, the NSAS (Northwest Snow and Avalanche Seminar), took place in Seattle in November 2007. Components included an international panel discussion on avalanche education, with panelists Ian Tomm of the CAA, Tom Murphy of AIARE, Michael Jackson—event organizer and ASAP executive director, and Sarah Carpenter of the AAA education committee. Other presentations included a view of women in the backcountry, extreme skiing decision-making, and multiple burial updates.

We plan to offer up to three Continuing Education seminars on each off-ISSW year; funds and organizational support are available from the AAA.

Final: It is a great pleasure to further collaboration with our colleagues to the North. I appreciate Mary Clayton's (communications director of the CAA/ CAC) contributions to *The Avalanche Review (TAR).* We encourage snow geeks from both countries to subscribe to both periodicals, and *The Avalanche Review* welcomes your Canadian contributions and perspectives. You can subscribe to TAR online at http://www.americanavalancheassociation.org/pub_subscribe.html. You can contact me at lwolfe.avalanchereview@gmail.com.

Backcountry Bursary

By Gord Ohm


Levi Marriot graduated from high school in Fernie last year with an Avalanche Safety Bursary. Levi took his first AST course this spring.

Levi Marriott Collection

A bursary for backcountry enthusiasts graduating from Fernie Secondary School has been created that offers avalanche training to the successful applicant. The funding for the bursary comes from local ski guides and patrollers, who want to "give something back" and help ensure the youth of our ski town are on the program. In addition, Mountain Pursuits, a Fernie-based guiding company that's part of the Island Lake Resort Group, has donated a space in their Avalanche Skills Training courses for this cause.

The award is available to any graduating student who is dedicated to downhill skiing and has an interest in ski touring and ski mountaineering. The recipient receives an AST course and a certificate upon completion. In addition, the recipient also receives financial assistance toward the Canadian Avalanche Association Level I program.

The bursary was first awarded in June, 2007, and the recipients were Levi Marriott and Garrett Hamilton. Levi completed his AST course this past February. We intend to approach the Snowmobile Association and perhaps expand the parameters of the award for the graduating class of 2008. Work has begun on a basic website, which you can find at www.avalanchesafetybursary.com. The principal and counselors of the high school were very excited to add the award to their list of scholarships and bursaries and made the process very easy. This sort of award for students would work well in many of our western ski towns. If you have any questions, please e-mail me at fiveohms@telus.net.

Schedule of Coming Events

April 13-18, 2008
European Geosciences Union, General Assembly
There will be two sessions on snow avalanches: Snow Cover Processes and Avalanche Formation, and Avalanche Dynamics and Risk Assessment. Deadline for abstract submission is January 14, 2008.
Where: Vienna, Austria
Info: http://meetings.copernicus.org/egu2008/

April 15-17, 2008
Western Snow Conference 2008
The Western Snow Conference provides a forum for individuals and organizations to share scientific, management, and socio-political information on snow and runoff from any viewpoint and to advance the snow and hydrologic sciences.
Where: Hood River, Oregon
Info: www.westernsnowconference.org

April 28-May 1, 2008
Canada West Ski Areas Association Spring Conference
Where: The Grand Okanagan Lakefront Conference Centre, Kelowna BC
Info: Call (250) 542-9021 or e-mail office@cwsaa.org

May 4, 2008
HeliCat Canada Annual General Meeting
Where: The Ramada Inn, Penticton, BC
Info: Call (250) 542-9021 or e-mail info@helicatcanada.com

May 5-9, 2008
CAA & CAC Annual General Meetings
See page xx for conference schedule. See you there!
Where: The Ramada Inn, Penticton, BC
Contact: Call Ian Tomm at (250) 837-2435 or e-mail itomm@avalanche.ca

October 15 – 18, 2008
SARSCENE 2008
This year, SARScene is co-hosted by the Government of Newfoundland & Labrador Department of Justice and the Newfoundland & Labrador Search and Rescue Association.
Where: St. John's, Newfoundland and Labrador
Info: www.nss.gc.ca or call 1-800-727-9414.

October 1 – 3, 2008
Wilderness Risk Manager's Conference
Pre-conference workshops September 29-30, 2008
This annual conference focuses on risk management and practical skills for the wilderness adventure and education industry.
Where: Jackson, Wyoming
Info: www.nols.edu/srmc

Brent Strand

Research and Results

A story of survival in the Cold Feet Basin

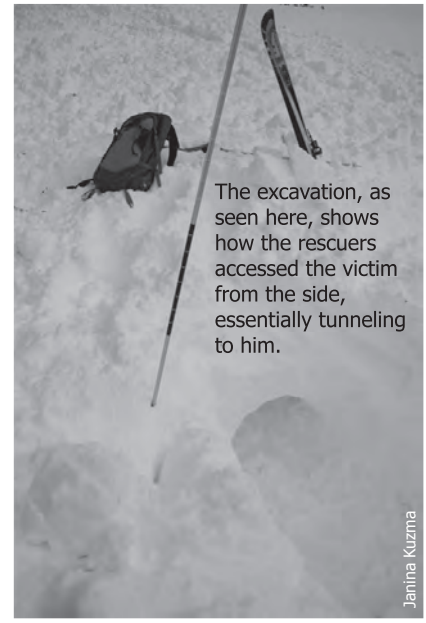
By Gord Ohm

Editor note: *This past January, we received an amazing report of survival from the Fernie area. A young man's life was saved because his companions had just learned the V-shaped Conveyor Method of shovelling. By using this technique, they managed to free the victim from a two-metre burial in a matter of minutes.*

CAA Professional Member and Fernie local Gord Ohm writes a snow-safety column for the monthly magazine, the Fernie Fix. Gord interviewed two of the three people involved and wrote this article: Conveyor method of shovelling (see the original research on this method on the following page).

Todd Weselake and his partners did a great job reporting an involvement in Cold Feet Basin on the back of Mt Proctor January 7. Todd has his CAA Level 1 and his two partners, Janina Kuzma and Ian Bezubiak had recently completed an Avalanche Safety Training Course with Duncan Maisels of Mountain Pursuits. Their understanding of the new "snow conveyor" shovelling technique probably saved Todd's life. That recent training was invaluable. Way to go!

Todd, Ian and Janina were very diligent in the way they approached their day, including doing snow profiles, selecting relatively conservative terrain and travelling as a controlled group. Nonetheless, on a 27˚slope, they triggered a size 2 avalanche that buried Todd two metres deep. He was buried for close to 15 minutes. He and Ian agreed to answer a few questions in order to continue the education and awareness for everyone who is listening.



The excavation, as seen here, shows how the rescuers accessed the victim from the side, essentially tunneling to him.

Janina Kuzma

Gordo: So, Todd, I know every time I do something that hurts real bad, a myriad of thoughts race through my mind from initial panic to realization to resolution. Could you share the thoughts you had when you knew you were down and buried?

Todd: As soon as I knew I was buried and deep I said to myself: I've got two really good people above me so just "go to sleep."

G: Ian, what did you experience?

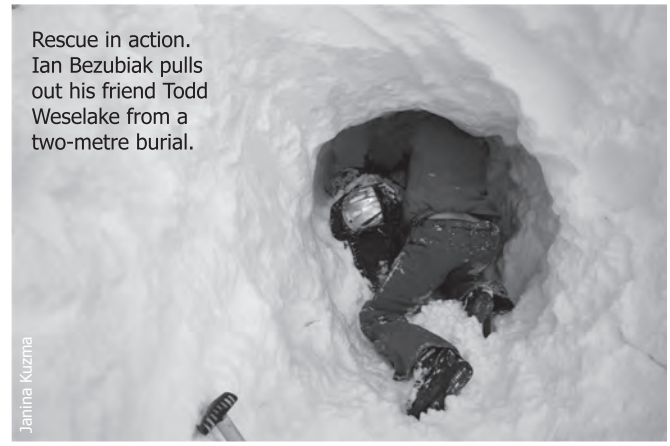
Ian: I was above a large tree when the slab broke—I was barely able to hold on and the slab passed me. When the snow stopped moving I looked up at Janina (who was just above the crown) and she said, "Todd got taken." I headed down to search.

G: Janina's lowest transceiver reading was 4.2 metres and your probe struck Todd's helmet. Tell us about the shovelling.

I: We used the system we learned in our course. It was just like, "find Todd!" I was just totally focussed on digging to the end of that probe.

Todd was extricated. His skin was totally white with dark blue lips. After a moment he took a huge breath and revived. The group hurried out of the slide path and skinned back to their snowmobile. They were equipped with hot drinks which helped rejuvenate them for the trip out.

This is a great story with a great ending. Todd and Ian described the amount of hangfire that threatened their location during the rescue. There were settlements and cracks above and beside the slope that had avalanched. Janina and Ian, with focus and urgency, did everything right.



Rescue in action. Ian Bezubiak pulls out his friend Todd Weselake from a two-metre burial.

Janina Kuzma

G: What is the foremost piece of advice you have for your backcountry peers?

T: Before you go out, make sure you have the right training and equipment. For sure.

Play safe out there folks. The mountains have been here for millenia and will still be here tomorrow. If conditions aren't right, head back to town and have a cold one. On me.

V-Shaped Conveyor Belt Approach to Snow Transport

By Manuel Genswein and Ragnhild Eide
All photos and graphics Genswein/Eide

During an avalanche rescue, excavating the victim takes by far the greatest amount of time. Despite a tremendously well-structured knowledge base for this type of rescue, a significant gap exists in the chain of events between a successful hit with the probe and the care / detection of the air pocket. To address this "missing link," work began in 2004 to develop the most effective approach to extricating an avalanche victim. The V-shaped conveyor belt method is the result. In the spring of 2007, this method was quantitatively assessed during a four-day field test. A quantitative comparison with different coordinated and uncoordinated shoveling techniques was accomplished in the field test.

Field test environment

A site near the field laboratory of the Norwegian Geotechnical Institute in western Norway was chosen. A spring snowpack with high density and hardness proved to be a realistic simulation of dense avalanche debris.

The "victims" were two bags normally used to carry firewood, sewn together and filled with straw. The total size of the target was approximately 80x200cm.The surface texture of the bag is similar to ski clothing and the snow stuck to it quite closely, making it necessary for the rescuers to completely free the target from the snow before being able to transport the victims out of the snow. In order to avoid loose debris around the victims, great care was taken to dig small shafts during burial. In addition, the snow around the victims was left to re-freeze overnight, and the next day the snow around the victims was boot packed layer by layer. Three days after burial, the victims were ready to be rescued.

