AVALANCHE news

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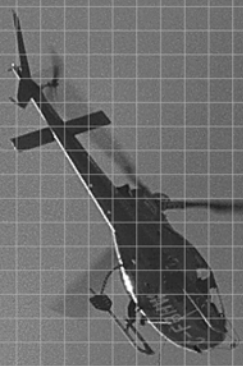
Volume 64 *Winter 2002-03*



inside

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Editor's View

What a winter for avalanche news! For many of us living in Revelstoke, the inkling that something had gone wrong was announced by the roar of many helicopters rushing overhead toward what could only be a rescue. Unfortunately that something was two tragic avalanches that claimed 14 lives in as many days. Fortunately, through the help of local rescuers, lives were saved in both accidents. The first few pages of this issue feature letters of thanks from Parks Canada, Selkirk Mountain Experience, the general public and a speaker at a local memorial.

For others living in Revelstoke, news that a major incident had occurred locally was broken to us by curious reporters that had been scanning radio channels. Their calls, and the onslaught of mobile TV studios only hours after each incident, were a surreal reminder of the importance of **media preparedness** before an avalanche strikes. Bruce Tremper has supplied us with his article "Winning the Media Game", which outlines skills that every avalanche professional should have in their tool kit.

This winter many people (particularly the media) were scratching their heads about the semantics of the danger scale and the risk of backcountry travel when conditions are rated "considerable". Peter Schaerer revisits the historical roots of the word "considerable" and Blyth Wright offers a European perspective called "**Considering Considerable**". Of course, one of the greatest unknowns with considerable conditions are deep slab instabilities, so we are also reprinting a research paper on deep slab instabilities that Ethan Greene and Greg Johnson presented at the ISSW 2002.

The Avalanche News has some news of its own – Janod Contractors and Vertec Contractors Inc., specialists in snow avalanche barriers and rock stabilization, have contributed funds to the CAA earmarked specifically to help publish the newsletter in-house and to update it to match the changing preferences of its readers. This ends 24 years of publishing the Avalanche News by the BC Ministry of Transportation, as outlined in an article by Peter Schaerer. Thank you BC Ministry of Transportation for sponsoring 63 volumes of this newsletter for several decades!

To find out how readers would like the Avalanche News to grow we sent out a survey in early February and received more than sixty responses. Thanks to all who participated. This growth will be lead by the new editor (this is not my day job), which is posted along with some other **CAA job openings** on page 59. One of the strongest messages we received from our Avalanche News survey was that readers, most of whom are ski guides (45%), value research papers and case studies above all else. In this issue we feature three research papers. We hope that our members can supply us with case studies for future issues. As always, we invite submissions of any kind. If you have any ideas, let us know by mailing editor@avalanche.ca.

Best regards,

Todd Beernink
Visiting Editor

Birth of the Avalanche News – 24 Years Ago By Peter Schaerer

The Avalanche News was the creation of the Avalanche Committee, formed in 1975 as a vehicle for coordinating concerns of avalanche safety in Western Canada. The members of the committee represented the four major organizations that were involved with avalanche work in Canada at the time:

- Peter Schaerer, National Research Council (Chairman)
- Ron Perla, Glaciology Division of Environment Canada
- Geoff Freer, British Columbia Ministry of Highways
- Dave Pick, Western Regional Office of Parks Canada, who was later replaced by Jim Sime and Willi Pfisterer

The Avalanche Committee decided to publish Avalanche News because others who were engaged in avalanche work in Canada had expressed the need to be informed about developments and to maintain contact with others working in the same business. Since BC's Ministry of Highways formed its Snow Avalanche Programs under the direction of Geoff Freer in 1975, they were the most interested in promoting avalanche safety so they decided to print and mail the first Avalanche News in 1979.

The first editor of the Avalanche News was Peter Schaerer. Janice Johnson, from the Victoria office of the Snow Avalanche Programs, served as the copy editor and supervised the printing and mailing. The publication was mailed to all highway maintenance employees who worked in avalanche areas as a means of educating them and keeping them informed. The Avalanche Committee eventually disbanded in 1980 and was superseded by the founding of the Canadian Avalanche Association.

We are thankful for the Ministers of Transportation and Highways, Geoff Freer and his successor Jack Bennetto, for their 24-year support of Avalanche News. The CAA now publishes the Avalanche News completely in-house, with the support of presenting partners Janod Contractors and Vertec Contractors Inc.

executive director's report

Executive Director's Report

These past few months have been tragic and turbulent times. In three months 16 people have perished in avalanches in British Columbia. Everyone involved with avalanche protection in Canada has been reminded that despite all the advances we have made in recent years, our challenges are not over. International publicity following the Durrand Glacier and Connaught Creek avalanches has impacted the entire Canadian avalanche community and raised public awareness of avalanche protection issues from coast to coast.

The tragedies of this winter have accelerated the CAA's evolution as the Canadian authority and resource centre for avalanche-related matters. During the past few weeks the CAA's President, Board of Directors, Committees, CAC staff, and numerous leaders from the avalanche, business and government communities have been moving quickly on a number of coordinated initiatives to improve avalanche protection in Canada. To everyone that pitched in to make things happen, thank you! Without your efforts, none of the good things that are happening would have been possible.

Although there are always unknowns and uncertainties, and while there will probably be both disappointments and pleasant surprises, I'd like to share the upcoming year's vision with you.

A key group of avalanche and industry leaders met in Golden in early February, 2003, to identify challenges and solutions for avalanche protection in Canada. They recommended a Canadian Avalanche Centre, with assured support from federal, provincial and other sources, to meet the expanding needs for core services, public education and warnings. This is our long-term goal.

At the direction of BC Solicitor General Rich Coleman, a multi-agency review to develop strategies and long-term solutions to address avalanche protection is underway. A review steering committee (comprised of representatives from industry, government and the CAA) recently met in Kamloops to discuss terms of reference, milestones and timelines, and project management requirements. The components of this review will include:

- Avalanche forecasting (including data and research gaps)
- Public education and awareness
- Development of funding options
- Partnerships with industry and governments (federal and provincial)
- Public warning services

The report from the review project manager(s) is scheduled for June 30, 2003. As part of this review, we will also be engaging the Alberta and federal governments to partner in these initiatives to provide care services, coordination, and adequate avalanche protection and support for all regions of Canada.

We are presently negotiating with CP Rail to endow the Canadian Avalanche Centre with a permanent office in Revelstoke, complete with fibre-optics links required for high-speed data transfer. This structure would serve as a memorial to the hundreds that died in avalanches near Rogers Pass at the turn of the century, CP Rail's heritage role in mountain tourism in western Canada, and their ongoing efforts to reduce interruptions to rail traffic caused by avalanches. If all goes well, it is possible that an unused portion of the Revelstoke railway station could be renovated and available for CAC occupancy by the end of August.

We will be issuing extra-ordinary Public Avalanche Bulletins, as required for the remainder of this winter season, using funds offered by the BC Provincial Emergency Program.

We will be working with Klaus Krannebitter, CMH, Jim Spencer, Canada West Ski Areas Association and others to set up an avalanche awareness program for youth based on a model developed by Klaus in Austria. This program is intended to bridge the gap between Snowsmart and the Recreation Avalanche Course (RAC) programs.

The Avalanche Education Review Committee report is being finalized and should be in the hands of the Education Committee and the CAA's Board of Directors by early April.

I believe we're all feeling intense pressure right now to do everything we can to get through the remainder of this winter accident free. Let's keep that intensity up by continuing to demonstrate the highest possible levels of professionalism and commitment to safety. Let's hope that spring comes early this year…

There are many other irons in the fire, and we're all doing our best at the CAA to keep our eye on the north star, and our map oriented. I welcome your thoughts or suggestions on how we can do better.

Stay safe,

Clair

Sincere Appreciation From Selkirk Mountain Experience

The avalanche at Durrand Glacier on January 20, 2003 has touched many in our community and in communities around the world.

On behalf of Ruedi and Nicoline Beglinger and **Selkirk Mountain Experience Ltd**. we wish to express our sincere appreciation and special thanks to our friends, our colleagues and associates, and those we did not know previously, for the exceptional efforts that were made during the rescue and for the support, friendship and understanding that we have received afterwards.

Alpine Helicopters Ltd., Kelowna
Avalanche Dog Masters of Kicking Horse Ski Area, Golden
B.C. Ambulance Service, Revelstoke
Campbell Helicopters Ltd., Abbotsford
Canadian Avalanche Association, Revelstoke
Canadian Mountain Holidays Inc., Revelstoke
Coroner Service of British Columbia
Golden & District Search & Rescue
Ministry of Transportation & Highways, Revelstoke
Peter Schlunegger
Queen Victoria Hospital (Doctors and Medical staff), Revelstoke
RCMP, Revelstoke
Selkirk Mountain Helicopters Ltd., Revelstoke
Selkirk Tangiers Helicopter Skiing Ltd., Revelstoke
Wintergreen Inn, Revelstoke

Family, friends, all the Revelstoke community and the mountain communities who all worked together.

Excerpts From the Revelstoke Memorial For "Those Who Lost Their Lives on Durrand Glacier"

By Monsignor John Dulong, January 2003

We celebrate seven lives today – we hold hands symbolically with seven very enthusiastic people, and with their families, their friends and strangers who have been touched by tragedy. They were seven people who lived their lives with vigour and enthusiasm.

We don't often stop to remember that the word enthusiasm, one of the most beautiful words of our language, means "one with the energy of God within them". It derives from Greek root words pointing to being inspired and possessed by the divine and so enthusiastic people give all they've got, they hold nothing back. It's a wonderful way of life. It's difficult, if not impossible, to stifle the ardor or dampen the spirits of people who believe passionately in what they are doing – they operate full throttle with a kind of faith that has been set on fire.

"Thanks for the way their enthusiasm inspires us to be so profoundly grateful for the extraordinary beauty of this mountain valley"

We give thanks for seven lives – lived enthusiastically – "with the energy of God within them." Thanks for the way their enthusiasm inspires us to be so profoundly grateful for the extraordinary beauty of this mountain valley where we live our lives in awe at the ever-changing grandeur of the mountains that surround us. Thanks for the enthusiasm of the thousands of people who venture into our backcountry each week and for the meticulous hospitality, care and service of all who guide and support their quest for beauty and adventure. Thanks for the lives of all who are dedicated to making both life and leisure safe and accessible for us all.

Avalanche Tragedy in Glacier National Park

by: Doreen McGillis, Parks Canada

On February 1, 2003, a huge avalanche swept into the Connaught Creek drainage of Glacier National Park and into the awareness of millions of Canadians. This avalanche accident attracted the attention of the nation. The seven victims of this avalanche were 15-year olds on a school field trip, and the accident happened less than two weeks after an avalanche that killed seven skiers in an area only 40 kilometres away.

All 17 skiers in the school group were caught in this avalanche, either partially or fully buried, and 10 survived. Two Association of Canadian Mountain Guides (ACMG) members were above this party, heard and saw the avalanche across the valley and tried to warn the group, but the avalanche hit them so fast they were unable to get to safety.

The rescuers, Abby Watkins and Rich Marshall, immediately skied down to the slide area and started to dig out those buried. The first person that they dug out called for help on his satellite phone, which mobilized a large rescue team. Then, as members of the group were freed from the slide, they helped dig out the others.

Upon hearing the number of people who were caught in this avalanche, the rescuers wondered how so many could be involved. Their answer came when they flew to the scene of the avalanche: It was huge. The fracture zone was about 800 metres wide and the run-out was more than a kilometre long.

The size of the rescue operation was also huge: more than 30 people, seven helicopters, six avalanche dogs and their handlers and dozens of support staff were involved. This was a multi-agency rescue, involving Parks Canada staff from three national parks, several local companies (Selkirk Tangiers Helicopter Skiing, Canadian Mountain Holidays, Selkirk Mountain Experience, Alpine Helicopters, Kokanee Helicopters, Shell Canada Revelstoke, Executive Flight Services), mountain guides, RCMP, tourists, medical staff and the Canadian Army stationed at Rogers Pass. Important services provided during the rescue included grief counselling, support to the families, media relations, transportation and logistical support.

Participating in such a difficult situation is very stressful. It is tragic that seven young people lost their lives in the accident, and the people of Revelstoke and Golden have shared this grief. The speedy rescue helped save the lives of the remaining 10 people in the group, and to quickly recover the victims.

The credit for the speed and efficiency of the entire rescue effort can be shared among all of those who participated in this rescue. Times such as these show how public safety professionals and volunteers truly rise to the occasion when called upon.

Photo courtesy of Parks Canada - Eric Dafoe

After all members of the Strathcona-Tweedsmuir party were located, rescuers continued to search for others who may have been in the area at the time. Here they are probing the snow and opening it up to air percolation to aid the search dogs.

The staff and management of Mount Revelstoke and Glacier National Parks would like to offer our gratitude and appreciation to all of the individuals and organizations who took part in the rescue efforts following the tragic avalanche of February 1, 2003.