The victims were buried at three different depths—1 metre, 2 metres and 3 metres—and on two different slope angles, flat and steep. The flat slope was 0˚–5˚ and the steep slope was between 20˚–25˚.

Choice of rescuers

All "rescuers" were chosen carefully. Aged between 19 and 39, they represented the age group that statistically most often becomes avalanche victims. Men and women from three different countries were chosen; the ensuing language challenges simulated to a certain degree the communication problems that often occur between rescuers who, although they may speak the same language, are faced with increased stress levels during a real incident. The call for volunteers read: "Four-day avalanche course free of charge, including food, including active participation in a two-day digging experiment."

In order to eliminate exhaustion as a cause for potential error in the data, the digging experiments were spread out over four days. After digging for a short while, the rescuers were assigned a less physically challenging learning module, after which another section of work with the shovel was completed.

Collection of data

The increase in depth of the hole was measured every 30 seconds. After every excavation, the hole and volume of excavated snow were carefully measured. The time measurements included first visual contact with the victim, head (airway) access time, first visual of the full body, lifting of the victim, and positioning the victim outside the burial site. Documentation included high-definition pictures taken every 60 seconds during all tests as well as real-time video documentation of the entire field test. An instructional video is available.

Shovelling

All rescuers were taught the correct way to use the shovel (i.e., cut blocks). It is difficult for companion rescuers to shovel with the same efficiency on both their right and left sides. Therefore, it is important that the system allows the rescuers to adapt their working position in the V to accommodate personal, body-specific preferences.

Uncoordinated shovelling

Statistics and video analysis of uncoordinated shovelling clearly show how often rescuers stepped on top of the buried subject, possibly compromising the air pocket and causing additional injuries. Rescuers also got in each other's way, resulting in diminished efficiency for excavation. Onset of fatigue was rapid, and work was interrupted for everyone while exchanging exhausted rescuers. With increasing burial depth, not all rescuers could be utilized due to lack of work space.

This series of photos shows poorly coordinated shovelling. A too-deep hole means shovellers have to lift snow above their heads, causing rapid exhaustion and guaranteeing a longer rescue time. All rescuers are unable to work at the same time and, with no exit ramp, gentle transport of the patient is almost impossible.

Challenges for an efficient and careful excavation

Care of the air pocket

During companion rescue a single probe is normally used to locate the victim. This method gives rescuers little knowledge about the exact positioning of the body. On one hand a quick approach to the airway is necessary; on the other hand a certain amount of snow needs to be transported to facilitate efficient removal of the mass of snow. Furthermore, rescuers should be positioned so that the buried subject and possible air pocket are not endangered. The V-shaped conveyor-belt approach to snow transport is the answer to this challenge.

Working efficiently

Maintaining the efficiency of the rescuers is a vital requirement of an effective rescue. We asked ourselves: Why do rescuers get exhausted so quickly when they apply uncoordinated shoveling? It's clear that fatigue results in longer breaks and slows down the rescue. We noted that rescuers rapidly became exhausted when holding an ergonomically challenging position over a long period of time. In response we applied the concept of job rotation, a model used in industrial production. We found rotating the rescuers clockwise every four minutes in the V-shaped conveyor belt method avoided this early exhaustion.

Transporting snow

An additional challenge to efficiency is how the rescuers transport the excavated snow. Lifting the snow vertically constitutes one of the least efficient methods. Despite maximum use of strength, snow still does not get transferred away from the victim. Another significant drawback to this method is that bigger lifts often leads to more snow falling off the shovel. The V-shaped conveyor belt method allows a paddling motion, where the range of motion of the whole body can be utilized as opposed to just using the arms. This is much more efficient and results in the transportation of a bigger mass of snow (measured in litres/rescuers/minute). Shovelling methods that suggest steps be dug for snow transport or recommending kneeling or sitting positions which do not allow the use of the body's full range of motion are also inefficient.

V-shaped Conveyor Belt Method

Position of rescuers

Rescuers form a V, with the first two rescuers positioned one shovel length apart; the rest are two shovel lengths from each other. This positioning–which can be assumed quickly– enables everyone to work without disturbing each other in individual segments of the V, while offering the optimal length of motion in the snow conveyor for each person. The principle of the individual segments allows the rescuer to find the optimal work position considering his or her personal preferences (i.e. left handed or right handed)

The size of the V depends on the depth of the victim, which is determined by probing. In a flat debris field (0˚–5˚), the required length of the V is double the burial depth. On a steep slope (20˚–25˚), the length of the V equals the burial depth. Values in between can be interpolated. The width of the V at its open end always equals burial depth.

As a general rule, one rescuer can cover 80 cm of the V's height. So, if a victim is buried 2 metres deep on a flat area, five is the perfect number of rescuers (2 x 2 metres deep = 4m/80 cm = 5). It's up to the rescuers where to position themselves within their sector of V height.

Excavating the victim

The person closest to the probe cuts blocks only. The second person starts the transport of the blocks, and might still have enough time to cut a few blocks as well. The primary job of each person in the conveyor is to move the snow from their section backwards to the next section behind them. Once there is no snow to transport, blocks should be cut to increase depth.

The further back in the V, the more work is applied to transporting the snow and less to gaining depth. This results in a sloping plane that slants towards the buried victim. If the angle of this slope becomes greater than approximately 25˚, snow falls back into the hole. This is avoided by ensuring the V is the correct length for the depth of the hole.

Rotation of rescuers is initiated by the front person. A four-minute cycle has been found to be the optimal balance between getting used to the new position and onset of fatigue. A greater gain in depth was measured during the first two minutes of the rotation, as opposed to the last two minutes. The psychological effect of expecting the rotation was rated as very important, and resulted in increased motivation. Of course, those four minutes don't have to be measured exactly. At maximum, the rotation should be made at the first sign of fatigue by any of the rescuers.

When the buried victim is first seen, the last rotation is made in which a second rescuer moves to the tip of the V. Stopping the rotation at this point avoids the challenge of rescuers having to communicate information about the victim's 3D position in the snow. Furthermore it would be psychologically challenging for a conscious victim to have to adapt to a different rescuer every few minutes.

The rescuers in position at the tip of the V work directly and carefully near the victim. This means the amount of snow available to feed the capacity of the snow conveyor decreases. To compensate, the person behind the first two rescuers should aggressively cut out the sidewalls in order to make more space for the two front rescuers, and to adapt the tip of the V to the real orientation of the victim. During this phase the first sign of a cave can be observed, as there is no purpose to removing the entire height of the front and sidewalls.

During this phase, more rescuers are used at the tip of the V. The V does not need to be fully maintained anymore. Often it is sufficient to keep only one side of the V open and to use the free space as an additional depository for snow.

Organized rescue

Once organized rescuers appear on the scene, they often require additional space for first aid and the transport / loading zone of victim. While this request is well founded, it should not result in wasting time to gain access to the victim's airway. The V-shaped conveyor belt approach to snow transport should be used for all user groups until commencement of first aid. At that time the diggers can step back a couple of metres and, while maintaining the V formation, start transporting the snow further away to create more space, unless they are needed for more pressing tasks.

Above pictures l to r: In this example of coordinated shoveling, the rescuers decided to transport the snow sideways (micro management). The front team at work after first visual contact with buried person. After the shoveling is completed, there is enough space for four rescuers to lift the buried person to the top of the "V."

The avalanche shovel

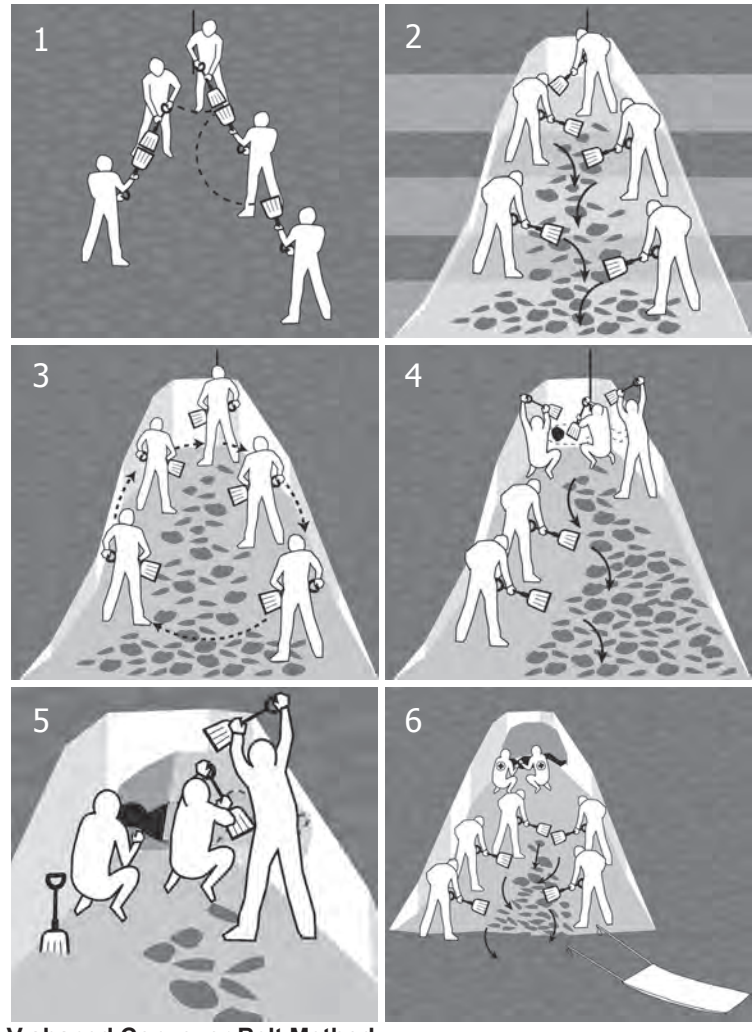
This test was not conducted to systematically test avalanche shovels. However, valuable observations were made regarding different models of shovels. All rescuers received detailed instructions in the correct use of each shovel. Not one single shovel failed due to incorrect use. Plastic shovels serve the purpose of merely "having a shovel" but usually fail before reaching the first metre of depth.

Light metal-alloy shovels need to be hardened by a metallurgical or temperature process (i.e. alloy 6061 T6), as the majority of those metal-alloy shovels from prominent manufacturers were seriously bent after little use. The front edge cannot end in a triangle with one exposed tip, since that will bend and deform the entire blade after continued stress. Collapsible handles have a clear advantage because of the increased length of the shaft, but the two parts must sufficiently overlap in the extended state. By creating a second hole this doubling can be increased. A D-shaped grip proved to be superior to a T-shaped grip. The Voilé Telepro T6 proved to be a very sturdy and ergonomic working tool.

THANKS

We would like to thank our participants for their extraordinary efforts. A further thanks goes to Krister Kristensen of NGI for providing us with a very affordable work environment at the modern field station.

The results of this study will be presented at the ISSW2008 in Whistler, BC, September 21 – 27, 2008.



V-shaped Conveyor Belt Method

1. Positioning of rescuers: quick measurement of distance between shovelers
2. Working in sectors on the 'snow conveyor belt': Snow is transported with paddling motions
3. Clock wise rotation is initiated by the front person: 'Job Rotation' maintains a high level of motivation and minimizes early fatigue
4. Buried victim is first seen: More rescuers are needed at the front, the snow conveyor belt only need to be partly kept running.
5. Careful work near the buried victim while some shovelers aggressively cut the side walls to adapt the tip of the V to the real position of the victim.
6. Interface to organized rescue: More space is shoveled only after medical treatment of victim has started

Manuel Genswein has been working for 15 years in over 20 different countries as an independent instructor for avalanche rescue and prevention. He developed many of today's most advanced avalanche rescue search technologies as well as search and excavation strategies. As a consultant and trainer for many of the largest players in the industry, he has gathered a broad-scale knowledge within the field of avalanches, avalanche rescue, development projects and teaching participants with very different backgrounds.

Ragnhild Eide has been working as a NF mountain guide in Norway since 1997. She has, together with Manuel Genswein, been part of the development of the V-shaped snow conveyor technique for excavating avalanche victims.

Uncertainty and Input Sensitivity in Avalanche Dynamics Models

By Chris Borstad

Avalanche dynamics models are important tools for avalanche-related planning applications. In this paper, I outline the sensitivity of flow models to the input parameters, most importantly for the basal sliding friction. This illustrates a shortcoming of flow models for making independent predictions of flow speed or runout distance. I argue that additional empirical data is necessary in order to constrain the output of a dynamics model to within a reasonable or desirable uncertainty.

New and more complex avalanche dynamics models are emerging and evolving. Early flow models were one-dimensional. That is, they simulate a single point of the flow, usually either the center of mass or the leading edge. The newest models are two- and even three-dimensional, and proclaim to account for processes such as mass entrainment and coupling between the dense flow and the powder cloud. These more complex models come at the cost of further parameterization, however. It is necessary to provide as inputs, to name just a few, the initial fracture dimensions, the depth of entrainment, and multiple friction coefficients.

Some of my research and that of others has demonstrated that it takes a lot of precision in the input(s) of a flow model to get the output that you want or expect. In other words, to re-create an observed extreme avalanche with the model (as a way to "check" or "calibrate" the model), it takes a lot of trial and error to get the parameters just right in order to match the observed speed and/or runout distance of the event in question.

When you compare the precision necessary in a model input to your actual level of confidence in the physical process the input represents, you can run into problems. As an example, consider a simple, hypothetical model with one input and one output. It can be any physical model—in my case was an avalanche flow model that takes a single friction coefficient and calculates the flow speed and runout distance. In order to apply the model with confidence, you need to compare your confidence or uncertainty in your model input with the "answer" that the model spits out.

Consider Table 1, which shows a simple way that we might classify our hypothetical model depending on how the input uncertainty compares to the output uncertainty. Assume arbitrarily (the number doesn't matter) that we are confident in the model input to within 10%. If the model output varies by less than 10% over this range, then we can say our model performs well and doesn't magnify our input uncertainty.

Uncertainty in Model Input	Uncertainty in Model Output	"Prognosis"
10%	<10%	☺
10%	10%	😐
10%	>10%	☹

Table 1. Example of a hypothetical one-parameter model and how we might "rate" the model based on how the input confidence compares with the output confidence.

If the model compounds or magnifies the input uncertainty and we are left with greater than a 10% uncertainty in the output, then our confidence in the input becomes crucial. In this case we have to work harder to narrow down our confidence interval in our model input in order to have confidence in the model output.

Of course this assumes that we actually perform a proper sensitivity analysis using our model. This is straightforward for one-parameter models—we simply run the model at both the upper and lower bounds of our input confidence band. For more complex models with large numbers of inputs, the situation is a bit more difficult. Typically, such a model will be more sensitive to some inputs than others. In any case, a proper sensitivity analysis should be a part of any modeling scenario, especially when the model is used to make decisions concerning the safety of people. It's one thing to tune the model parameters to re-create an observed event. It's a very different thing to use the model to make a prediction for an avalanche path that has little or no historical data.

The important point here is the emphasis on the model inputs as well as the output of the model. Too often it seems the only concern is whether a model gives you the output that you want or expect. Highly parameterized models can always be "tuned" to give you the exact output you want. This is of little value unless you assign a confidence or uncertainty to each model input and then get the desired or expected output over the whole range of these inputs in your model.

For avalanche flow models specifically, then, we need to start with an explicit recognition of what we do and don't know about how exactly snow slides down a slope and how to best simulate that in a model. We do know, for sure, that big dry avalanches decelerate very sharply to a stop in the runout zone. This means that they carry a high speed, and thus high destructive potential, almost right up to the point they stop. This also necessarily means that the sum total friction of the flow is very high in the runout zone because you need high friction to bring something to a stop very quickly, just like slamming on the brakes of your car.

We also know that most of that friction has to come from sliding at the base of the flow—the kind of friction that you studied in high school physics by putting a wooden block on an inclined plane and increasing the angle of the plane until the block slid. This is the only kind of flow resistance that could possibly stop an avalanche as quickly as we observe. There are other mechanisms that can contribute to the friction, but sliding friction dominates (see for example McClung 1990).

This seems like good news. We have a single dominant resistance mechanism, which means we can use a flow model with a single input. Now let's look at what we think the actual value of this friction is. There are a number of ways to measure the friction of flowing snow. Table 2 shows a selection of values of the friction coefficient (often called the Coulomb or bulk friction coefficient μ), measured or calculated in different ways.

The values of μ covered in Table 2 range from about 0.2 to 0.7. This range results from the different methods used to obtain these numbers, the different scales of measurement, as well as the wide range of flowing snow conditions. It is clear from Table 2 that if we are to properly assign an uncertainty to μ, it will be in the first digit of precision.

The next step is to use some initial value of μ in a flow model, and then vary μ in the first digit of precision to see how the output changes. Standardized values of flow friction coefficients, intended to be applicable for any avalanche path, have been shown to be inadequate in representing the sharp deceleration of avalanche speed in the runout zone (e.g., Gauer et. al (1996), Ancey and Meunier (2004)). The most appropriate way to select an initial value for the friction coefficient is based on the geometry of the avalanche path in question. Specifically, the tangent of the alpha angle is a measure of the average value of the flow friction for an extreme event, which will then vary for paths of different steepness.

Study	μ	Range	n
Dent et al. (1998)[a]	0.42	-	1
Tiefenbacher and Kern (2004)[b]	0.72±0.11	-	1
Ancey and Meunier (2004)[c]	-	0.4-0.7	11
Ancey (2005)[c]	0.5	0.46-0.6	173
Platzer et al. (2007)[b] – dry	0.26	0.22-0.29	6
Platzer et al. (2007)[b] – wet	0.48	0.37-0.55	12

Table 2. Selection of reported values of the Coulomb or bulk friction coefficient μ for avalanche flow. a- full-path experimental flow measurement; b- chute-flow measurements at Weissfluhjoch, Switzerland; c- inverse calculations using measured flow speeds and runout distances.

Figure 1 shows the results of such an exercise for a sample flow model DAN, which is the model I used in my research. For this particular path, the flow friction coefficient was initially selected as μ = tan(α) = 0.6. The value of μ was then varied, successively, in the first three digits of precision and the model simulation was repeated.

The results are startling! The model output varies widely for μ ± 0.1. The necessary conclusion from Figure 1, if we cannot be more confident than ± 0.1 in the input, is that we are left with a 600 m uncertainty in the runout distance! If we are interested in the flow speed at, say, x = 1800 m, we can only say that the model predicts it will be somewhere between 0 and almost 60 m/s. We'd certainly like to do better than this.

If we wish our model output to be a bit more constrained, we would have to go to the second digit of precision. This is shown by the darker grey area in Figure 1. The third digit of precision would allow us to be certain of the model runout to within about 10 meters. However, revisiting Table 2, there is no way that we can assign a confidence to μ to better than the first digit of precision. Additionally, some avalanche paths are more sensitive to changes in the friction than others, so a sensitivity analysis like this needs to be carried out for every path.

This analysis was for a flow model with a single friction coefficient. When you add more parameters to a model and consider your uncertainty in these additional parameters, such a sensitivity

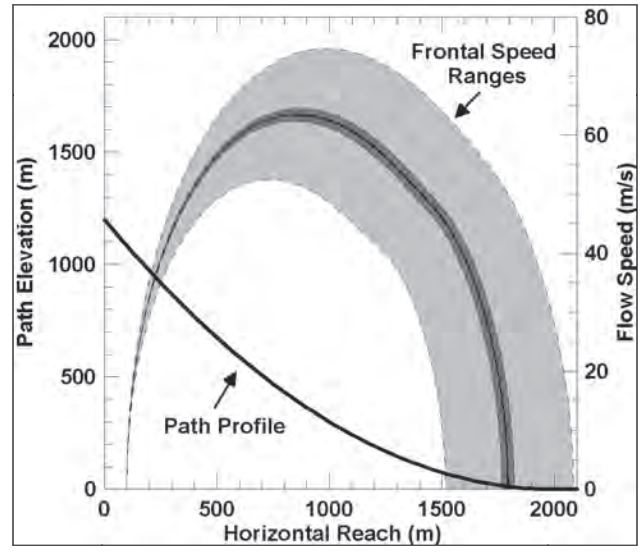


Figure 1. Path profile of a sample avalanche path with speed calculations using the flow model DAN. The large grey area represents the output of the model when the friction coefficient is varied within the first digit of precision, i.e. μ ± 0.1. The darker grey area represents μ ± 0.01, and μ ± 0.001 is covered by the thickness of the central black curve.

analysis becomes a little trickier. However, even for a highly parameterized model, the most important flow parameter is still the sliding friction coefficient μ. Even with a wealth of experimental data on flow friction, we still have to recognize our uncertainty in μ and how it influences the confidence in our model output.