Steve Blagbrough
Evelyn Enn
Scott Hicks
Shelly Jackson
Rich Marshall
Kathleen O'Toole
Goran Skuncke
Remi Thieverge
John Warren
Anders Blakstvedt
Kyle Hale
Clair Israelson
Peter Kimmel
Carolyn McBain
Steve Parsons
Tuulikki Tennant
James Vickers
Abby Watkins

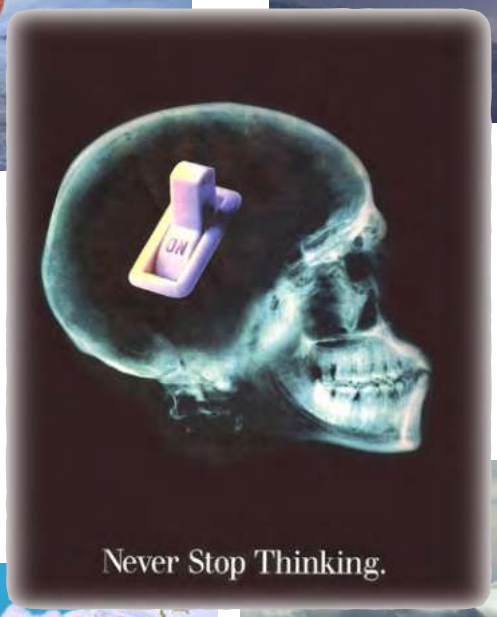
The staff of Alpine Helicopters Ltd. - Golden
The staff of Brandon-Bowers Funeral Home - Revelstoke
The staff of Canadian Avalanche Association - Revelstoke
The staff of Canadian Mountain Holidays Inc. - Revelstoke and Gothics
The staff of Executive Flight Services - Revelstoke
The staff of Kicking Horse Mountain Resort - Golden
The staff of Kokanee Helicopters - Revelstoke
The staff of Selkirk Mountain Experience - Revelstoke
The staff of Selkirk Tangiers Helicopter Skiing - Revelstoke
The staff of Shell Oil - Revelstoke
The staff of Yamnuska Inc. - Canmore
Royal Canadian Mounted Police (Revelstoke, Cranbrook, Nelson, Kamloops and Vancouver)
RCMP Revelstoke Victim Assistance Counsellors
British Columbia Ambulance Service (Golden and Revelstoke)
British Columbia Coroner Chuck Purse
2nd Regiment, Royal Canadian Horse Artillery, Petawawa, ON.

Please accept our sincere thanks.

Parcs Canada Parks Canada Canada

CAA Annual General Meeting

Meeting Dates: May 5-9, 2003
Location: Ramada Courtyard Inn, Penticton, BC
Contact: Evan Manners
Email: canav@avalanche.ca
Notes: Specific meetings are held May 5th and 6th. General meetings are 7- 8th, CPD seminar is May 9th. Special rate negotiated at the Ramada – $70/night single or double occupancy, larger suites available. Reservations recommended ASAP. Reservations at www.pentictonramada.com, ramada@img.net or 1-800-665-4966.



Know of an event that would appeal to CAA members?
Send info to canav@avalanche.ca

SAR*SCENE* 2003

Meeting Dates: October 15-18, 2003
Location: Kingston, ON
Contact: Lynn Tremblay, Registrar
E-mail: ltremblay@nss.gc.ca
Notes: SAR*SCENE* 2003 provides a forum for search and rescue (SAR) personnel to share expertise and experiences and to find out about new SAR technologies. More than 600 participants are expected from air, land and marine organizations across Canada – Department of National Defence, Royal Canadian Mounted Police, Environment Canada, Department of Fisheries and Oceans, Canadian Coast Guard, Canadian Heritage/Parks Canada, provincial and municipal governments, and numerous volunteer organizations. SAR organizations from other countries will also attend.

2nd Snow and Avalanche Workshop

Meeting Dates: April 15-17, 2003
Location: Sewell, Chile
Contact: Dr. Jose Vergara
E-mail: avalanchas@entelchile.net
Notes: Conference themes include avalanche engineering, avalanche forecasting, avalanche formation, avalanche modelling, avalanche disasters, avalanche rescue, mountain climates, operational analysis and forecasting in mountains, snow accumulation, snow-air interface, snow and ice engineering, and snow hydrology. Abstracts not exceeding 300 words are invited on these topics. Abstract submissions should include the paper title and the name and correspondence address of the author. Send submissions to: avalanchas@entelchile.net. A technical exhibition and a series of field trips will be held in conjunction with the conference.

5th International Conference on Snow Engineering

Meeting Dates: July 5-8, 2004
Location: Davos, Switzerland
Contact: Snow Engineering Secretariat
E-mail: snow2004@slf.ch
Notes: The Snow Engineering Conferences is an established forum for snow practitioners and researchers to present, discuss and exchange research results. Unlike other snow conferences, Snow Engineering is dedicated to the application of snow science to industrial and engineering applications. The sponsor of the conference, the Swiss Federal Institute for Snow and Avalanche Research SLF, Davos, is calling for papers. The deadline for abstract submission is June 30, 2003. For more information on the conference, visit www.snow2004.ch.
Tel: 1-800-661-0252 or (403) 762-7108
Fax: 1 (403) 762-5879
E-mail: marionkingsbury@cmhinc.com

Symposium of Snow and Avalanche in Warm Climatic Zones

Symposium of Snow and Avalanche in Warm Climatic Zones (SAWCZ) at Manali, India (third week of April 2004). First call for papers & participation in International Symposium Snow and Avalanche Study Estt. (SASE)
RDC Him Parisar
Sector 37A
Chandigarh
UT – 160036
Tel. No.: 0172 699804-06 Fax No.: 0172 699802
Email: afg_sase2000@yahoo.co.uk

The 3rd Canadian Conference on Geotechnique and Natural Hazards

Meeting Dates: June 8-10th, 2003
Location: Sheraton Hotel in Edmonton, AB
Contact: EBA Engineering Consultants Ltd.
E-mail: ngoldup@eba.ca
Tel: (780) 451-2121
Information: http://www.geohazards2003.eba.ca/
Notes: It follows the successful conferences in Vancouver in 1992 and Montreal in 2000, and will highlight recent advances in geohazard risk assessment and mitigation in Canada. A collection of keynote speakers, papers, and poster presentations will be incorporated into a two-day, single-session conference.

Letter to Prime Minister Jean Chrétien

Tuesday, January 28, 2003

Dear Mr. Chretien:

Thank you for your statement Monday expressing your condolences to the families of the victims of the recent avalanche tragedy near Revelstoke, British Columbia. Your interest and sympathy are very much appreciated by those who have experienced loss, and by all Canadians.

Canada is world famous for our spectacular wild places and snow. Snow avalanches are a deadly natural hazard that impacts the lives of Canadians from St. Johns to Vancouver. Avalanches effect inter-provincial transportation, industries such as forestry and mining, Canada's winter tourism industry, community buildings and homes, and the personal recreational activities of tens of thousands of Canadians. The annual dollar cost of avalanche protection in Canada has been estimated to exceed $50 million annually, and this cost is growing. The human cost of avalanche accidents cannot be measured.

The Canadian Avalanche Association (CAA) is a small non-profit society promoting excellence in avalanche safety for industry and recreation. We serve as the national voice and technical support centre for the Canadian avalanche community. In the past decade federal support from the National Search and Rescue Secretariat, Parks Canada, and the National Sciences and Engineering Research Council of Canada has helped to establish the Canadian Avalanche Centre in Revelstoke, develop Canadian technical standards and training programs for industry and recreation, conduct avalanche research, and assist with building avalanche safety capacity in Newfoundland and Quebec. On behalf of all Canadians, I offer our most sincere thanks. Together we have accomplished many good things.

"I believe we need to continue to invest in avalanche research... We need to educate Canadians"

As Monday's tragic accident illustrates, our work is not over. Snow covers most of Canada for half the year. Steep slopes are everywhere. Avalanche accidents are high profile events that generate questions about the security of Canadians, effect Canada's reputation as a winter tourism destination, and perhaps even call into question Canada's ability to successfully host events such as the 2010 Winter Olympics. In this environment, I believe there is an essential role for continued federal interest in avalanche safety in Canada.

I believe we need to continue to invest in avalanche research programs at universities in Rimouski, Calgary and Vancouver. We need to learn more about snow and avalanches so we can design better defenses for the safety and security of Canadians. We need to create capacity for transfer of technology and best practices internationally, and between western Canada and developing avalanche safety programs in Quebec, Labrador and Newfoundland, and the Arctic. All countries comparable to Canada ensure basic support to their national avalanche centre. We need to educate Canadians, especially young Canadians, to understand and live in harmony with nature.

I believe Canadians in all provinces are strongly supportive of ongoing federal interest to help manage natural hazards that impact their lives. I welcome any opportunity to explore how the federal government and the Canadian Avalanche Association can work together to achieve this common goal.

Clair Israelson
Managing Director
Canadian Avalanche Association

Reply From Prime Minister Chrétien

Dear Mr. Israelson:

On behalf of the Right Honourable Jean Chrétien, I would like to acknowledge receipt of your e-mail regarding avalanche safety.

You may be assured that your comments have been carefully reviewed. I have taken the liberty of forwarding your message to the Honourable John McCallum, Minister of National Defence, the Honourable Sheila Copps, Minister of Canadian Heritage, and the Honourable Allan Rock, Minister of Industry, for their information and consideration.

Thank you for writing to the Prime Minister.

K. Mayer
Executive Correspondence Officer
Agente de correspondance de la haute direction

Letter to Premier Gordon Campbell

January 22, 2003

Dear Mr. Campbell:

Thank you for your statement yesterday expressing your condolences to the families of the victims of Monday's avalanche tragedy near Revelstoke. Your interest and sympathy are very much appreciated by those who have experienced loss, and by all British Columbians. I also take note of your comments regarding avalanche safety in this province.

British Columbia is world famous for our spectacular mountains and snow. Snow avalanches effect provincial transportation, primary industries such as forestry and mining, our entire winter tourism industry and the personal recreational activities of tens of thousands of BC residents. Avalanches are the greatest natural hazard we face. Elsewhere in the world, government investment in essential avalanche safety infrastructure has been a standard practice for many years. BC's reputation as a secure place to live, invest, and vacation is undermined by the international publicity following avalanche tragedies. Avalanche accidents are bad for BC.

"Quick action involving all stakeholders would be a highly visible signal that the security of BC's visitors, businesses and residents is important."

To achieve BC's potential as a place to live, do business, grow as a winter tourism destination, and host the 2010 Winter Olympics, I believe we need to take a fresh look at avalanche protection in this province. I believe that government, industry, researchers and NGO's like the Canadian Avalanche Association need to act now to develop the tools we need for cost effective avalanche protection and warnings. I believe security issues are the public's number one concern right now. Quick action involving all stakeholders would be a highly visible signal that the security of BC's visitors, businesses and residents is important, and is being well managed. Failure to act now will also send a highly visible signal. Together, we need to do the right thing for the future of British Columbia.

I look forward to pursuing these ideas with you, or your officials, in the near future.

Clair Israelson
Managing Director
Canadian Avalanche Association

News Release From British Columbia Government

AGREEMENT REACHED TO REVIEW, ENHANCE AVALANCHE SAFETY

VICTORIA, BC February 16, 2003 – The government has reached an agreement to work with avalanche-related agencies and the winter recreation industry to make B.C. mountain areas safer, Solicitor General Rich Coleman said today.

"The recent and tragic loss of life due to avalanches has made it clear that we need to work together to make sure we do everything possible to raise awareness about the risks," said Coleman.

The minister and MLA Wendy McMahon met with the Canadian Avalanche Association and industry representatives this past week and agreed that a multi-agency review is needed to develop strategies and long-term solutions. The review will look at all aspects of avalanche protection, including forecasting, public education and awareness, up-to-date research and potential options for the avalanche bulletin.

"I've been working in avalanche safety programs for 30 years in Western Canada, and this is the most positive step I've seen happen in that time," said Clair Israelson, managing director of the Canadian Avalanche Association. "The B.C. winter tourism industry is vital to the economic health of this province, and whatever we can do to make it safer will benefit all British Columbians."

"The people of my community live every day with both the joys and dangers of winter recreation," said McMahon, MLA for Columbia River-Revelstoke "We are confident that this review will make people safer as they enjoy B.C.'s great outdoors." McMahon added that everyone has a responsibility to use good judgment and pay attention when participating in outdoor winter activities.

The organizations involved in the review are meeting with interest groups to determine terms of reference and the scope of the review. It will be completed by June 30.

Today's announcement follows the B.C. government's commitment last week to fund extraordinary risk advisory bulletins when the avalanche danger increases dramatically due to temperature inversions, severe weather changes or increased avalanche activity in a given area.

5th Annual Columbia Brewery Avalanche Awareness Days 2003

What happens when 30 mountain communities band together for avalanche safety on the same weekend? Accidents are prevented, lives are saved and more than $15,000 is raised to support the CAA Public Avalanche Bulletin!

On January 10th-12th, skiers, boarders, and snowmobilers were treated to free avalanche awareness education across BC & Alberta. CARDA dogs and handlers "wowed" folks with their skills, avalanche technicians spoke to curious participants about the snow pack and terrain. Marketing departments, bar managers, and concerned backcountry citizens threw parties, slideshows, auctions and raffles in support of the CAA Public Safety Programs.

Gracie, the avalanche dog and her handler dangle in mid-air for media

As part of a national awareness campaign, the CAA coordinates an exclusive media event. This year we went to Whistler. Special thanks to the Whistler/ Blackcomb Ski Patrol who treated the cameras to a dynamic, interactive display of explosives control and rescue demonstrations. The press conference received excellent national and regional coverage highlighting the personal messages of the CAA, Brian Savard (Whistler Freeride Team), Paul Smith (Columbia Brewery), and Canadian Avalanche Foundation Director, Justin Trudeau.

The success of this annual event depends solely on the efforts of good people who share a common concern for public avalanche safety. "It's not often we see our ski resort, Parks staff, sledders and local businesses all singing off the same page. It's clear that avalanche safety is an important issue for our town," explains Todd Beernink, volunteer coordinator for the Revelstoke events.

The CAA would like to thank these communities and good corporate citizens for spreading the word about avalanche safety :

- ***Whistler (raised $10,325)***
- ***Revelstoke (raised $3400)***
- ***Pemberton Snowmobile Club (raised $1125)***
- ***Big White (raised $882)***
- ***Apex (raised $450)***
- ***Kimberley Ski Resort (raised $400)***
- ***Glacier National Park (raised $200)***
- ***Mt. Cain (raised $144)***
- ***Fernie (raised $130)***
- ***Grouse Mtn. (raised $130)***
- ***Castle Mountain Resort***
- ***Nakiska Resort***
- ***Fortress Mountain***
- ***Ski Smithers***
- ***Cypress Mountain***
- ***Mt Baldy***
- ***Panorama Mountain***
- ***Red Mountain***
- ***Silver Star Mountain***
- ***Sun Peaks***
- ***Kicking Horse Mountain Resort***
- ***Marmot Basin***
- ***Mt. Seymour***
- ***Norquay – Ski Banff at Norquay***
- ***Whitewater***
- ***Lake Louise Ski Area***
- ***Sunshine Village***
- ***Mike Wiegele Heli Skiing***

Justin Trudeau accepts cheque from "Avalanche of Support" team captain, Paul Smith from Columbia Brewery

How Did Columbia Brewery Avalanche Awareness Days Go In Your Community?