The fundamental conclusion from an analysis like this is that avalanche dynamics models should not be used to make independent predictions of flow speed or runout distance. These models must be combined with other empirical methods to constrain the output. One such method is to use an empirical, α-β type model that statistically predicts the runout position in advance of using the flow model. An α-β model also has an assigned uncertainty in the predicted runout position, which we hope is narrower than the flow model by itself. The value of μ can then be adjusted so that the model output falls within the output range of the empirical model.

A further way to constrain μ is to use data on avalanche flow speeds. A primary objective of my Master's thesis was to use speed data as a further constraint on the output of a dynamics model. We can look at Figure 1, for example, and compare the maximum model speed to the maximum speeds of actual avalanches. If our model predicts higher speeds than we actually see, that tells us our friction is too low. Additionally, if we're interested in an extreme event, we can adjust μ so that the model flow speed just matches the maximum speed that we observe in nature. This is just another way of saying that the fastest avalanches have the lowest friction.

We need more than one tool to make predictions about avalanche flow speeds and runout distances. Dynamics models do not provide sensitivity analyses as built-in functions. If a model comes with "calibrated" friction coefficients without confidence bands on those inputs, then a key piece of the puzzle is missing. The onus is on the end user to both investigate how the input uncertainty compounds into output uncertainty and then to use additional empirical data to give better confidence to the final calculations.

Acknowledgements:

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After finishing a BSc in Physics at Colorado State University, followed by a little bartending and a lot of skiing, Chris Borstad moved to Vancouver to work with Dave McClung at UBC. This research on dynamics modeling was part of his Master's thesis, now completed. Chris is currently a PhD candidate focusing on fracture mechanics. In the winter you can find him in the cold lab at Rogers Pass. If you can find the cold lab, stop by to say hello—it gets lonely in there

Avalanche Transceivers & Multiple Burials

By Felix Meier

Avalanche beacons and multiple burials are a controversial issue. By evaluating properly selected signal features and by using suitable classification algorithms, it is possible to resolve multiple burial situations correctly in most of the cases, thus providing good guidance especially to users that never or rarely practice multiple burial searches. Some modifications to the standard EN 300 718, however, would make the process even more reliable.

INTRODUCTION

The issue of avalanche beacons and multiple burials has been discussed in a recent contribution [1] in avalanche.ca. The article is rather pessimistic, and there are quite some arguments why the issue is much less of a problem than suggested in that paper.

PROBLEM STATEMENT

A certain percentage of avalanche accidents involve multiple burials [1], [2]. As explained in [1], part of these cases can be resolved using single burial search tactics. But some cases require a more sophisticated approach because there is a high probability that the searching transceiver will receive signals from multiple transceivers simultaneously.

Two search strategies are available for resolving such situations: The Micro Search Strip Method [2] and the Three Circle Method [3]. Both strategies require some practice for efficient use. But it is a sad fact that about 90 percent of the transceiver users practice less than one hour per season, so in most cases they will not be able to apply any of these strategies properly.

Any support for resolving a multiple burial situation that can be made part of the transceiver functionality will therefore be very helpful to most of the users. Even if such support is not perfect, it is still better than no support at all.

MULTIPLE BURIAL ALGORITHMS

A good algorithm for resolving multiple burials is based on the following method:

At the end of the receiver chain, a suitable method is used for extracting one (or more) features of the received signal that shall be used for classifying it. The classification system then enters every new signal feature record into a pool of unassigned records. Every time a new record is added to this pool, the pool is checked for a subset of records that exhibit identical features and can therefore be assigned to a single transmitter. Once such a subset has been found, all records pertaining to it are removed from the pool and are assigned to a chain of records pertaining to a particular transmitter. When a new record comes in from the feature extractor, it is first checked for matching an existing chain of records. If it does match a pre-existing record set, it is assigned to that chain, and it may also be used for adjusting the feature values. If it does not fit into an existing chain, it goes to the unassigned records pool, and the pool is analyzed again for a possible new chain of signals from a new transmitter.

If a record fits an existing chain, it can be used for displaying information about the transmitter to the user if the user has selected that chain for display. If the user has “marked” that transmitter, the internal data records will be updated, but there will not be any indication to the user. This is to prevent signals from that marked transmitter from disturbing the search for another transmitter.

SIGNAL FEATURES

There are several features that may be used for characterizing the signal from a transmitter:

Pulse amplitude (or signal strength, for that purpose), is a measure for the distance to the transmitter. Since the strength of the received signal is also dependent on the relative orientation of the transmitting and the receiving beacon, it is subject to a lot of variance. Just imagine a searcher walking on avalanche debris and keeping his transceiver in the same orientation – nearly impossible. So it is really not a good idea to use pulse amplitude for classification.

Another feature that has been proposed for classification is the exact frequency of the transmitter [1]. Algorithms for extracting frequency information from a time domain signal are well known and widely available, e.g. the Fast Fourier Transform (FFT). One of the fundamental laws of those algorithms states that the obtainable resolution in frequency is equal to the reciprocal of the time duration of the signal sample being analyzed. The shortest transmitter pulse duration allowed by the standard EN 300 718 [4] is 70 ms. In order to not create any artifacts in the frequency domain, the signal to be analyzed should cover the entire interval under investigation. If no overlap is used (and that is pretty much a necessity because anything else would require enormous computing power), the maximum duration of the signal sample is thus 35 ms, resulting in a frequency resolution of at best 28.5 Hz. But most transceivers transmit within about ± 20 Hz of the nominal carrier frequency of 457’000 Hz, so that feature would not be very helpful for classification since most of the time, the signals from multiple transmitters would show up in the same frequency bin. The

FFT algorithm is very computation intensive, and so there is very little bang for the buck when using this feature.

A third feature that can be used is the position of the signal pulse edges on the time axis. This feature is independent of the relative orientation of the transmitting and of the receiving antennas, and it can be measured with high resolution by a signal processor. Also, its short term stability is excellent unless the signals are emanating from an "intelligent transmitter". For more on that, see farther down. As has been explained in [1], when pulses from multiple transmitters overlap in time, some problems come up. But contrary to [1] which states that overlap makes multiple transmitter detection impossible and may lead to false "masking", we do believe (and we have checked it by practical implementation) that by proper evaluation of the received signal it is still possible to correctly handle multiple transmitters as well as "marking" most of the time.

When signals from multiple transmitters overlap, there will be steps in the amplitude:

This is a simulated overlap of pulses from two transmitters at equal distance. The pulse duration is 300 ms, the pulse interval is 1000 ms for both transmitters, the second one of them is offset by 100 ms in time relative to the first one, and they transmit at exactly the same frequency. So the pulses do overlap for a duration of 200 ms. It may be surprising that the signals do not simply add all the time. But this is the reality, and it is due to the fact that the relative phase of the two transmitters is different for every overlap. Almost all beacons turn their 457 kHz oscillator off in between the pulses in order to save on battery power, and so they come up with a different phase every time the oscillator is switched on. If the signals from two beacons at equal distance have equal phase, the amplitude of the signal will double, if they are opposite in phase, the result is extinction. And all combinations of relative phase are possible, so the receiver gets a rich assortment of signal envelope shapes. But in any case there are edges that can be detected even if the signals overlap, and if interpreted properly, they can help a lot in mitigating the effects of overlap.

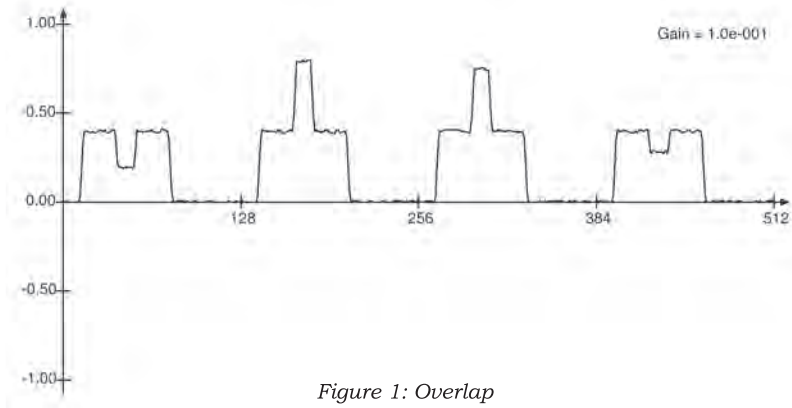

Figure 1: Overlap

Also note that the signals may add in a way that does not affect the overall amplitude. In that case, there will definitely be a change in phase of the resulting signal vector, and this could also be used for purposes of classification.

Another complication to be considered is the fact that overlapping beacons may not transmit at exactly the same frequency. This may lead to periodic amplitude changes during the overlap:

In this example, the parameters are the same as in the first one, but with a frequency difference of 20 Hz. Even this situation can be resolved by a good classification algorithm. For larger frequency differences, there is the option of running multiple local oscillators in the receiver, thus obtaining a clean baseband signal for every transmitter that is detected. This, however, is a little more complicated, but feasible and obviously improves performance.

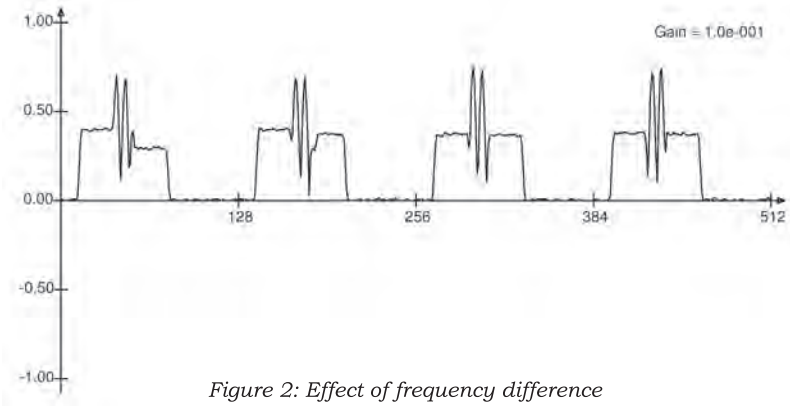

Figure 2: Effect of frequency difference

We have found out by experiment that it is possible to detect up to 80% of the edges during overlap. If this information is used in a good classification algorithm, the reliability of a multiple burial resolution algorithm can be improved considerably, and will be much better than predicted in [1].

Obviously, the signal position on the time axis is subject to jumps if a signal originates from a so called "intelligent transmitter". When an intelligent transmitter shifts the position of its transmit pulses in time in order to avoid overlap, the signal edges from such transmitter will no longer fit any existing chain at the receiver, and thus they will be considered emanating from a new transmitter. So focusing on a specific transmitter in a multiple burial situation becomes next to impossible. To this author, it looks like "intelligent transmitters" are not an intelligent thing at all, since they affect the signal that is best suited for handling multiple burial situations.

MARKING

With the above scheme, the marking of a transmitter can never lead to double markings as stated in [1], since a single transmitter will be marked only, based on some chain-specific icon on the display.

COMPATIBILITY

[1] also concludes that beacons that provide signal timing analysis and marking features are not downwardly compatible with the existing base of avalanche transceivers. As we have shown in this paper, this is not necessarily the case. If proper algorithms are used for signal analysis, the problems arising from some properties of the older beacons can be taken care of quite well. We have run many field tests and not noticed a particular loss in performance when searching for older beacons.

Transceivers with large deviations from the 457 kHz standard transmitter frequency do not affect compatibility in terms of multiple burial resolution algorithms. However, as has been shown in [5], they do pose a problem since they require that receiver bandwidths be relatively large in order to accommodate their frequency offset. This in turn has a negative influence on the achievable range when searching for such beacons.

BEACON STANDARD MODIFICATION

We agree with [1] regarding the following items to be considered for the next overhaul of the EN 300 718 [4]:

Beacon pulse periods should be randomized to some extent. This would greatly reduce the probability of long duration overlap situations. It does not affect backward compatibility.

Beacon pulse width should be limited to e.g. 200 ms, since longer pulses increase the probability of overlap. Backward compatibility would not be affected.

The tolerance for the transmitter frequency should be tightened, e.g. to ± 50Hz. This requirement can be met with today's components without an undue increase in cost, and it would permit the construction of better receivers (see [6]). However, since narrowband receivers would then receive signals from transmitters with a larger frequency offset, backward compatibility with old beacons exhibiting a large frequency offset would be affected. A possible approach to this problem may be the introduction of a transition period of several years, similar to the one declared when concentrating on the 457 kHz beacons and abolishing the 2.275 kHz variety.

CONCLUSIONS

Some of the modifications to the standard EN 300 718 as suggested by [1] would really help to handle multiple burial situations by good receiver algorithms.

"Intelligent Transmitters" play havoc with multiple burial resolution algorithms, since they affect the must useful signal feature that can be used for classification.

Contrary to [1], we believe that even in case of signal overlap multiple burial situations can be resolved properly in most of the cases by applying suitable feature extraction and classification algorithms.

ACKNOWLEDGEMENTS

The author would like to thank Reto Jaeger for his review of the paper and for making suggestions.

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Felix Meier is a consultant in electronics and software engineering. He has participated in all avalanche beacon standard groups since 1982. He was involved in the development of the Mammut Barryvox beacons. You can reach him at felix.meier.45@bluewin.ch.

Losing ASARC?

Since 2004, Dr. Bruce Jamieson has held the Avalanche Research Chair at the University of Calgary. A research chair is a faculty position with a reduced teaching load and a dedicated research program, including graduate students. Industry research chairs are supported by the Natural Sciences and Engineering Research Council (NSERC) for one or more five-year terms.

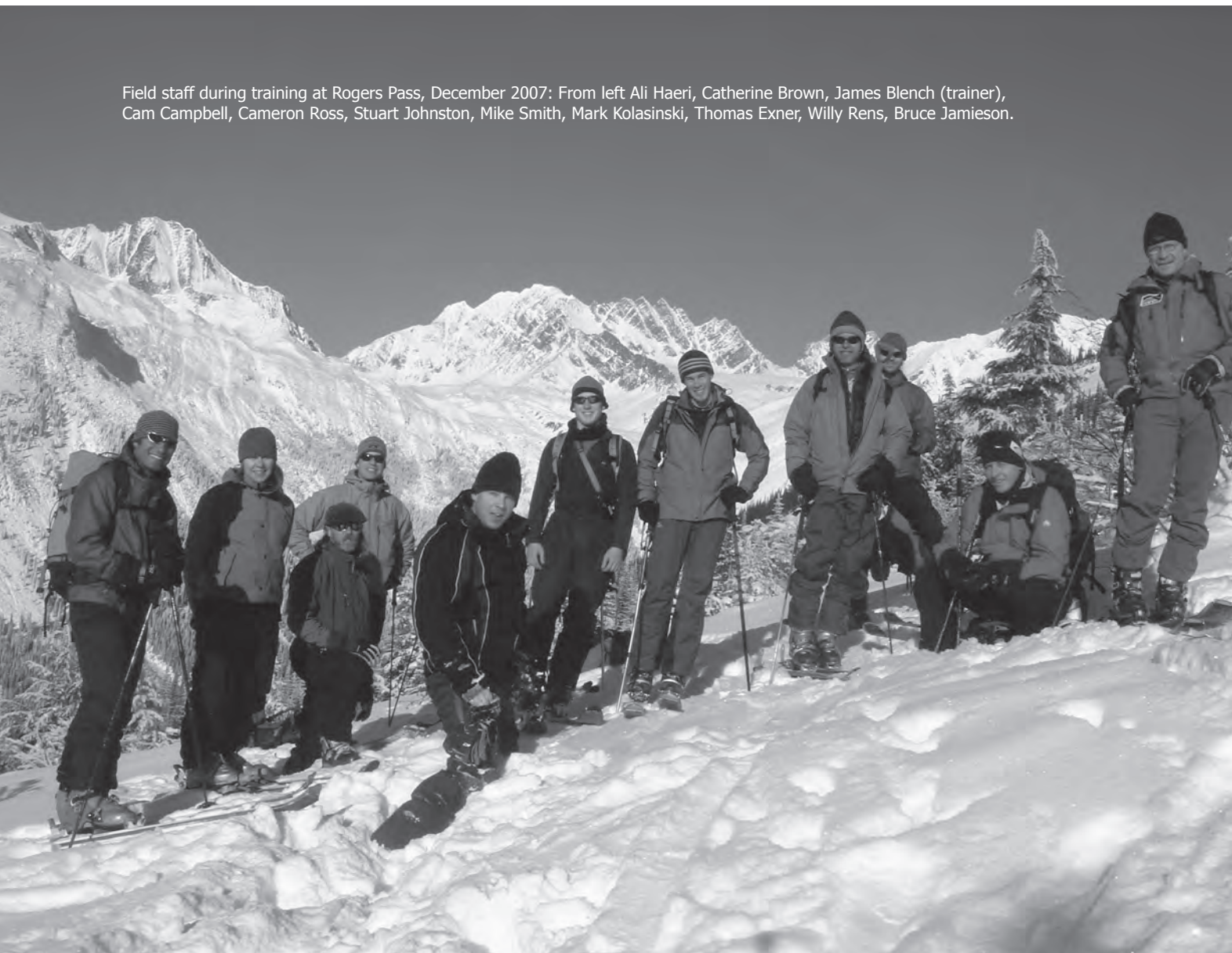
NSERC currently funds half of the research costs for the first term of this chair (from 2004 – 2009). Funding for the other half is split between the university and these industry organizations: HeliCat Canada; Canadian Avalanche Association; Mike Wiegele Helicopter Skiing; Canada West Ski Areas Association; and Parks Canada. Many thanks are owed to these generous organizations but now, more support from industry is needed.

For the second term of industry research chairs, the contribution from NSERC decreases substantially. Industry partners, who all benefit from the work accomplished by these research programs, are expected to make up the shortfall. And, as Dr. Jamieson prepares his application for a second term, there is a definite shortfall.

Clair Israelson, Executive Director of the CAA, is very clear on the value Dr. Jamieson's team brings to industry. "This is the only research program in the world dedicated to solving the problems faced by practitioners," he says. "It is vital that more industry partners step up to the plate and demonstrate their commitment to worker and public safety in avalanche terrain."

Dr. Jamieson is seeking input from existing and potential supporters: "I am keen to discuss research topics that are of interest to potential supporters," he says. "As well, the name of the chair could change for the second term, and could be named after a major supporter."

The application process for second term funding from NSERC is well underway, and must be finalized by August 31, 2008. That leaves only a few short weeks for industry partners to show their support, or face the consequences of losing this invaluable program.



Field staff during training at Rogers Pass, December 2007: From left Ali Haeri, Catherine Brown, James Blench (trainer), Cam Campbell, Cameron Ross, Stuart Johnston, Mike Smith, Mark Kolasinski, Thomas Exner, Willy Rens, Bruce Jamieson.

Did you know?

Applied Snow and Avalanche Research, University of Calgary (ASARC)

- The Avalanche Research Chair and other funding typically supports four concurrent graduate students, and two to four seasonal technicians
- Graduate students can be in Civil Engineering or Geoscience
- Field stations at Rogers Pass (hosted by Parks Canada) and Blue River (hosted by Mike Wiegele Helicopter Skiing)
- Largest field studies of snow and avalanche research in the world
- 12 previous graduate students or technicians are now working with avalanches as forecasters, guides, consultants, etc.
- Annual outreach includes presentations at 10+ venues to 300+ practitioners and 300+ recreationists
- More than 19,000 downloads from the ASARC web site in last year
- Strong international collaborations, including established Swiss collaboration
- See www.ucalgary.ca/asarc for more information including newsletter, outreach, contributions and publications

Proposed research topics

- Forecasting for deep slab avalanches including critical loading patterns, critical layering, effect of solar radiation and warming, appropriate snowpack tests.
- Hazard mapping including runout estimation for the Columbia Mountains, runout estimation models for GIS, using GIS for preliminary hazard mapping for work sites.
- Worksite decision support for low-risk sites without an on-site forecaster.
- Decision support for backcountry users with observations skills, in collaboration with Dr. Pascal Haegeli.