Success at Apex! Our "Avalanche Awareness Days" special event at Apex Mountain Resort was very successful. We had a video / slide show with Charles Wood, CWSNOWPRO, on both Friday and Saturday nights. The attendance and feedback was excellent. On Saturday and Sunday, our head forecasters, Lyle and Charles, ran beacon searches for prizes and handed out related avalanche safety information. During après-ski, both Saturday and Sunday, in the Gunbarrel Saloon we held 50/50 draws, raffles for prizes, as well as auctioning off trail signs. The total funds raised for the CAA were $450!
– Myleen Mallach, Guest Services Manager

Panorama Participates! Our events here at Panorama are getting bigger each season. We had ski demo days on the same weekend which helped draw a more diverse crowd to the base area. Posters were put up in all high traffic areas of the resort. Pamphlets and danger cards were available in the on-mountain food outlets (and still are). During the weekend we had a booth at the base of the mountain where the public could learn about and try avalanche beacons. There was a display of typical backcountry equipment. The local Canadian Avalanche Rescue Dog Association (CARDA) handler from our patrol was also available and giving demonstrations with her dog.
– Andrew Nelson, Avalanche Forecaster

Mike Wiegele shows Support! Celebrated from the first time in Blue River, our efforts included a large poster display at the lodge and post office, newspaper coverage, nightly announcements and information in our dining room at dinner, and an educational session for the two classes at Blue River Elementary. The posters highlighted the work of the CAA and the various arms of the CAC. We also created an awareness poster that touched on the 'red flags' to watch for when it comes to instability in the snowpack. Our guides spoke to students about what they do, how we avoid avalanches, and allowed the students to use some of the avalanche safety equipment. We offer a program that takes local intermediate and secondary school students heli-skiing on Saturdays. They have become quite proficient with the standards we use for avalanche rescue. We look forward to hosting another Avalanche Awareness Days event next year and hope to continue to spread the message of avalanche awareness throughout the rest of this season. At Mike Wiegele Heli-skiing we are committed to furthering education in this field and this event was a fantastic way to do that.
– Chelsey Walker, Guide

Poker Runs Rocked in Pemberton & Revy!

Representatives from our generous sponsors (from left to right) BC SAR-Stuart MacDonald, SOS-Richard Rotteveel, Marmot-AL Safrata, Janod-Daniel Journeaux, Vertec-Peter Perreault, & MEC-Andrea Harris…and Uncle Clair!

Whitewater Races for Avalanche Safety! Avalanche Awareness Days was a big hit at Whitewater on Sunday. Sponsored by Whitewater Nelson Search and Rescue, and supported by many local merchants, this event helps educate the powder seeking public of the risks and responsibilities of winter recreation. Avalanche awareness poster competitions, avalanche safety videos, a large tent and information display, and snowpack and beacon sessions were all part of the festivities. We held the third annual Backcountry Skills Race that involved skinning up about 250 meters of ski hill, finding a transceiver, and then constructing a toboggan. The toboggan was then used to sled a team member down the cat-track to the finish line. Toboggans had to be constructed from equipment that one would easily carry in a backcountry pack. This year the prize was, once again, a day of cat-skiing with Retallack Resort and Nelson SAR took the trophy away from last year's champions, Whitewater Professional Ski Patrol. *–Monica Nissen, Nelson SAR*

Kicking Horse Bucks into Safety! Our efforts to reach the public were quite successful this year, thanks to our enthusiastic patrollers and volunteers! We set up an area in the lodge with explanations of our boundary and avalanche signs. There was a

collage of pictures of an avalanche scenario in size 2 debris with a headline reading "Poachers Beware!" Posters from three different grade two classes were on display; these kids seemed to get most people's attention with messages far stronger than anything we could portray. On hill, we held beacon and probe demos and competitions while our level two patrollers were kept busy pointing out avalanche terrain and snow crystals in a test profile. There were also CARDA demonstrations with live burials; poachers working on getting there passes were used as victims (nothing like sitting in a cold, dark hole to drive a message home). We also had poachers posted along our north boundary doing beacon checks and informing public on avalanche safety.

We had phenomenal support from local businesses, there were a tonne of prizes to go round! Our local watering hole, The Roadhouse Tavern, is now donating a percentage of their beer sales on Fresh Meat Mondays. Good things are definitely happening in Golden!

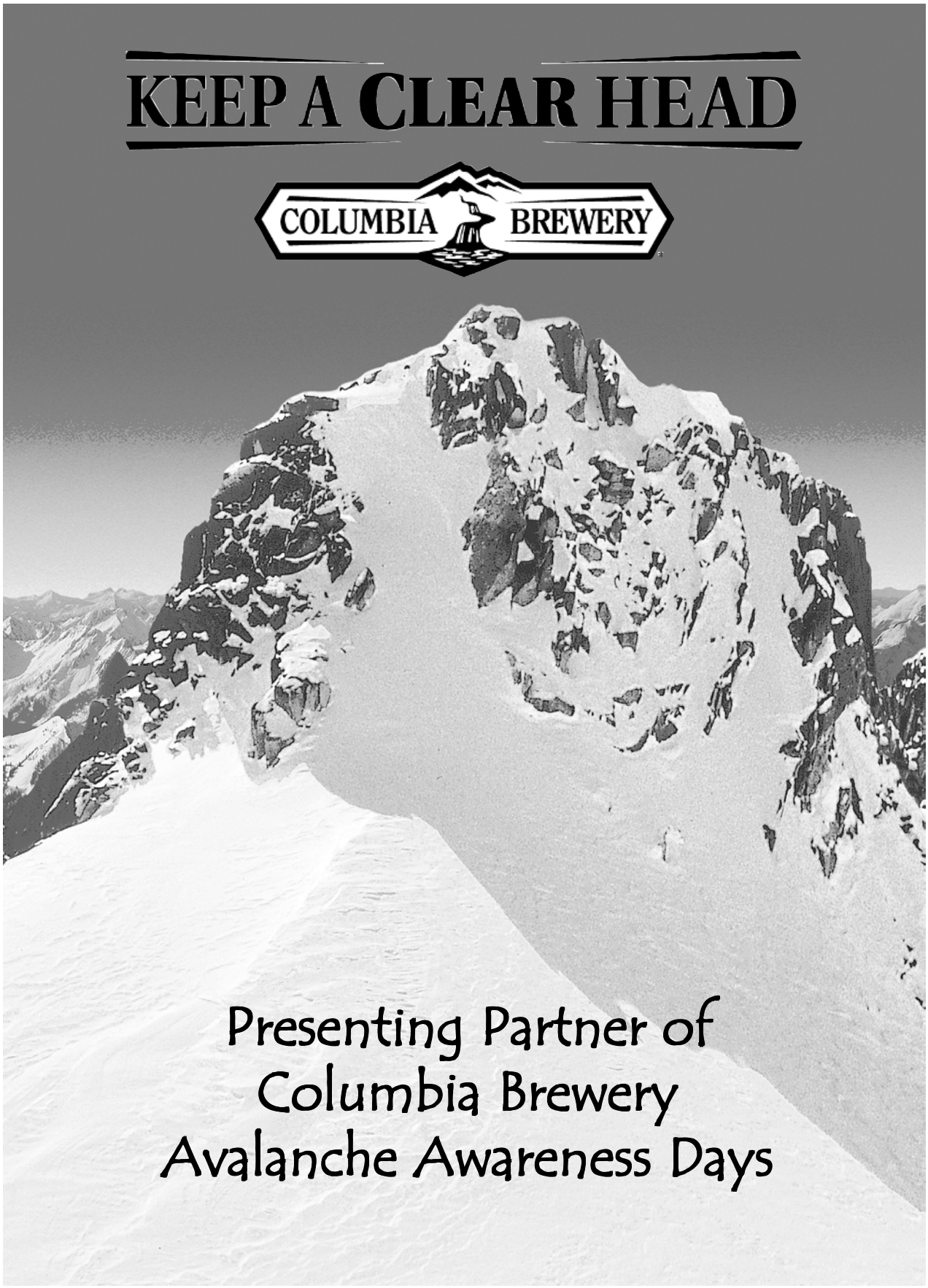
– Amy Barret, Snow Safety

Pemberton Poker Runners hangout to see who had the best Hand!

Revelstoke Sets Record! About 275 snowmobilers, skiers and boarders came out to Revelstoke's events to learn about safe travel in avalanche terrain and to show support for the CAA. Friday night, about 100 people packed into the Woolsey Creek Café for "Mountain Slide Fest", featuring Owen Day's "Avy Daze" compilation of avalanche footage and a slide show by *Powder* Magazine's senior photographer Dave Heath, followed by Calgary funk band "Recipe from a Small Planet". On Saturday, about 60 sledders met with local avalanche experts outside the Boulder Mountain cabin for the "avalanche poker rally", where they could see the basics of avalanche prevention and rescue techniques in about an hour. On Sunday, skiers could choose from events at one of two venues: Powder Springs Resort and the Rogers Pass Discovery Centre. While Powder Springs had events for youth, Bruce Jamieson, Park Wardens, and representatives from the Avalanche Control Service spoke to backcountry skiers in the Pass. The Avalanche Control unit of the Department of National Defence displayed the 105 mm Howitzers they use along the TransCanada, which drew a few curious people off the highway. Roughly a third of the funds raised in Revelstoke came in the form of a straight cash donation from the Revelstoke Snowmobile Club and the Revelstoke Snowmobile Society. "Once again, we were blown away by the support of local snowmobilers!" ***– Todd Beernink, Volunteer***

Through awareness and education, more people will not end up here!

Next Year's Dates are Jan 9-11, 2004
Start Planning Your Event Today!
Contact the CAA for more info (250) 837-2435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Avalanche Awareness Days

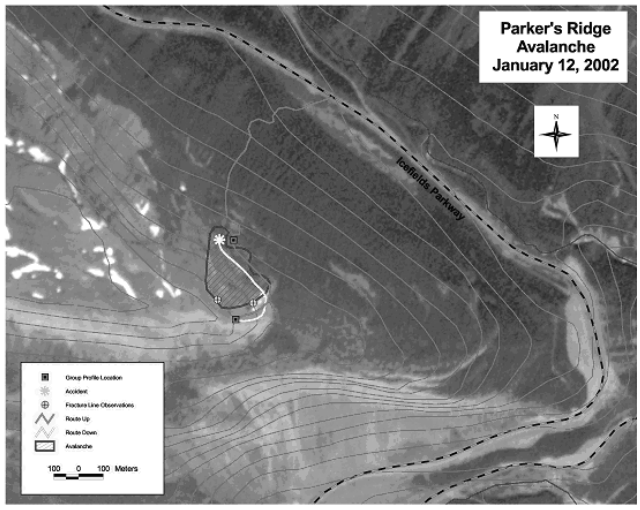
Organizational Implications of Avalanche Fatalities by Steve Blake

1. Preface

This paper has been adapted from a presentation first made at the Canadian Avalanche Association general meetings. It attempts to capture the themes of the presentation although the original intent was not for publication in this format.

On January 12, 2002 three park wardens were conducting routine snow and avalanche observations in the Parker Ridge area near the northern boundary of Banff National Park. At approximately 14:30 Jasper Emergency Dispatch received a broken radio transmission: an avalanche from above had overtaken all three men. The report came from one of the three who was able to free himself from the debris. Immediate companion rescue efforts were initiated. One warden was located in 4-6 minutes and was uncovered, unconscious and not breathing. Immediate AR was able to produce spontaneous breathing. As is often the harsh reality, the search for the final missing person was not to be as fortunate. He was uncovered 25 minutes after the avalanche hit, buried under 1.5 metres of snow. CPR was initiated and an organized rescue response followed. Despite tremendous efforts at the scene and later in hospital he died from his injuries. A husband and father of a two-year-old son, Mike Wynn was 37 years old.

1.1 Air Photo Map of Accident Location



Brad White

2. Introduction

Avalanche fatalities have far reaching implications beyond what many individuals and organizations consider. Not intended to be a complete list, the following items are presented to provoke thought and to help develop awareness. While it pays to be prepared for the worst, accident prevention must always be the focal point of any organization.

3. Considerations

3.1 Expense

Direct costs of this avalanche rescue operation with helicopter support, multiple ambulances, investigations and incidentals exceeded $40k. This figure does not account for wages of employees during the operation or for the weeks of time spent during the subsequent months of related follow-up work.

The actual cost to "replace" a fully trained person in an organization would fall into the $1-2 million range. The most significant cost however, that being the human cost, is immeasurable.

3.2 Media Relations

The death of an employee significantly stresses the capabilities of any organization. The media attention surrounding such an event can easily transform this stressed state to an overwhelmed state. Media attention surrounding the Parker Ridge avalanche encompassed at least 5 on-camera television interviews, 15 newspaper interviews and no less than 12 radio spots. Follow-up interviews were still taking place the week prior to this paper's original presentation, four months after the incident.

The message regarding the media is simple. Be prepared. Reporters have a job to find stories and present them in a interesting fashion to viewers/listeners/readers. If the story is noteworthy it will receive attention. If your organization is not prepared or willing to deal effectively with the media, they will keep looking. While you do not want to hide the facts regarding an incident you do want to present your perspective on the story. If you fail to satisfy the curiosity of the media by being evasive or not forthcoming with details, they will go elsewhere in search of the story. They may end up finding an alternate perspective that may not portray your operation in a favourable light.

Media relations is a subject of its own worthy of a dedicated paper. There are many training providers available that can assist your organization with a media preparedness plan.