Can Solar Warming Contribute to Dry Slab Avalanches?

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Many people associate snow pack warming with spring-like conditions, when snow temperatures are close to 0°C and the likelihood of wet avalanches increases rapidly as soon as the sun softens up the melt-freeze-crust that often forms during cool nights. This is a common scenario in spring, when signs of warming, such as relatively warm air temperatures, strong solar radiation, and moist surface snow are easy to observe. *But, what happens to a cold, dry snow pack that warms up significantly at air temperatures below zero?*

Figure 1. This dry slab avalanche was triggered on a cold, sunny day by a skier on a steep south-west facing aspect. Solar warming may have contributed to this release. (photo: ASARC).

In this article we discuss a few concepts of stability changes caused by daytime warming and summarise results from reported avalanches mainly caused by solar warming of a dry snowpack. These cases are quite rare, but under the right conditions warming can be the significant factor decreasing stability. According to a Swiss study (Harvey and Signorell, 2002) in 20% of 128 avalanche accidents in the Swiss Alps, daytime warming was the only factor contributing to avalanching. On those days no significant amount of new snow or recent wind loading was reported. Of course, maybe in some of those cases there may have been just a lingering instability, which could have been triggered by a skier regardless of the warming. However, the 20% suggest a significant correlation to the influence of warming.

What are the sources of warming that can rapidly increase the temperature of near surface layers?

The main warming sources that effectively are able to increase avalanche danger are solar warming, rain, and warm, strong winds. Rain is probably the most efficient way of adding heat to the snowpack (Marshall and others, 1999). It destabilizes the snow pack in a short time, can penetrate down to deep layers, and affects all aspects. Luckily, mid-winter rain events are rare in alpine regions in most places in Western Canada. Warm, dry winds, such as the Chinook are known to cause rapid warming of the near surface layers and may reduce snow pack stability. But, these warm wind events are infrequent, except on the eastern slopes of the Canadian Rockies.

The most frequent cause of near surface warming seems to be direct solar radiation. It can warm up the upper layers of the snow pack rapidly within hours and affect the stability of the snowpack down to about 30 to 50 cm (McClung and Schaerer, 2006, p.38). By softening the surface layers, loads (e.g. skiers or snow boarders) may even affect deeper layers. Thin clouds may intensify the heating effect by trapping radiation between the snow pack and the clouds (greenhouse effect).

The effect of time

Usually, warming of a dry snowpack is associated with increased settlement of the snow pack, and non-persistent (storm snow) weak layers are believed to be stabilizing under these conditions. This seems to be the case as long as the settlement happens slowly and gradually (McClung and Schweizer, 1996). Settlement and creep are always connected with a deformation of the snowpack, and snow as a material can adjust to slow changes in deformation without damage. However, fast deformation, as sometimes observed during rapid warming events, can result in collapse of the snow micro-structure (bonds are breaking faster than new bonds are forming), and a layered snowpack may release slab avalanches.

So, slow warming and settlement of the snowpack usually promotes stability. But, of course, there is an exception to this rule. Imagine for example a surface hoar layer, buried under a layer of low density snow with low cohesion (Fig. 2). No matter how hard a skier, boarder or snowmobiler hits this layer there is no slab to release. But with ongoing settlement, even when slow and gradual, the overlying layer(s) will increase in stiffness and density (become “slabby”). Now it may not take a lot to trigger and propagate a fracture in the surface hoar layer, and release a slab avalanche. This process requires a pre-existing persistent weak layer, such as the surface hoar layer.

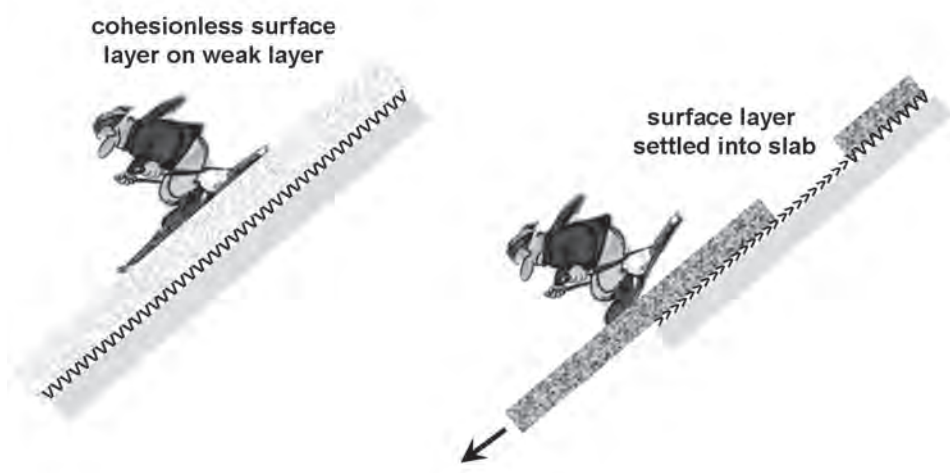

Figure 2. Even a prominent surface hoar layer with loose, low density snow on top is not releasable (left); neither by a skier nor as a natural avalanche. After the surface layer settles into a slab a fracture can propagate along the weak layer and release a slab avalanche (right). Daytime warming accelerates the settlement process and may act as a trigger.

In most cases when rapid solar warming, within a few hours or so, increases avalanche danger the slab/weak layer combination is mostly already like a “loaded gun.” The warming speeds up the creep of the slab on the weak layer just enough to possibly trigger a natural slab avalanche. Keep in mind we are still talking about a dry, sub-freezing snowpack. Once the snow surface starts to melt we are dealing with moist or wet point releases, which are a different story not addressed in this article. However, there are few cases where rapid solar warming significantly decreased stability, even though an obvious weak layer was not observed. The following section summarizes the conditions when this phenomenon was observed.

Low density snow and rapid solar warming

According to the results of a survey conducted amongst 35 experienced avalanche practitioners in the fall of 2006, numerous reports of solar warming related avalanches followed a similar pattern. In all of these cases obvious signs of instability (shooting cracks, whumpfing and skier-triggered avalanches) developed during a short period of strong solar warming after the snow pack initially appeared to be stable and, interestingly, no obvious weak layer was observed initially. A few of these cases were reported by mechanised skiing operations, where a run was skied several times during the warming period. Snowpack observations ranged from no signs of instability on the first run to shooting cracks and triggered slabs within hours on the following runs. The following list summarises conditions, each of which were reported in a number of incidents.

- East to south-east facing slopes (35-40°)
- Air temperatures well below zero (in the -8° to -15°C range)
- Clear skies, strong solar radiation in the morning hours in March or April
- First sunny day after a storm
- Cold, low density near surface layer
- No signs of warming (snow surface still dry)
- Initially stable snowpack, no obvious weak layers

We assume that rapid solar warming and settlement stiffened up the near-surface layer and so turned into a releasable slab

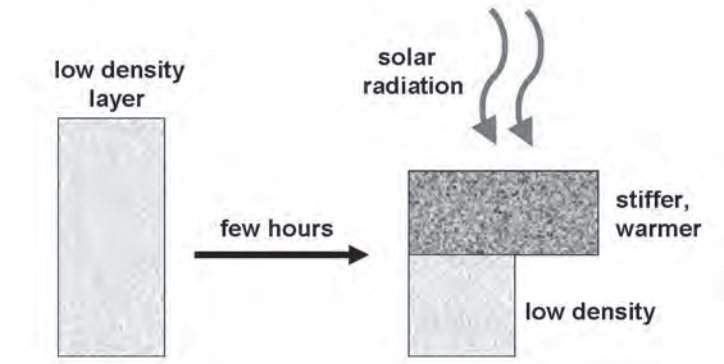

Figure 3. A cold low density layer can settle in to a reactive slab within hours caused by strong solar radiation. A subtle storm snow layer or just the interface of the stiffer, warmer layer above the low density snow may become the weak layer.

(Fig. 3). A buried, subtle storm snow layer may have turned into a reactive sliding surface with the stiffening slab on top. With ongoing warming this temporary stage of instability probably stabilizes subsequently due to strengthening of the storm snow layer. Potentially, the interface of the warmer and denser layer overlying the still colder and less dense layer may have acted as the weak layer. Attempts to model this interface with a numerical snowpack model have been inconclusive so far. The idea of a storm snow layer becoming the reactive weak layer seems to be more likely.

We set out to track down these warming events and gather more detailed data over a limited number of days during the winter of 2006/07. So far, we have not been able to observe this phenomenon. Even when conditions seemed right, we only observed the settlement and stiffening of the surface layer but could not find any signs of decreasing stability. So, what happened? It seems like this scenario is a complex interaction of many factors, such as warming rate, temperature range, snowpack properties, presence of an initially subtle weak layer, slope angle, aspect, and so on, which is so far poorly understood. In some of our observations some clouds may have delayed the warming or snow temperatures were too high, softening the slab and preventing propagation.

Nevertheless, the reported cases seem to suggest that solar radiation can temporarily promote slab avalanching without a pre-existing obvious weak layer. The case where an obvious persistent weak layer (e.g. surface hoar, rain crust), with a stiffening layer on top, turns into a reactive slab is a more common scenario and easier to recognise, even though experienced people have been surprised by it. Once the slab on such a layer has formed, unstable conditions can prevail for quite a while. In most of the cases reported here, the temporary stage of increased avalanche danger may just last for a few hours or so. The storm snow layers, or perhaps the interface gains strength quite rapidly with ongoing settlement and warming.

Other recent observations

In this winter season of 2007/08, a number of natural slab avalanches released in January above ice climbs in the Rockies on steep sunny aspects. Most of these avalanches released in the first few days after a storm on a sunny day and air temperatures were well below zero. Usually, at this time of year it is quite uncommon that solar radiation releases slab avalanches. Perhaps the combination of the weak snowpack in the Rockies this winter and still sufficiently strong solar radiation on steep sunny aspects was a factor in releasing these avalanches. Given the weak, unstable snow pack even the low January sun provided enough warming to act as a trigger. In the spring time it is more common for avalanches above ice climbs to start as moist point releases and may eventually step down to a weak layer and release a slab avalanche.