3.3 Technical Investigations

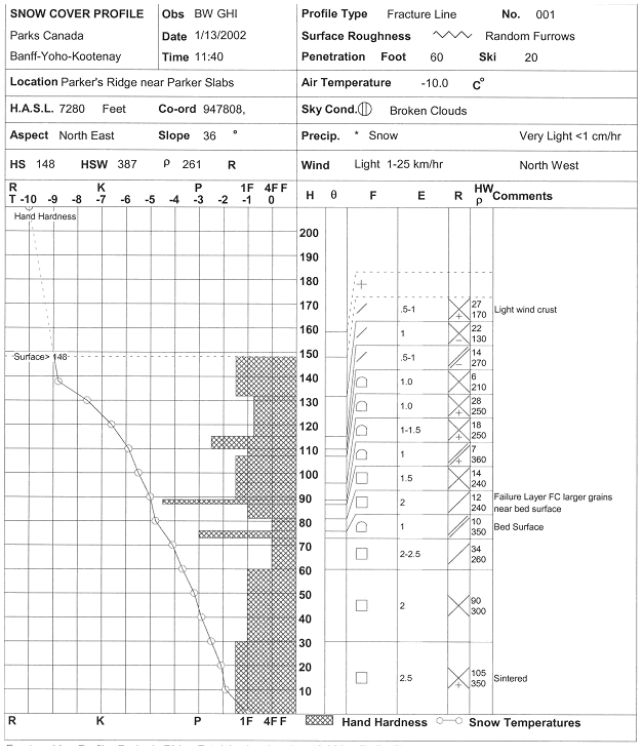
After the field component of the operation has been concluded several levels of investigation take place. The details of the incident are examined in an attempt to answer the question, "why?"

Avalanche professionals from other national parks as well as the Canadian Avalanche Association conducted the technical investigation for the Parker Ridge Avalanche. Fracture line profiles, weather history, a site visit and photographs were used to help determine causative factors.

The investigation revealed the following details regarding the accident:

- NNE aspect
- Incline start zone 34-38 degrees
- Crown width 300 m
- Crown Depth 30 - 124 (average 60cm)
- Size 2.5
- Failure layer: 4F facets size 2
- Compression test results: H(22)@70 cm
- Snow Stability Rating: Fair

3.3.1 Parker Ridge Fracture Line Profile



Fracture Line Profile: Parker's Ridge Fatal Avalanche, Jan 12 2001. FL Profile #1 taken at apex of slide crown in medium depth area approximately 1.5 metres back from crown. Crown varied from 30-90 cm across the top with maximum depth 110 in one spot. Crown depth 55cm at profile site.
Test Results: CTE(9) @ 115 on top of thin wind layer. CTM X 2 (12,17) @ 107 on FC 1-1.5. CTH(22)@ 76 on FC 2 chains above bed surface. CTM 14 @ 73 on FC 2 below crust once crust cut.
Suspect bed surface as remains of November crust but no evidence of melt freeze in his location.

3.4 Labour Canada Investigation

Various levels of government, depending on jurisdiction, may be called upon to conduct a microscopic analysis of your operation. In the case of the Parker Ridge avalanche **all** documentation regarding the job, operational plans, training records, procedures, protocols and staff orientation materials is being reviewed by Labour Canada. The depth of the review is such that findings are not expected for at least one year's time.

3.5 Legal Liability

Workplace avalanche fatalities as with any accident involving clients represent a significant legal liability concern for the employer (not to mention the criminal charges that may be brought forward by the Workers Compensation Board and/or Labour Canada). The chances of a lawsuit have become almost a certainty. Organizations can help protect themselves by diligent record keeping and by following industry established best practices. Use of comprehensive waivers remains prudent though they do not exonerate organizations from responsibility. Post accident information management becomes paramount. Retaining legal counsel should be an automatic response by the organization in question

3.6 Administrative Review

An entirely different form of investigation, Jasper National Park performed an "Administrative Review" of the accident. Broad in scope, this amounted to a critical examination of the Park's entire avalanche program.

The Administrative Review was specifically tasked to identify policies, practices or procedures:

- That contributed to positive outcomes and should be continued.
- Where modifications may reduce the risk of future incidents.

The scope of the review includes training, certification, equipment, communications, planning, policies for risk operations, employee/survivor support and assistance, etc.

3.7 Case Studies

Following the discovery of the details of the incident the information is then summarized and presented at meetings and workshops and published in reports and books. This information is intended to be used to further our collective knowledge, that is, for us to learn from and to teach to others.

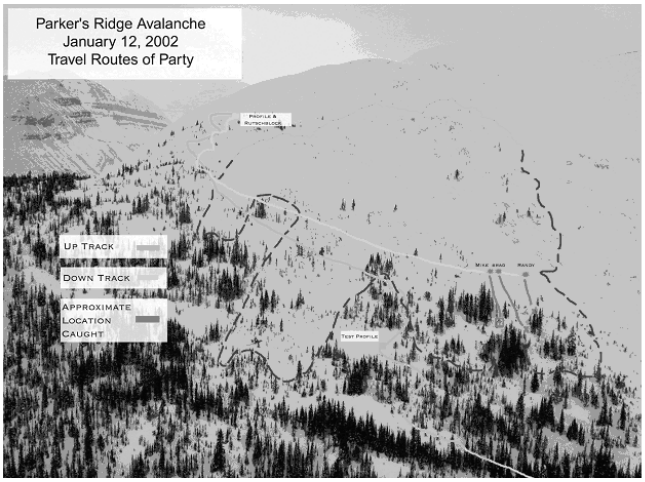
The specifics may read like this when presented as a case study: Three park wardens made a ski ascent in the Parker Ridge area to do snow profile observations adjacent to a highway control path. All carried standard safety equipment including beacon, probe and shovel. One member of the party had received avalanche awareness training while the others had completed the CAA Level 1 and Level 2 respectively.

On their descent the three men traversed a low angled terrace below a steep headwall and above an area of dense forest. At this point an avalanche was triggered and all 3 were caught and buried. One man was able to free himself, he then located the second man who was almost completely buried, unconscious and non-breathing. Artificial respiration was performed until spontaneous breathing occurred (2 minutes). At this point the search began for the third and final person. On uncovering the final man, CPR was initiated immediately although the awkward position of the subject made chest compressions difficult. Organized rescue efforts followed and the subject was transported to Calgary where he later died from his injuries.

The particulars of the January 12, 2002 Parker Ridge Avalanche:

- Depth of burial 1.5 metres.
- Time of burial 25 - 30 minutes.
- Subject unable to exchange air (no ice mask).
- No physical trauma.

3.7.1 Accident Scene Photo



Brad White

3.8 Workload Disruption

Depending on the circumstances an organized avalanche rescue operation can take anywhere from minutes to days to complete. Many organizations with emergency response mandates can participate in a serious rescue and be ready for another later in the same day. When the incident involves emergency responders a significant portion of your energy and resources will be required to handle the immediate increase in workload. Media relations, investigations, operational debriefings and many other incidental tasks that are direct fall-out from the accident, combine with a net decrease in employee's productivity. Many individuals are simply trying to cope with the stress of the situation, let alone further the goals of the operation.

3.9 Psychological Follow-up

This accident affected all of the park employees, some profoundly. The park's avalanche control operations and emergency response duties must be maintained following an incident such as this. Key people within the operations of an organization, many of who where closest to the event, remain the key people and are expected to be ready for further emergencies as they arise.

Management requires some level of assurance that employees are "fit" to return to work. Many individuals need to take time off to rest, reflect and grieve while others prefer to immediately return to work. At one point the question was asked of me, "Is this staff member ready to return to work?" Who is to say I was fit to be at work let alone evaluate the fitness of others? The use of common sense and good judgement will often lead to appropriate solutions. However, professional consultation must also be considered to guide your approach. Even then, who really knows what course of treatment will best suit each of the individuals involved?

The emergency responders, along with their spouses and families require immediate treatment to protect against Post Traumatic Stress disorders and to safeguard their own long-term health. This combines to insure the overall health of the organization.

A reference document regarding psychological services is being developed for use in future incidents. This document will outline practices intended to safeguard individuals mental and emotional health by summarizing the lessons learned.

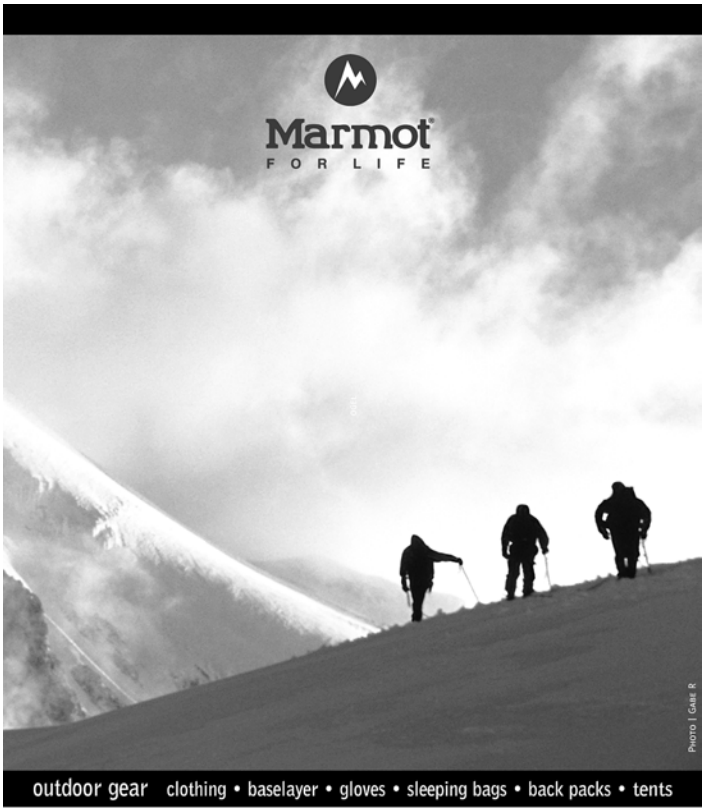
3.10 Spousal Considerations

Mike is survived by his wife and two-year-old son. They lived in staff accommodation 72 km from town. Mike was the main wage earner in the family and a career warden. The future can only be a frightening and empty place for someone in this situation.

There were several questions left to park mangers. What was the park responsible for in terms of housing and relocation and what of future employment opportunities? Thankfully insurance was in place and Worker's Compensation will provide steady income for several years to come. Financial considerations however are only one aspect of the big picture. When does the involvement of the organization constitute an appropriate helping hand and when does in become meddling? It is a fine line indeed when dealing with people's lives and emotional well being. There seems to be more questions than answers when attempting to comfort/console/guide grieving loved ones.

4. Summary

Fatal avalanche involvements continue to be a reality in the Canadian avalanche industry. Training courses have and will continue to focus training efforts on developing safe practices and risk management strategies for professionals. Organizations too must develop an awareness of the greater implications of avalanche accidents. The above list attempts to introduce some of the operational implications of avalanche fatalities. While no organization can ever be fully prepared for avalanche fatalities some basic steps can be taken to help them manage in the event of such a tragic situation.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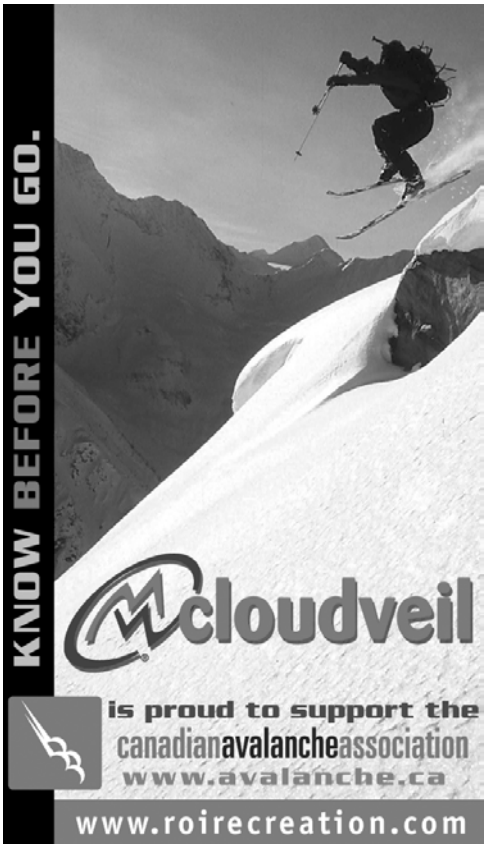
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December 20, 2002

Mr. Robert Kennedy
Alexander, Holburn, Beaudin & Lang
PO Box 10057
Vancouver, BC
V7Y 1B8

Dear Robert:

Re: Legal services supporting the Canadian Avalanche Association

On behalf of our Board of Directors, membership, staff, and partners in avalanche safety, I would like to take this opportunity to publicly recognize your many years of pro bono assistance to the Canadian Avalanche Association (CAA).

As a relatively small non-profit society dedicated to promoting excellence in avalanche safety, the CAA has relied on your expert advice to guide us as we deal with the complexities of managing risk associated with our operations while at the same time maintaining high ethical standards. Your knowledge and experience with legal issues associated with recreation and commercial operations in mountainous environments is unparalleled, and we have benefited tremendously. Your most recent contribution, developing new agreements, waivers and other public documents for the CAA's Recreational Avalanche Course programs required a significant amount of time and energy from you and your staff at Alexander, Holburn, Beaudin & Lang. We are extremely pleased with the results of your work.

As CAA President, I would like to take this opportunity to extend a most sincere and heart felt "Thank You" for all that you have done for this association over the years.

Yours truly,

Bill Mark
President
Canadian Avalanche Association

Cc Editor, Avalanche News

Alberta address: P.O. Box 5000, Banff, AB T1L 1J7

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January 2, 2003

Reply to: Robert B. Kennedy
Direct Line: (604) 643-2426
E-mail: rkennedy@ahbl.ca
File No.: n/a

Canadian Avalanche Association
Box 2759
Revelstoke, B.C.
V0E 2S0

Attention: Bill Mark,
President

Dear Bill:

I am writing to thank you for your letter of December 20, 2002, which was very much appreciated. I have always considered it to be a great honour to be associated with the Canadian Avalanche Association, and I look forward to continuing to work with the Association in the years to come.

Please extend my regards to the Board of Directors and accept my wishes for a successful and safe 2003.