Snowpack warming model – SWARM

Most of the above reported scenarios showed air temperatures well below the freezing point, and obvious clues such as

a moist snow surface and snow balling were missing. Without many years of experience these warming conditions are hard to recognise and can easily be overlooked, but still can lead to a significant increase in avalanche danger. From field observations we know that only a few degrees difference in slope angle or aspect have a strong effect on the amount of heat the snow surface layers absorb. This winter for instance, we observed a sun crust on steep south-facing terrain above 40° or so on a cold day in January with air temperatures in the -15 to -20°C range. On parts of the slope with only a minor change in angle or aspect the snow surface was still dry.

Laura Bakermans, a former grad student with ASARC, developed a snow pack warming model (SWARM) based on extensive temperature measurements of near surface layers to evaluate the influence of solar radiation depending on slope angle, aspect and time of year (Bakermans, 2006). Of course, it is not only the amount of daytime warming possibly raising avalanche danger on warming days. There are many other contributing factors. However, solar daytime warming is often underestimated on cold days when signs of warming are not obvious. Experienced people may know through intuition, based on many years of experience, when warming effects come into play. SWARM may help to train your intuition and shorten this learning process. Hogarth (2001), in his book "Educating Intuition", would describe avalanche terrain as a "wicked" learning environment, since feedback is not always immediate or obvious, and it can have high consequences. On days when warming may be an issue it is probably wise to leave a wider margin of safety. There is still a lot to learn about the interaction of daytime warming and slab avalanching. SWARM is freely available for download on the ASARC web page (http://www.schulich.ucalgary.ca/cgi-bin/ENG/TrackIt.pl?SWarm.xls). Feel free to contact us if you have any questions, suggestions or comments.

Acknowledgements

Many thanks to all guides and forecasters, who kindly shared their knowledge and experiences on warming-related avalanches.

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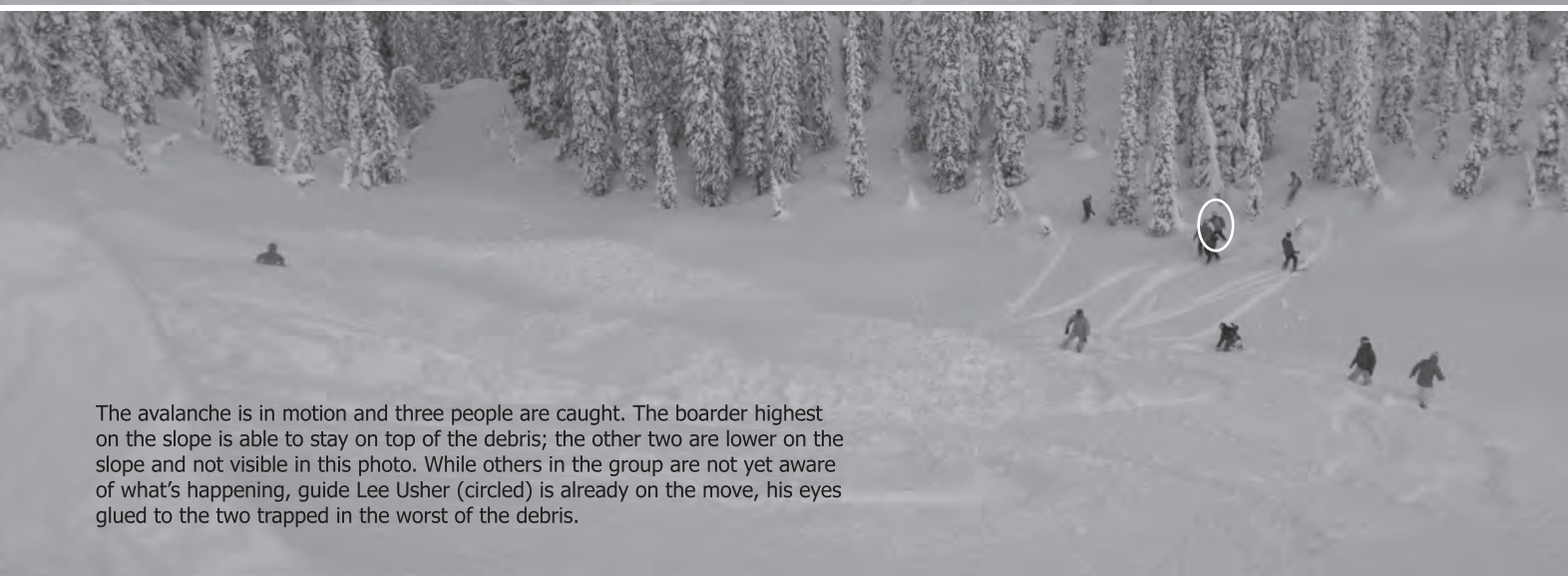
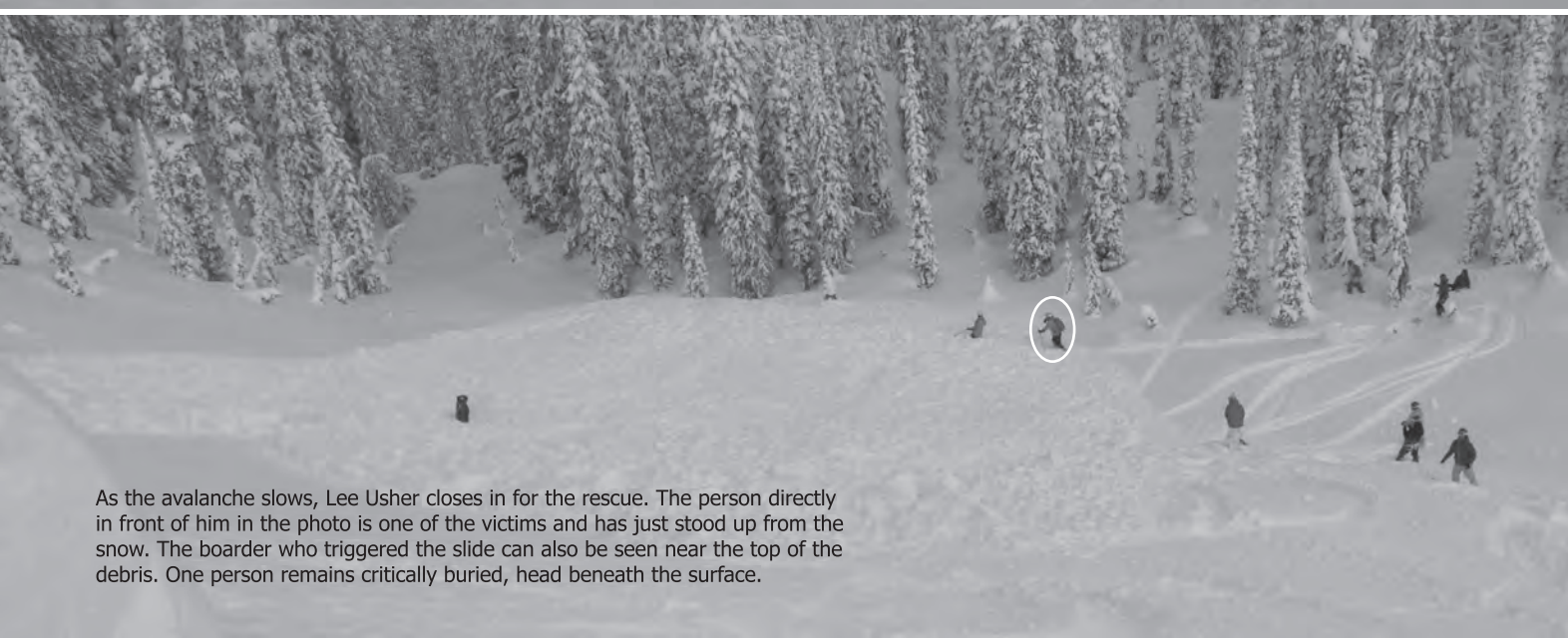
Incident at Thunder Canyon

All Photos Dave Thomas www.unred.com

It's February 13, 2008, the first clear skies after many days of snow. The last boarder in a group of 12 has just triggered a slide.



The avalanche is in motion and three people are caught. The boarder highest on the slope is able to stay on top of the debris; the other two are lower on the slope and not visible in this photo. While others in the group are not yet aware of what's happening, guide Lee Usher (circled) is already on the move, his eyes glued to the two trapped in the worst of the debris.



As the avalanche slows, Lee Usher closes in for the rescue. The person directly in front of him in the photo is one of the victims and has just stood up from the snow. The boarder who triggered the slide can also be seen near the top of the debris. One person remains critically buried, head beneath the surface.

A hand! The buried victim reaches for the surface. Lee is just metres away.

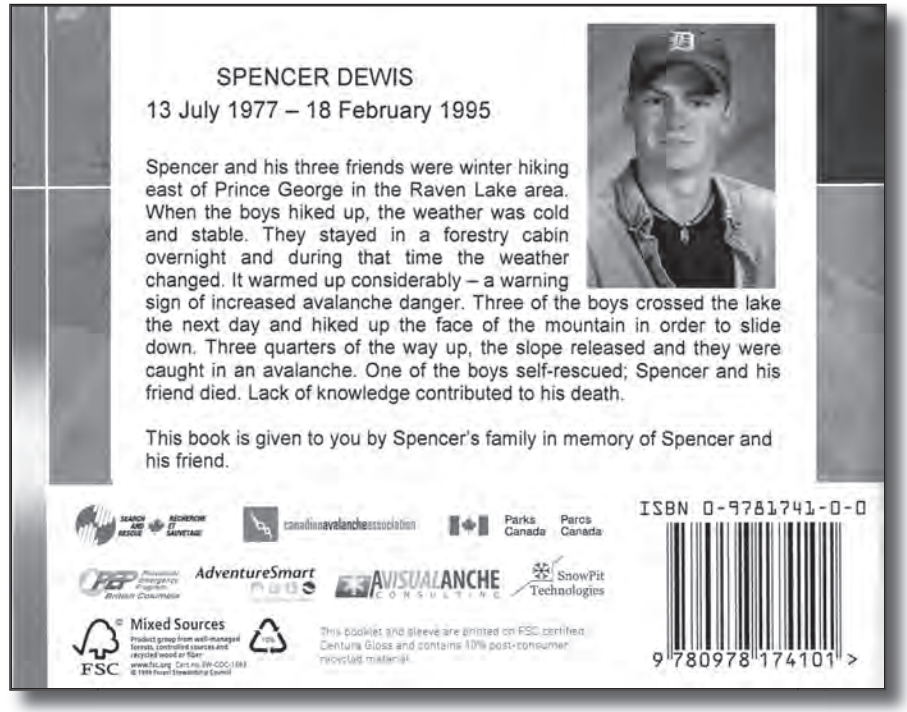
Adrenalin is racing as the group digs for the victim. Tail guide Greg Johnson (far right) radios for help.