Kindest regards,

ALEXANDER, HOLBURN, BEAUDIN & LANG

Per:

Robert B. Kennedy

RBK/atd

cc: Canadian Avalanche Association
Attn.: Clair Israelson,
Managing Director

OGRS Update – Highlight of Changes Since 1995 by Rob Whelan

In 2001 the Board of Directors identified the revision of the Observation Guidelines and Recording Standards for Weather, Snowpack and Avalanches (OGRS) as a priority. They tasked the Technical Committee with the revisions, who in turn recommended a working group, comprised of J. Goodrich, S. Gould, B. Jamieson, T. Riley, R. Whelan, and D. Wilson. Chaired by Doug Kelly, the working group reviewed feedback from users and updated the appendices. The working group's changes were reviewed by D. McClung, B.Sayer and S. Walker. Final revisions were compiled by R. Whelan and B. Strand; translation into the French language was by M. Deschenes. The final revisions were approved by the Technical Committee in May 2002 and the current edition was printed in December of 2002. Future directions may include a new XML data transfer standard and compression test "qualities" per Jamieson et al.

Below is a summary of the more significant changes that would be of use to field staff:

- Page 2 section 1.4.3 **SKY CONDITION:** A new symbol for up to 2/8ths cloud cover - (Few Clouds) to align with WMO metrological standards
- Page 5 section 1.4.8 **SNOW BOARD NAMING CONVENTIONS**:
  Standard : Measured & cleared at each standard observation, once or twice daily depending on the operation
  Twice a day (H2D): Measured & cleared at the end of each standard observation, *if* the operation uses 2 standard observations/24 hrs.
  24-hour (HN24): Snow deposited in past 24 hrs, cleared in the morning
  Interval (HIN): Definition unchanged
  Intermittent (HIT): Definition unchanged
  Shoot (HSB): Definition unchanged
  Storm (HST): Definition unchanged
- Page 19 section 2.1.6 (c) **GRAPHICAL SNOW PROFILE REPRESENTATIONS:** "Use of the graphic symbols for hardness is optional"
- Page 41 section 3.4.4 **BED SURFACE: G -** "The avalanche released at the ground, glacial ice or firn" - to include avalanches that release with glacier ice as the bed surface.
- Page 52 section B4.5 **REPORTING AVALANCHE INVOLVEMENTS:** New categories for partial burials - *partial burial-not critical* (breathing not impaired) and *partial burial-critical* (some part of the body exposed but breathing impaired)
- Pages 53-58 Appendix B **LONG AND SHORT REPORT FORMS:** Numerous formatting and reporting requirement changes.
- Page 74 Appendix G - **SNOW STABILITY RATING**: New matrix. Column 2 is the comment on snow stability. Columns 3 & 4 are for determining the triggering level - pay particular attention to the column heading for inclusions and exclusions. Column 5 is results of stability tests. Additional notes, definitions and examples to clarify terms used in the rating system.
- Page 78 **SNOW PROFILE FORM:** Rearranged the header, deleted water equiv, avg density. Included space for a description of the site characteristics in the header. Expanded the temperature scale, added more room for comments, and space at the bottom for total HS.

Thanks to all those members who attended OGRS revision meetings, deliberated and critiqued the drafts for these revisions.

Copies of the latest OGRS have been printed on waterproof / tearproof paper. They can be purchased for $30 (includes tax) through the CAA's on-line store at www.avalanche.ca or by calling the CAA at (250) 837-2435.


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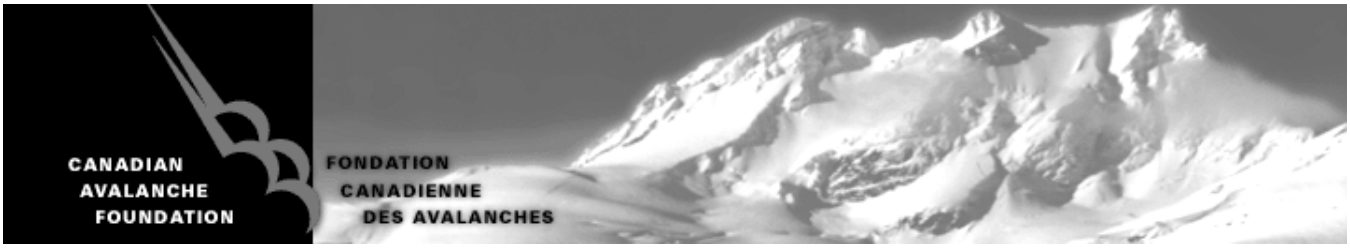
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ROI Thanks Supporters of CAA Fundraiser
February 19, 2003

Montreal, Que. – Recreation Outfitters Inc. (ROI), distributors of Cloudveil apparel and gloves, Scarpa footwear, Deuter backpacks, Twenty–7 gloves, Solar Silk underwear and E3 Footgear hosted a fundraiser raffle and party at Montreal's National Snow Industries Association (NSIA) show for the CAA. The evening raised more than $350 for the CAA, but more importantly, it raised the profile of the organization with the Canadian snowboard and ski industry throughout.

"The support from the industry when asked to contribute prizes to the event was phenomenal," said Russ Angrignon, Director of Sales for ROI. "We had originally planned to do a smaller event, but we decided somewhat last minute to approach the industry as a whole to raise more money and awareness. Everyone definitely enjoyed themselves and we will be doing it bigger and better next year, no doubt about that."

On behalf of the CAA, ROI would like to thank the following companies for their very kind support. These companies responded well and they should be congratulated.

- Victorinox Knives and Accessories
- Tubbs Snowshoes
- Smith Goggles
- Bolle Sunglasses
- Craft Underwear
- Da Kine Backpacks
- Kayland Boots
- Rudy Project Sunglasses
- Fischer Skis
- Sugoi Apparel
- Arc'Teryx Equipment
- Asolo Backpacks
- Lafuma/Millet Apparel and Backpacks
- Big Bang Products – 180º Gloves and Accessories
- Elan Skis
- Bugaboo Sunglasses

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Heli-Ski Weekend as a Fundraiser For the Canadian Avalanche Foundation

The Canadian Avalanche Foundation was formed to raise funds so that a daily bulletin giving the latest snow stability and avalanche conditions in the mountains of Western Canada could be produced and disseminated widely to the general public. Such Public Avalanche Bulletins have been in use for many years in the Alpine Countries of Europe and have been a large factor in reducing avalanche fatalities by as much as 50%. In these countries the bulletin is funded primarily by the respective governments. In Canada the government contributes 16% at most, and last year's funding was cut to 3.2%.

The Canadian Avalanche Foundation consists of a seven member volunteer Board of Directors, and one part-time office administrator.

As our major fundraising activity this winter season we are offering a Heli-Skiing Weekend at one of the Canadian Mountain Holidays (CMH) heli-skiing lodges for a maximum of 18 skiers. Justin Trudeau and Hans Gmoser, both foundation directors, will host this weekend. The lodge of choice will depend on the status of regular bookings at the time and a final decision was to be made at the end of February 2003.
Our guests will be met on Saturday April 12th, 2003 at the Delta Airport Hotel in Calgary and then flown by private plane to the airport nearest the heli-skiing area. They will spend three nights at the lodge with double accommodation, all meals and two and a half days of heli-skiing (Sunday, Monday and Tuesday morning) with unlimited vertical meters and use of special heli-skis in two groups of nine skiers, utilizing a Bell 212, twin-engine helicopter just for our group. A CMH guide will accompany the group. The return flight to Calgary, on April 15th, will arrive at 16:00.

This offer is limited to 18 participants on a first come first serve basis. With only two small groups we are able to accommodate the very keen skiers as well as those who would want to ski at a slow pace. We will have two additional guides on standby should there by a wide range of skiing abilities and/or desires. With one helicopter servicing the two groups there will be no waiting.

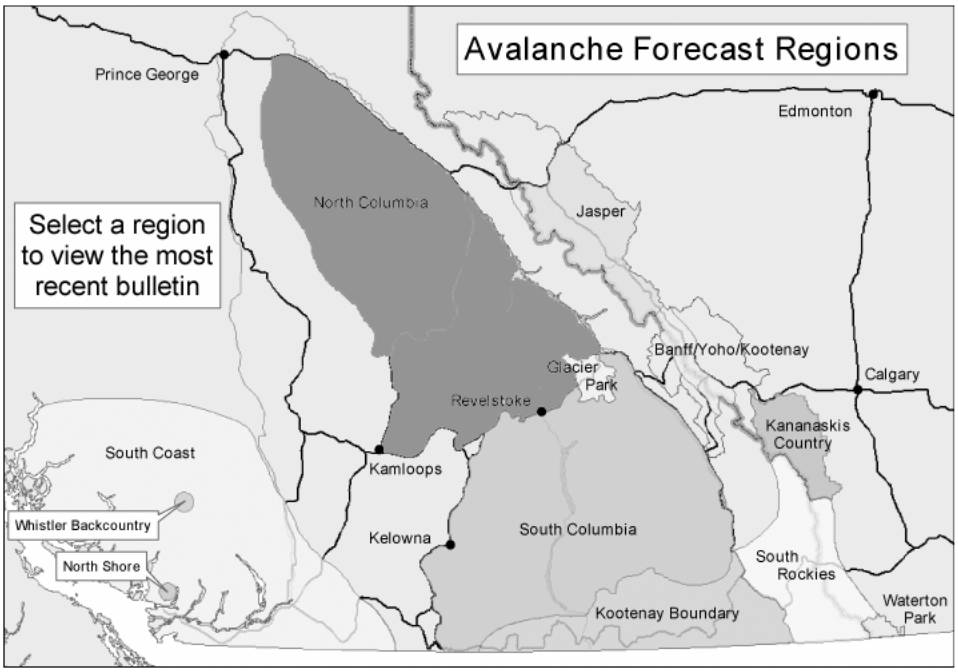
The cost for this weekend is $5000 CDN per person and participants will receive a tax receipt for $3000 CDN.

For reservations please contact Marion Kingsbury at CMH:

Tel: 1-800-661-0252 or (403) 762-7108
Fax: 1 (403) 762-5879
E-mail: marionkingsbury@cmhinc.com

New Public Avalanche Bulletin (PAB) Areas by Evan Manners

Avalanche Bulletins are now issued by the CAA three times weekly, on Mondays, Wednesdays and Fridays. Along with this increase in frequency, some changes were made to the CAA forecast regions. A map showing these changes was published at www.avalanche.ca. Two main changes were made in the regions. The footprint of the CAA Rockies bulletin, which is now called South Rockies, was changed to cover the continental divide from the southern end of Kananaskis Country down to the US border. For the second major change, the old South Columbias region was broken into two regions, Kootenay Boundary along the US border, and South Columbias, which goes from the Kootenay region north to Highway 1. Other small changes can be seen online.



Buying a Programmable Rescue Radio – What's All This Talk about Tones?

Until recently, radio communications in the backcountry have been able to run over simple VHF and UHF frequencies. Over time, more and more people in western Canada started using radios for their own communication needs. Some companies were assigned the same frequencies as rescue and/or backcountry operations because their operating ranges were deemed to be distant enough that they should not interfere.

In some cases, the matching frequencies were installed in truck radios. Eventually, the trucks ended up well outside the original operating area they were licensed for. In other cases, the radios they were using were 'tuned up' to transmit at very high power. In some instances, freak propagation patterns allowed even unlikely transmissions from distant repeaters or base radios to open the sensitive squelch on the repeaters. The result: increased radio interference at almost all popular backcountry locations. No amount of letter writing, phone-calling and yelling on the radio is going to make these interference problems go away. Even if the interference comes in over the repeater, the 'culprit' will not receive your yelling, as their radio receives on a different frequency. Of course, yelling might make you feel better.

The solution to this problem was to implement tones in backcountry radio repeaters. "Tones, what does that mean?" you ask.

CTCSS, sub-audible tones, PL tones. It all means the same thing. CTCSS stands for **C**ontinuous **T**one **C**oded **S**quelch **S**ystem. PL tones for **P**rivate **L**ine. Sub-audible means you are not supposed to hear the tone. The technology was developed by Motorola years ago to allow different users to work on the same frequency. If a radio is programmed with PL tone on a receive frequency, only radios transmitting with the matching PL tone will be able to talk to that radio. All other transmissions on that frequency will not be received.

If a radio has no PL tone programmed on the receive frequency, it will receive ALL transmissions, tone or no tone. PL tone is like a lock: you need a key (matching tone) to open the door. If there is no lock, everyone can walk right in. Today there is a standard list of 39 PL tones in use, which can be programmed into most modern radios. They range from 67.0Hz to 250.3Hz.

Pros

- Less interference!

Cons

- Older radios may not work with the system.
- Some radio models are not good at filtering out the 'sub audible' tones and you will hear them anyway – as a background hum.
- If you buy a radio for backcountry safety concerns, your ability to reach many repeaters is compromised if your radio can not deal with sending a tone to "open the door" on the repeater.
- Not only will you need to find out the simplex and repeater frequencies and program them into your radio, but you also need the tone frequency. Programming all this in an emergency situation takes time, although the confusion can be greatly reduced by pre-programming for each trip or area.

This article was adapted from a staff safety bulletin produced by Canadian Mountain Holidays.

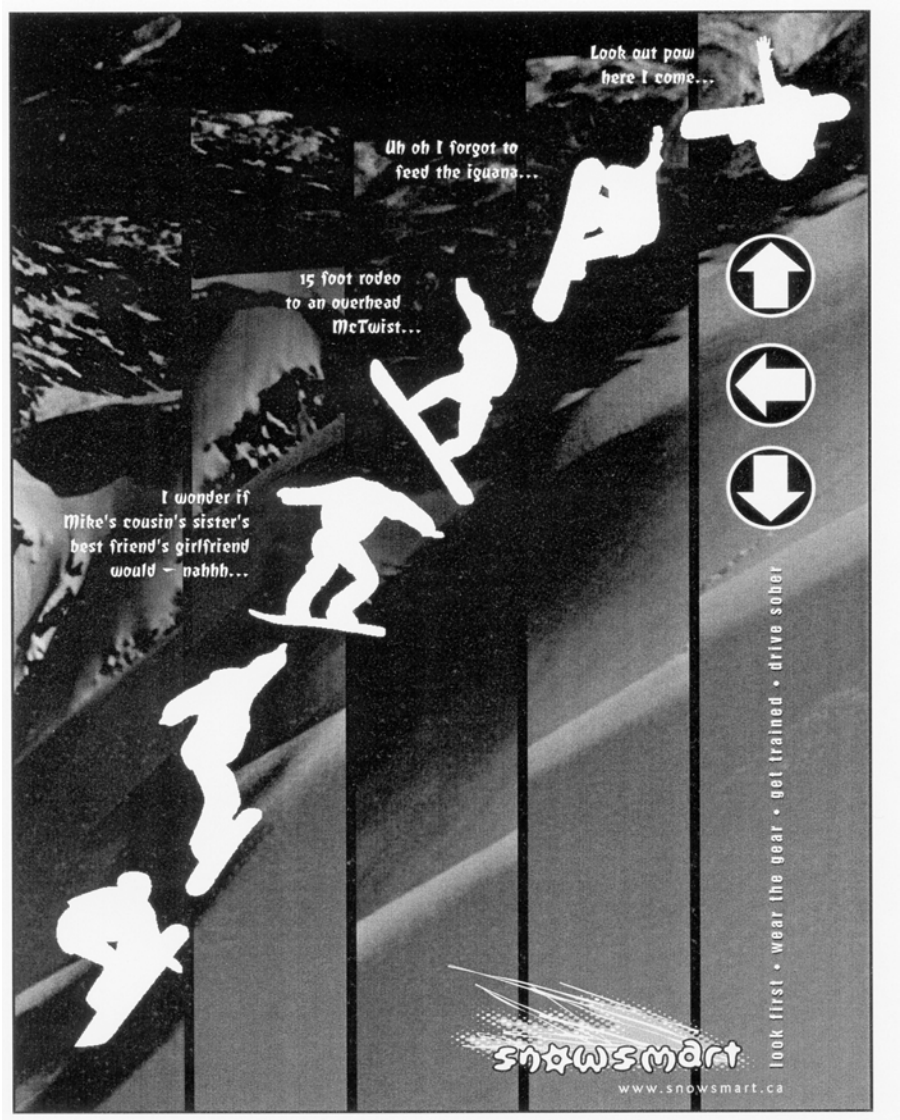
SNOWSMART Takes Aim at Risk-Taking Attitudes of Youth

This year's grisly avalanche toll reminds us why we need to invest in programs like SNOWSMART, designed to teach young people aged 12 to 18 on how to take smart risks in the snow.

SMARTRISK, a national non-profit foundation dedicated to injury prevention, created the SNOWSMART program with partners Parks Canada, the Canadian Avalanche Association and the Canadian Ski Patrol System. The SNOWSMART objective is to increase the knowledge and awareness of young people about the risks of winter recreation, and to change the way they see and take those risks in order to reduce the number of injuries and deaths on the slopes or trails and in the backcountry.

SNOWSMART is taught as part of the school curriculum in grades 7 and 10 physical education and science, and uses four key messages: Wear the Gear; Look First; Get Trained; and Drive Sober. It is also accompanied by a 14-minute fast-paced video called "Use it or Lose it."

In the words of teacher Cathy Elliott, whose Sault Ste. Marie school pilot-tested the program last winter, "Winter risks are a reality, but SNOWSMART gave my students the tools to understand how to take those risks in the smartest way possible, so that they stay alive and injury-free."



SNOWSMART's three years of federal funding allowed the program to be researched, developed and pilot tested in schools across Canada. SNOWSMART has been featured at international conferences, resulting in international demand. However, with funding coming to an end SMARTRISK is currently searching for bridge funding to enable it to continue offering the program to students across the country.

SNOWSMART is available to schools and communities. Consider how many students in your school are outdoor winter enthusiasts. If you have an interest in raising the awareness of winter activities, or an interest in helping them become more aware of how to take smart risks, consider bringing SNOWSMART to your community. The CAA has a few of these SNOWSMART packs available **free of charge** to schools who are genuinely interested in this program. Once these are gone, schools will have to purchase the SNOWSMART pack. If you would like to be the contact on behalf of a school in your area write Evan Manners at em@avalanche.ca for more details.

For more information on SNOWSMART's programs, contact Sarah Marshall, Youth Mobilization Project Coordinator at 416-596-2708 or toll free at 1-888-537-7777. Also, you can e-mail Sarah at smarshall@smartrisk.ca, or visit either www.snowsmart.ca or www.smartrisk.ca.

Life-Link / Dynafit Offer Air Bag Systems in Canada

Jackson Hole, Wyoming - Life-Link / Dynafit stack the odds of avalanche survival in the skiers favour with the Air Bag System (ABS) backpacks they have begun distributing in North America this winter.

"The ABS system is the only tool backcountry travelers have to actively prevent themselves from burial in an avalanche. The question is would you rather be on top or on the bottom?" says John Scott, vice president of Life-Link International.
With the growing popularity of backcountry winter sports and an increase in avalanche fatalities over the past few winters, this system is sure to attract those who want to and/or need to travel in avalanche prone areas, yet remain as safe as possible from the risk of being buried.

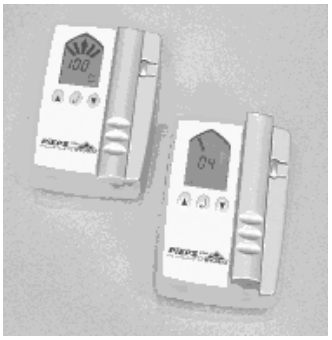
The ABS backpack is designed to keep the skier above the surface during an avalanche by increasing the volume and surface area to help "float" the victim to the surface during the avalanche and as the snow settles.

The airbags stow conveniently in the backpack until the trigger handle on the shoulder strap is pulled. Within 2-2.5 seconds the Nitrogen-air cartridge is activated, deploying two 75-liter air bags

out the sides of the pack. The system can be reused over and over by simply folding the air bags back up into their backpack pockets, inserting a new cartridge of Nitrogen Air, and replacing the Trigger handle (the cartridge and handle come as a package).
Approximately two thirds of buried avalanche victims are recovered dead while statistics have shown that 90% of non-buried victims survive avalanches (according to ABS Lawinen Airbag System reports). There have been more than 30 documented cases in Europe where the ABS backpack has saved lives. With the growth of backcountry travel taking off across the country, many skiers, snowboarders and snowmobilers will be investigating this new avalanche safety tool and stacking the odds as high as they can in their favor.

For more info contact Life-Link at 1-800-443-8620 or www.Life-Link.com

The New PIEPS – DSP is Here!!



We have been working on this new avalanche transceiver for a long time but now we have finished the work! At ISPO in Munich between February 1st and 4th we presented the PIEPS – DSP for the first time.

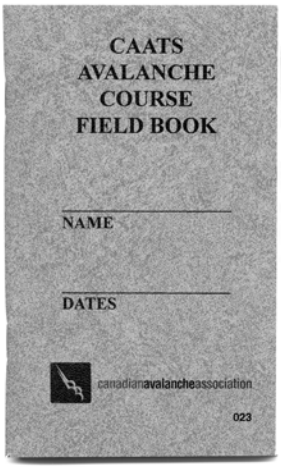
The new PIEPS-DSP is a brand new designed full digital avalanche transceiver with following main features:

- Compatible with all avalanche transceivers working on 457kc
- Digital range more than 50 meters
- Indication of direction and distance immediately after first signal received
- Indication of the number of victims
- Signal selection
- Additional features: altimeter, compass, thermometer

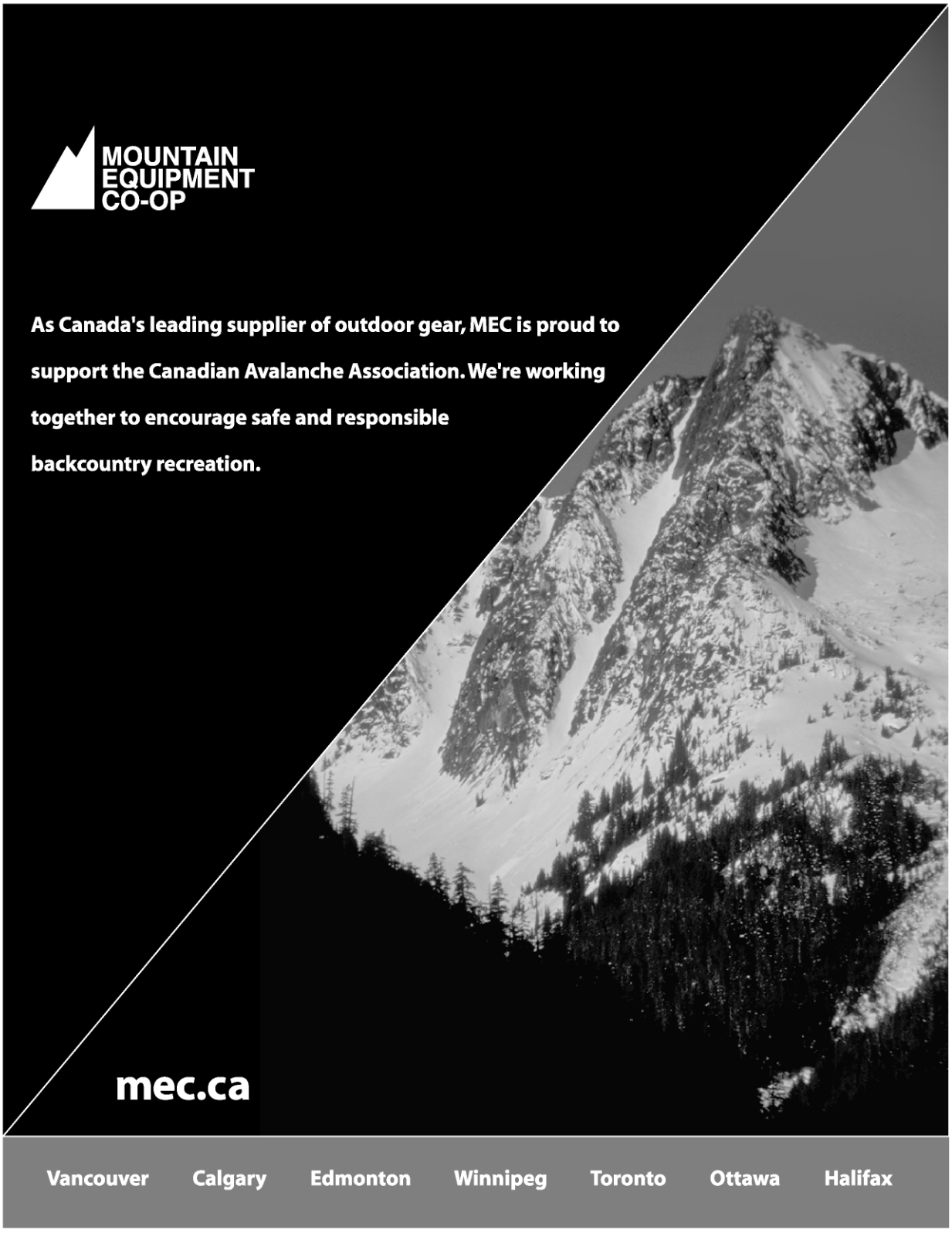
Field Books on Sale Now!

We have a surplus of the CAATS avalanche course field books. As there will be a few revisions to the field book next season we have put the last of our stock on sale for $10.00 (regular price $20.00).

To place an order contact the Canadian Avalanche Centre at (250) 837-2435 or email canav@avalanche.ca.



Presenting Partner of the Recreation Avalanche Course Program



BCA Opens "Beacon Basin" in Colorado

Loveland Basin, Colo. - Backcountry Access opened a state-of-the-art avalanche beacon training site in November, 2002, at Loveland Basin ski area. Designed and built by Dwayne Paynton of Winlaw, B.C., the site will be used to train avalanche educators and advanced beacon users.

Nicknamed "Beacon Basin," the site features 14 permanently buried transmitters, each separately hard-wired to a central control panel. The panel consists of 14 switches for turning the transmitters on and off, plus a remote power supply consisting of six alkaline D cells.

By permanently burying the beacons and controlling them remotely, trainers can eliminate the time-consuming process of excavating and re-burying transmitters between searches. It is especially effective for practicing multiple and deep burials, which are the most time-consuming scenarios of all — and which require the most practice.

"Even with today's easy-to-use transceiver technology, there is still no substitute for practice," said BCA Vice President Bruce Edgerly. "By providing a super efficient training opportunity like this, we hope to raise the bar on transceiver education in our region." He said BCA hopes to expand the program next year to include sites in other regions of North America and Europe. Access to Beacon Basin is generally limited to those who have been qualified by BCA to operate it. However, the company has organized numerous public training sessions at the site, the most recent being on Saturday, March 1. The next public training session is tentatively set for April 12th, and will run for three days. For more info see www.bcaccess.com or call (303) 417-1345.

Karen Edgerly operating the "Beacon Basin" controls at BCA's Dec. 7 public training

Mammut Opens Training Centre in Switzerland

The Zinal Ski Area in the state of Wallis in Switzerland is exploring new ways of avalanche prevention with an initiative sponsored by Mammut, the Swiss mountain sports specialist. An Avalanche Training Centre that was recently opened offers a comprehensive exhibit on avalanche risk assessment and a permanent training installation for practicing the search by means of avalanche beacons. Created by the Zinal Ski Area, Mammut AG, the St. Imier engineering college and Girsberger Elektronik AG, it is Europe's first permanent beacon practice site.

The training site is located in a triangular area of about 100 meters on each side and on a steep slope. It represents a typical avalanche runout zone. Within this area, there are 16 avalanche beacon transmitters buried at various depths. These transmitters have been designed to remain in the snow for a full season before the batteries need to be replaced. The transmitters can be activated and deactivated via radio signals by means of a control unit. This allows for very realistic practice, since the trainees will not know about the location of the buried transmitters. Furthermore, the transmitter(s) to be activated may be selected at random by the control unit. Multiple burial situations are thus easy to simulate and practice.