A beautiful sight, the victim is alert and unhurt. An on-site debrief helped everyone calm down, and the group got back on their boards to finish the day.

Education in Honour

This past winter, the CAC received a request from Maureen Shaw, a woman who had lost her son in an avalanche in 1995. Maureen wanted to help the CAC with youth education and honour her son's memory at the same time. The CAC's Karen Dube handled this project, and suggested that Maureen write a short paragraph about her son Spencer's accident.

This information, along with a photo of Spencer, was made into a label that was attached to more than 80 Avaluators. Those Avaluators were then handed out to all the Grade 10 students in Golden, BC, as a part of the CAC's expanded youth education initiative. "I'm very proud of how everything turned out," said Maureen. "Thank you, Karen, for all your input and help. I can't tell you how helpful it has been to me to send all this in the right direction—which in the end is to educate kids."



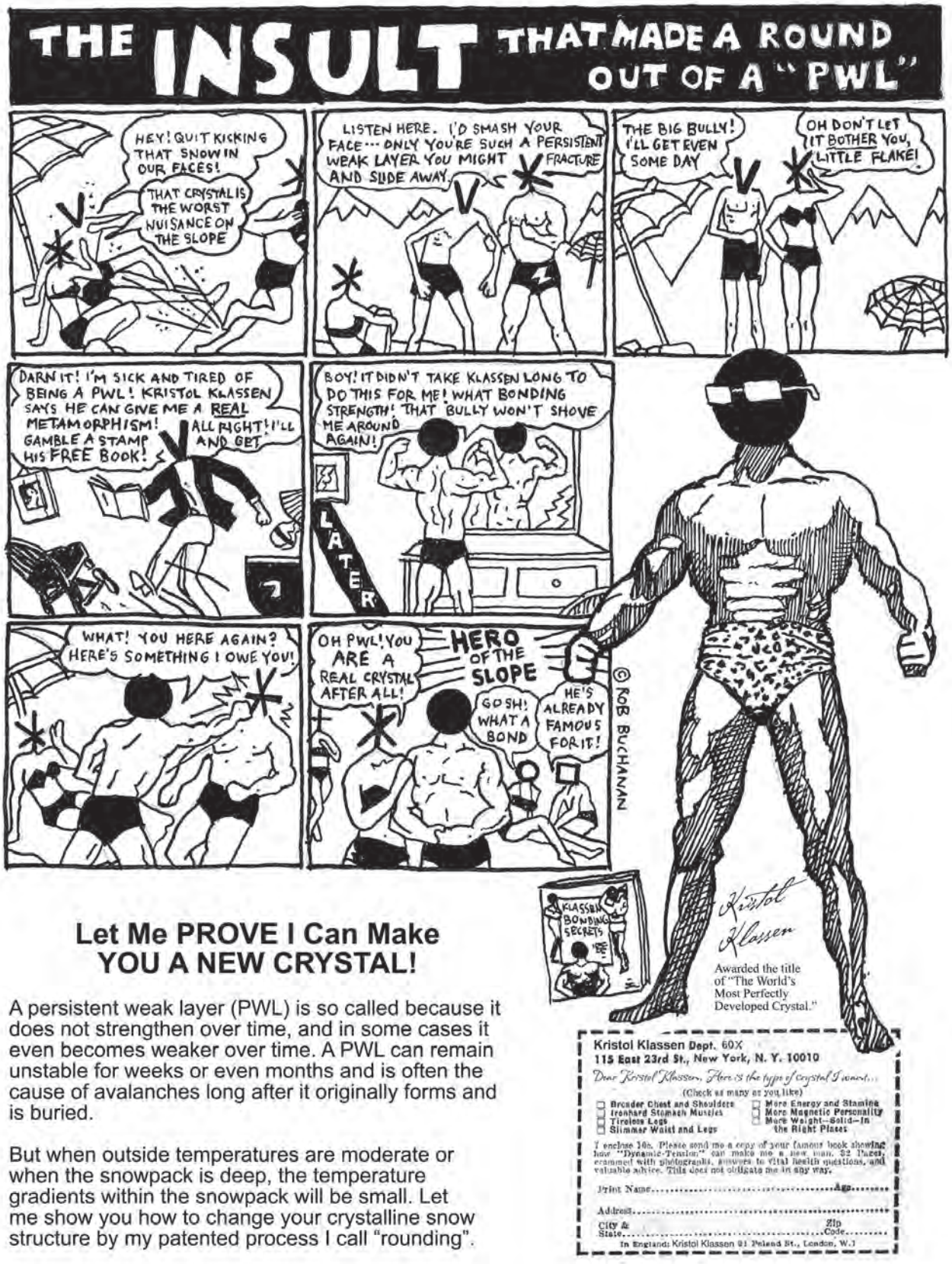
Julie Matteau
CAC Rando Ambassador

Ski mountaineering competitions are becoming more and more popular, and the CAC has been thinking of ways to become involved with this sport. This past fall, Laurie Edwards of the Mountain Equipment Co-op, offered a suggestion. One of their employees, Julie Matteau, had been named to the Canadian National Team and was going to be competing in a number of races.

Laurie suggested that Julie become an ambassador for the CAC while she was engaged in these high-profile competitions. MEC provided Julie with her outerwear, complete with the CAC logo. We provided Julie with some safety messaging to prepare her for interviews and conversations with

By all accounts, Julie had a great season. This past February, she competed at the World Championships in Portes-du-Soleil, Switzerland. Thanks Julie, and thanks MEC!

Flakes


THE INSULT THAT MADE A ROUND OUT OF A "PWL"
HEY! QUIT KICKING THAT SNOW IN OUR FACES!
THAT CRYSTAL IS THE WORST NUISANCE ON THE SLOPE
LISTEN HERE. I'D SMASH YOUR FACE··· ONLY YOU'RE SUCH A PERSISTENT WEAK LAYER YOU MIGHT FRACTURE AND SLIDE AWAY.
THE BIG BULLY! I'LL GET EVEN SOME DAY
OH DON'T LET IT BOTHER YOU, LITTLE FLAKE!
DARN IT! I'M SICK AND TIRED OF BEING A PWL! KRISTOL KLASSEN SAYS HE CAN GIVE ME A REAL METAMORPHISM! GAMBLE A STAMP AND GET HIS FREE BOOK!
ALL RIGHT! I'LL
BOY! IT DIDN'T TAKE KLASSEN LONG TO DO THIS FOR ME! WHAT BONDING STRENGTH! THAT BULLY WON'T SHOVE ME AROUND AGAIN!
LATER
WHAT! YOU HERE AGAIN? HERE'S SOMETHING I OWE YOU!
OH PWL! YOU ARE A REAL CRYSTAL AFTER ALL!
HERO OF THE SLOPE
GOSH! WHAT A BOND
HE'S ALREADY FAMOUS FOR IT!
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More Weight—Solid—In the Right Places
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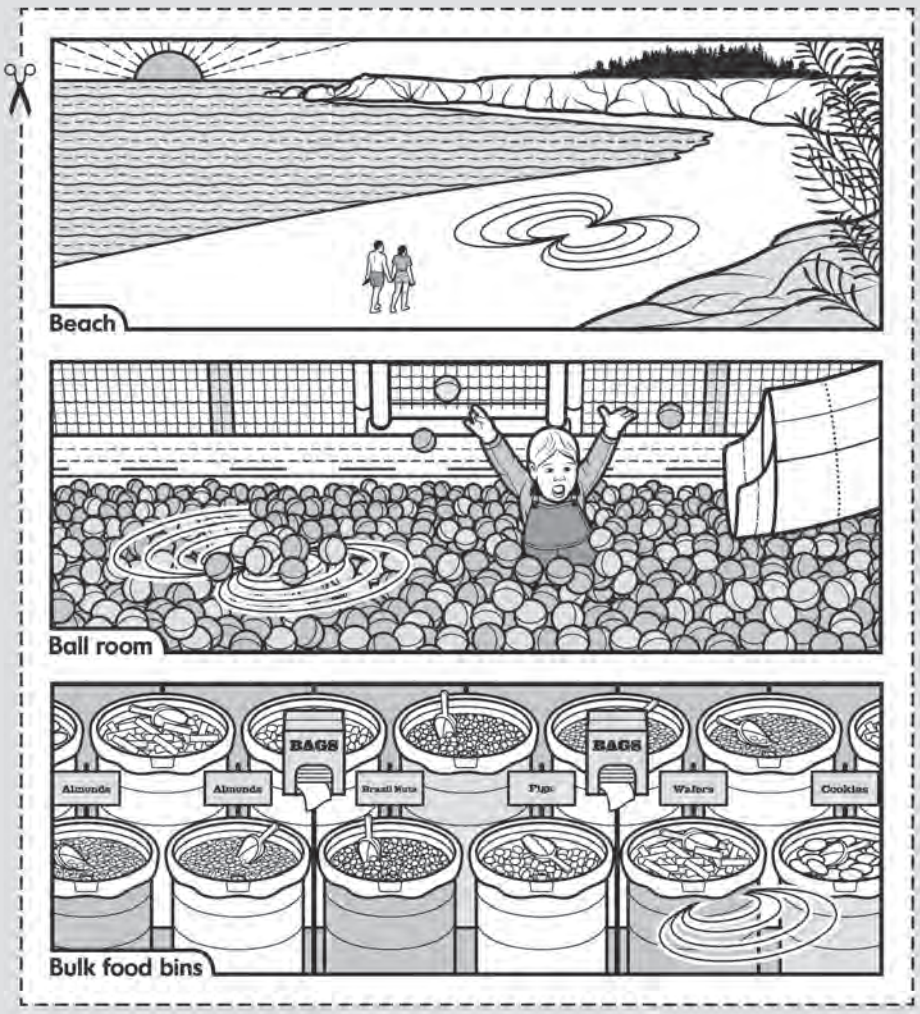
Print Name..... Age.....
Address.....
City & State..... Zip Code.....
In England: Kristol Klassen 91 Peland St., London, W.1



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