Apart from the fixed control unit which is powered by solar cells, a portable battery powered unit is also available. It comes in a robust plastic case. In addition to the manual control of each transmitter, it offers computer selected search scenarios. A built in timer can introduce timing restrictions, so at least some of the stress that exists in real situations is simulated.

For further information e-mail info@girsberger-elektronik.ch

Mammut's European avalanche training centre features a portable and a fixed beacon control unit. The fixed unit, shown above, is powered by solar cells.

Avalanche Survivor Saved By Friend's Avalung

Editor's Note: The following stories are first-hand accounts from two friends who survived an avalanche at Elm Creek Basin, just north of Revelstoke, BC, while heli-skiing on February 10, 2002. Mike Morrissey was given an Avalung as a gift from his girlfriend prior to leaving home, as was Barry Fisher. Barry did not have his on, both men were buried. While Mike was fully buried for more than 30 minutes, Barry was fortunate to be only partially buried. Mike credits the Avalung to saving his life. Exactly one year after the incident, both men came back to heli-ski in Revelstoke, both wearing Avalungs. They stopped by the CAA to tell their story.

In February 2002, a group of *the guys* went to Revelstoke once again for our annual heli-ski trip. Unless you have been there, you cannot imagine just how majestic the Selkirk Mountains are, sharp as knives, with millions of untouched acres of incredibly pure, endless deep snow. On our first day of skiing, as usual, the ride in the helicopter made our eyes as big as saucers and gave us non-stop smiles – it was like living in a dream of the past.

We had a couple of runs in when we broke for lunch. As always, we discussed moving to Revelstoke and becoming ski bums. We broke from lunch, skied the rest of the run and got into the helicopter for another ride to the top of the world.

After instructions from our guide on spacing and maintaining the distance between us, we skied down. Without a sound, other than the yell of Mike who happened to be looking uphill, we were hit by an avalanche and sent flying. If you can imagine being in a washing machine, you're with me now. How long of a ride I had, I'm not sure. It was long enough to say to myself, "This is big and I'm a goner. Here comes Heaven."

"Someone yelled that they had found a glove. I jumped out of the pit I was in and began digging along the arm and found out it was Mike. I knew he was dead."

When the avalanche stopped, I was buried at least from my chest down. I broke out with one arm then the other, but I was truly pinned and going absolutely nowhere. Another skier in the group was about 100 feet downhill from me and came up to dig me out. Shortly below him were two others from the group, which was all that was left standing. We had unknown knowledge of just how many skiers were involved. We knew that there were skiers above us, so we quickly and calmly got together and began our beacon search through over the slide debris. The derby was massive the slide zone was tremendous. As it turned out it was about five to six feet deep and the fracture line was some 250 feet wide.

I skied about ¾ of the way through the slide zone searching with no pick-ups on the beacon. At that point I told the other three searchers that I was going to the bottom and skied directly to the bottom of the runout, where digging efforts were already under way. I got a shovel and began digging side by side with my buddy Richard. Our guide was working the beacon and directing us where to dig. Out of my peripheral, I saw someone that had started CPR on an uncovered victim, but things did not look good. What seemed like hours at that time it turned out to be something along the line of 15 minutes. In an avalanche seconds are critical and minutes are horrendous.

During this time others had arrived. I simply cannot say enough of the rescue efforts from the heli-ski company and the many others who arrived in helicopters from areas I did not even know – tremendous!

One of my best and closets friends was still buried and I was frustrated to say the least. We kept digging and working as fast as possible. Someone yelled that they had found a glove. Because of my frustration, I jumped out of the pit I was in and began digging along the arm and found out it was Mike. I knew he was dead. I saw a chopper evacuate the first unconscious skier. Things did not look good there and a lot of time had since lapsed. In fact, another 20 minutes had ticked off the clock. You cannot imagine what it's like digging out a friend who's closer than your brother, knowing he is dead. That is an experience that words do no justice.

Upon digging him out I saw it. I had forgotten that Mike was wearing his Avalung. He was unconscious, but alive! Within half a minute after the tunnel of fresh air had got to him, my friend of years was awake! Fortunately nothing was broken and he was A-OK. It did take several additional minutes to dig him out, get an emergency blanket on him and get him safe. I gave Mike a big kiss and jumped back into the last pit to help finish the final evacuation.

There were two skiers that passed away that day February 10, 2002, but nine lived. Our guide that morning had given us a test on multiple burials never knowing that we would be put to the ultimate test. Our guide was incredible, walked the ultimate walk and brought nine skiers back that day!

I cannot express my thankfulness to the individuals who helped us and with the companies who came to the rescue. They were seemingly invisible, but just behind a cloud, there when we were in need.

The Avalung saved Mike's life that day. Use it along with the other required safety devices and hopefully you will never go through an episode like this.

- Barry "Fish" Fisher, Vail, Colorado

Avalung Survivor One Year to the Day...

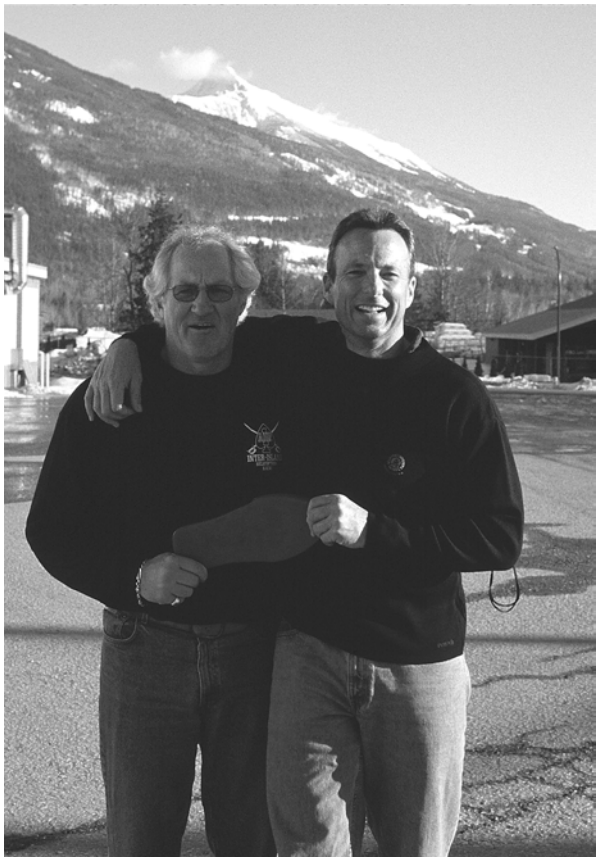
The down side of being buried in an avalanche with an Avalung is that your mind, since it is not oxygen starved, works overtime playing games with you. If you are lucky enough not to be dead of trauma, those will be the longest minutes of your life. In my particular case it was 34-plus minutes of emotions running the full gamut from being glad to be alive and waiting to be dug out to believing that my entire group was buried and there would be no one left to dig me out. Obviously this is actually an upside compared to the alternative of being buried without an Avalung.

"Being able to chew on the mouthpiece and listen to the two-way valve work while I was buried was very comforting to me."

Being able to chew on the mouthpiece and listen to the two-way valve work while I was buried was very comforting to me. I now am an expert at making every turn and jumping off every rock with that mouthpiece clamped firmly between my teeth. One thing I know for sure is that if you don't have the mouthpiece in your mouth before being egg-beatered down the mountain side, you are no better off than if you did not have an Avalung at all. What will happen is that your airways and Avalung mouthpiece will become completely packed with snow and essentially useless to you. I'm sure all rides in avalanches are different but I would not bet my life on being able to insert the mouthpiece while being thrashed by the unimaginable power that is an avalanche.

I was very encouraged while on my latest backcountry ski trip to Canada to see seven out of 10 clients, and 100% of the guides, wearing Avalungs. If wild snow is essential to your skiing enjoyment then local snowpack knowledge, avalanche awareness, proficient use of safety equipment and the Avalung as plan B should be standard equipment.

- Mike Morrissey, Littleton, Colorado



The day before this photo, Barry (left) and Mike were heli-skiing in the same area where they were hit by an avalanche one year before. Barry said their most recent day heli-skiing was "absolutely incredible. We were back in God's country and our shadows were 10 feet tall. The sun was shining on us and things were right."

Preliminary results from controlled experiments on the growth of faceted crystals above a wet snow layer

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and
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Calgary, Alberta T2N 1N4

Abstract

Faceted crystals have been observed above melt-freeze crusts, and the layers of such crystals form the failure layer for some hard-to-predict dry slab avalanches. Previous work proposed that wet layers could provide the heat to promote faceting in overlying dry snow, resulting in a weak layer of faceted crystals above a crust.

A series of seven experiments was conducted in the Rogers Pass Cold Laboratory in February and March 2002. Each experiment involved three snow layers within a laterally insulated box: a lower layer, approximately 15 cm thick, of natural dry snow; a middle layer of artificially wetted snow; and an upper layer of dry snow that was sieved onto the wet layer. In different experiments, the wet layer was varied in thickness from 2 to 9 cm, and the overlying dry snow (slab) was varied in thickness from 6 to 14 cm. The temperature was monitored in the wet layer, in the overlying dry snow layer and in the air, which remained well below 0°C. The crystals from the interface and from the overlying dry snow were observed at 20x magnification and photographed through a microscope at least once per day.

Faceted crystals were observed above the wet layer in all seven experiments within two days, and in two of the experiments after only two hours. The elapsed time until the wet layer froze was longer in experiments in which more liquid water was added to the wet layer. The maximum temperature gradient near the base of the dry slab was greater in experiments in which the dry slab was thinner. Facets were observed sooner in experiments in which the wet layer was thicker.

Keywords: snow heat flux, snow metamorphism, snow stability, slab avalanche, avalanche formation

1. Introduction

In the mountain snowpack, faceted crystals are sometimes observed just above melt-freeze crusts and such facet-over-crust combinations sometimes release dry slab avalanches (Stethem and Perla, 1980; Schweizer and Jamieson, 2001). Some of these avalanches are unexpected because the conditions favouring the formation of facets above crusts are not well understood and vary over the terrain, resulting in spatially variable instability.

This study focused on the formation of facets in dry snow overlying a temporarily wet layer of snow. A range of these conditions was created in a series of experiments in the Rogers Pass Cold Laboratory during the winter of 2001-02. Our objective was to better determine the range of conditions favourable to the formation of facets just above freezing wet layers.

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2. Literature review

In 1985, Richard Armstrong asked, "Could a melting or relatively warm, snow layer provide a heat source beneath a subsequent fall of cold snow sufficient to cause identifiable recrystallization?" Using simple boundary conditions, he calculated that a 1-m-thick layer of rain-soaked snow could take six days to freeze, during which time an overlying layer of dry snow would be subjected to a strong temperature gradient.

In field studies, Fukuzawa and Akitaya (1993) observed that the presence of a wet layer increased the rate of near surface faceting in an overlying thin layer of dry snow. In one night, a 6-cm-thick wet layer took six hours to freeze during which time the temperature gradient in the overlying 2-cm-thick layer of dry snow was sufficient to grow depth hoar crystals.

Using tree-line weather data from the Columbia Mountains of western Canada in November 1996, Jamieson and others (2001a, b) proposed that a prominent layer of faceted crystals formed in a new layer of dry snow due to surface cooling combined with latent heat provided by the underlying rain-wetted layer. The faceted layer released many dry slab avalanches until March 1997, and wet avalanches in May 1997.

Birkeland (1998) named this process *melt layer recrystallization* although we prefer *near-wet-layer faceting.*

Using the latent heat in the wet layer as the heat source, Colbeck and Jamieson (2001) derived an equation for the temperature in overlying dry snow during the period in which the wet layer would freeze. Based on the grain growth model of Colbeck (1983), they showed that a high growth rate is likely at the wet-dry interface even though the wet layer might freeze within hours.

3. Methods

A series of seven experiments, each lasting two to nine days, was conducted in the Rogers Pass Cold Laboratory during the winter of 2001-02. Each experiment consisted of a three-layer snowpack placed inside a box with internal dimensions 50 cm x 50 cm x 42 cm high (Figures 1, 2). The box was laterally insulated with 7-cm-thick foam.

The lower layer consisted of a 10- to 21-cm-thick block of dry natural snow with a density of 200-300 kg/m^3 that was fitted into the base of the box. The middle layer consisted of a mixture of snow and liquid water that was manually spread onto the underlying dry snow base (Figure 3). (Initial attempts to sprinkle water like rain resulted in uneven wetting of the snow layer.) In different experiments, the wet layer varied in thickness from 1.5 cm to 9 cm. Six to 14 cm of dry snow was then sieved onto the wet layer (Figure 4), forming the top dry layer which is subsequently referred to as the slab.

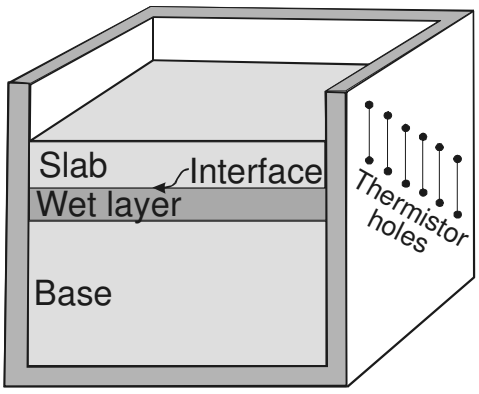

Figure 1. Section of laterally insulated box showing snow base, wet layer, overlying slab and interface between slab and wet layer. Six pairs of thermistors are placed in the holes on the right wall to monitor snow and air temperature.

Figure 2. Laterally insulated box with base snow layer. The side of the box at the bottom of the photo is removable to facilitate crystal extraction.

A total of twelve thermistors were placed in the air a few centimetres above the snowpack, at or near the snow surface, at or near the dry-wet interface, in the wet layer and in the dry base (Figure 5). The thermistors were connected to a datalogger that recorded average temperature every 30 minutes based

Figure 3. Spreading wet snow layer evenly onto dry snow base.

on readings every 30 seconds. The thermistors were calibrated to obtain an accuracy of 0.1°C.

The air temperature in the cold lab cycled between –7°C and –16°C every day to simulate a typical mid-winter diurnal cycle for the snow surface. The net radiant energy exchange at the snow surface was assumed to be minimal.

Crystals were extracted from the interface at the base of the slab and in the middle of the slab and were observed under 20x magnification and photographed with a microscope at 31x magnification. The most prominent and secondary grain types and sizes were classified according to Colbeck and others (1990).

There were some problems associated with the method. Forming the wet layer by spreading slush may have resulted in a wet layer with different characteristics than naturally occurring wet layers formed by rain, warm air and/or solar radiation. In the experiment started on 02-03-16, liquid water from the wet layer percolated down channels in the base layer and down the side of the box, reducing the latent heat in the wet layer. We experienced difficulty placing low-density dry snow onto the wet layer. After sieving, the density of the slabs varied from 138 to 339 kg/m^3 (mean 202 kg/m^3), which is approximately double that of many layers of fresh dry snow.

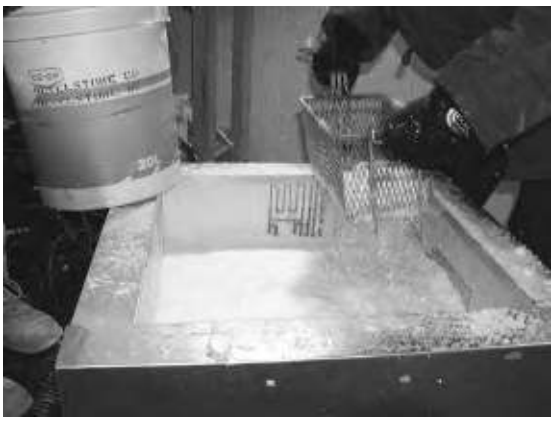

Figure 4. Sieving fresh snow onto the wet layer.

Figure 5. Laterally insulated box with thermistors placed to monitor temperature in air and in three-layer snow specimen.

4. Observations

For each of the seven experiments, Table 1 shows the length of the experiment, number of crystal observations during the experiment, selected properties of the wet layer and the slab, initial and final grain forms, elapsed time until the wet layer froze (i.e. until the last thermistor dropped below –0.5°C), maximum temperature gradient over a 30-minute period measured with thermistors placed 3 to 5 cm apart near the top of the wet layer, and the time to the observation in which facets were first recorded as the major grain type. For the wet layer, the water added is reported as the equivalent amount of rain in millimetres.

In each experiment, faceted crystals were observed at the interface and slab within 72 hours (Table 1). In two experiments, facets were observed at the interface and in the middle of the slab during the same observation. In the other five experiments, facets were first observed at the interface and then subsequently in the slab one or more observations later. For the experiment started on 2002-03-16, photographs of the crystals extracted from the interface show an increase in faceting over a period of 20 hours (Figure 6).

The maximum temperature gradient in all the experiments ranged from 11°C/10 cm to 23°C/10 cm, which is roughly 10 times the threshold usually associated with faceting (Colbeck, 1983).

5. Analysis

In Table 2, two properties of the wet layer (thickness and rain equivalent of added water) and two properties of the slab (thickness and density) are correlated with the time for the wet layer to freeze, the maximum temperature gradient and the time to observed faceting at the interface and in the slab.

Most of the correlations are not significant (significance level $p \geq 0.10$), in part because there were only seven experiments with a limited range of slab and wet layer properties. The time required for the wet layer to freeze positively correlated with the rain equivalent of the liquid water added to the wet layer (correlation coefficient $r = 0.82$, $p = 0.02$, Figure 7). The slab thickness negatively and weakly correlated with the maximum temperature gradient ($r = -0.70$, $p = 0.08$, Figure 8). Also, thickness of the wet layer negatively correlated with the time before facets were observed at the interface ($r = -0.71$, $p = 0.08$, Figure 9) and in the slab ($r = -0.78$, $p = 0.04$, Figure 9).

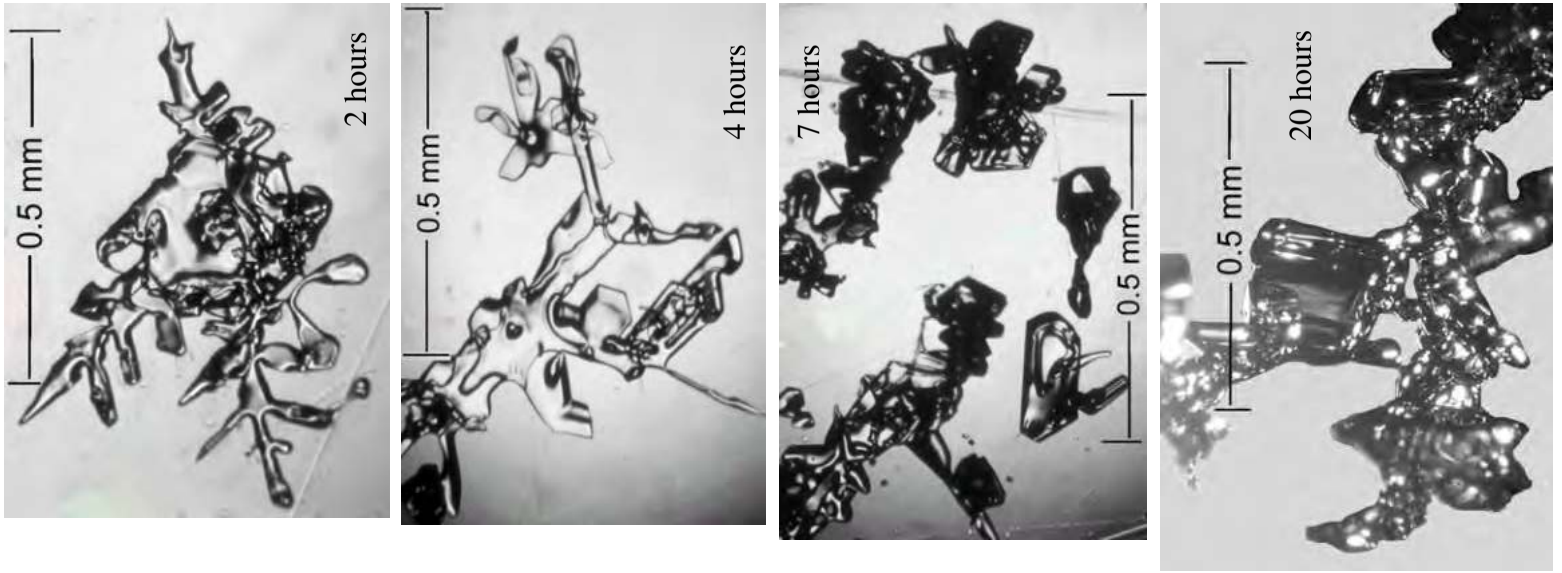

Figure 6. Photos of snow grains after 2 to 20 hours from interface of experiment started 2002-03-16. Faceting of grains over time is apparent.

Table 1: Summary of cold laboratory experiments

Experiment			Wet layer			Slab		Grain form at interface (Colbeck and others, 1990)		Max TG[1]	Time to first obs. of facets[2]	
Start date 2002	Duration	No. of obs.	Thickness	Equiv. rain	Time to freeze	Thickness	Density	Initial	Final	(°C/ 10 cm)	Interface	Mid-slab
	(days)		(cm)	(mm)	(h)	(cm)	(kg/m^3)				(h)	(h)
02-14	6.9	6	1.5	4	4	6.5	203	/ 0.5-1, + 1-1.5	□ 0.5	16	24	72
02-21	8.7	7	3.5	7	11.5	14	143	+ 3-4, / 1-2	□ 0.5 / 0.5-1	11	25	40
03-11	4.8	3	2.5	8	9.5	6[3]	201	• 0.5-1	□ 0.5-0.8	20	51	51
03-16	4.8	6	7.5[4]	21	23	5.5	141	+ 1, / 0.5-1	□ Λ 1-1.5	21	7	20
03-21	3.7	6	9	11	8	12	248	/ 0.5-1, □ 0.5	□ 0.5-0.8	13	2	2
03-25	1.9	4	4	11	10	8	339	• 0.5-1	□ 0.5-0.8	23	5	2
03-27	3.8	8	6	15	9.5	6	138	/ 1, + 1-1.5	□ 0.3-1	15	2	20

[1] Maximum temperature gradient between a thermistor placed in the wet layer and one 3-5 cm above in the dry layer.
[2] Time to first observation of facets in dominant grain form.
[3] Snow was moist when sieved.
[4] Percolation channels observed below wet layer.

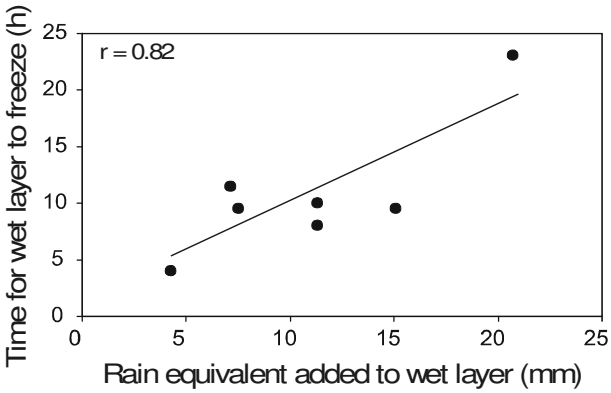

Figure 7. The time required for the wet layer to freeze increased with the amount of liquid water applied.

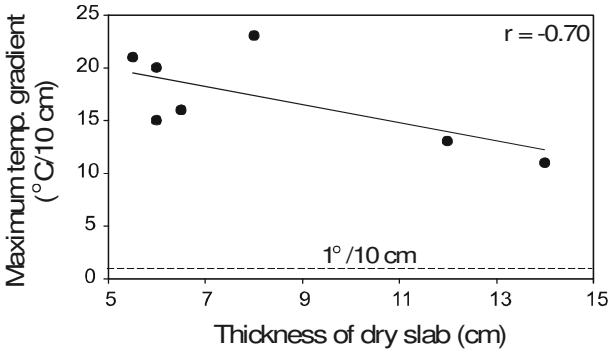

Figure 8. The maximum temperature gradient measured over a 30-minute period decreased with the thickness of the dry slab overlying the wet layer. The measured maximum temperature gradient greatly exceeded the commonly used threshold of 1°/10 cm.

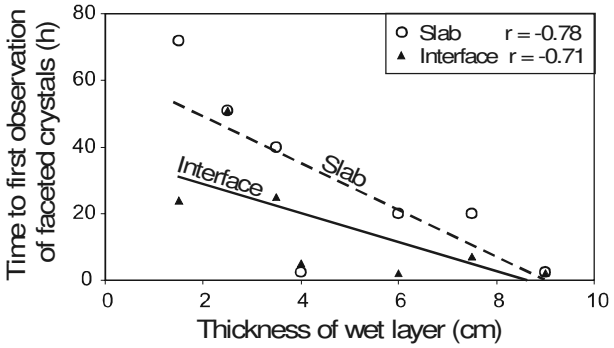

Figure 9. The elapsed time until faceted crystals were first observed at the interface and in the slab decreased with increased thickness of the wet layer.

6. Conclusions

When a cool thin layer of dry snow overlies a wet snow layer, there is a strong temperature gradient – often sufficient for faceting – in the lower part of the dry layer until the wet layer freezes.

In all seven experiments in which a thin layer of dry snow overlying a wet snow layer was subjected to subfreezing air temperature:

- The maximum magnitude of the temperature gradient near the base of the dry slab was temporarily 10 times the commonly accepted threshold for faceting.
- Facets formed at the interface within two to 51 hours, and in the thin overlying slab within two to 72 hours.

When comparing the experiments, the following trends were observed:

- The wet layer was slower to freeze in experiments in which more water was added to the wet layer.
- The maximum magnitude of the temperature gradient was greater in experiments in which the dry slab was thinner.
- Facets formed faster at the interface and in the overlying slab in experiments in which the wet layer was thicker.

We did not observe a significant effect of slab thickness or slab density on the time until facets were observed, but the range of these properties and the number of experiments were limited.

7. Application

The formation of major layers of faceted crystals that form in dry snow over a freezing wet layer can, in some cases, be predicted from a suitable located weather station (Jamieson and others, 2001b).

Areas of a mountain range, or of a start zone, that acquire more liquid water by rain (including wind-blown rain) or due to the exchange of radiant energy are, if overlain by cool dry snow, more likely to develop a weak layer of facets on a crust than areas that acquire less liquid water. The resulting spatial variability of stability can persist for weeks. An understanding of the conditions associated with near-wet-layer faceting may help site selection for profiles and snowpack tests, for explosive placement and intentional skier triggering (of small avalanches), as well as for routes to avoid. However, many other factors and observations are important for site and route selection.

8. Acknowledgements

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Storage and visualisation of relevant avalanche information at different scales

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Abstract/Summary

It is the decision-makers' perception of snow stability and how it applies to terrain that determines their decisions about closing a highway, opening additional ski runs, or choosing a appropriate ski route. Targeted education and experience have positive effects on human perception, while human biases interfere with objective reasoning (McClung, 2002). 'Good' decision-makers have developed the ability to use the available information effectively and in an unbiased way to form their perception of the current snow conditions. It is our belief that there are three crucial measures to aid in the unbiased use of information: 1) observation standards; 2) efficient data storage; and 3) meaningful information visualization. A number of tools are presented, which can enhance the effective use of data available to avalanche forecasters at different scales.

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1. Introduction

Information used for avalanche forecasting is highly diverse. It includes weather data, snowpack details, and direct observations of instability such as avalanches or stability tests. Depending on their background and experience, decision makers, such as mountain guides, ski patrollers, or highway personnel, interpret these pieces of information differently. It is the person's perception of snow stability and how it applies to specific terrain features that ultimately determines their decisions. Skilled forecasters develop an effective and unbiased ability to use the available information to form their perception regarding snow stability and make safe decisions. Visual representation can have a large effect on how the significance of the available information is perceived by forecasters. Patterns, trends, and relationships may be made apparent by visual presentation that would have been missed if the information were only presented in a non-visual form. In recent years avalanche forecasters have been faced with an enormous increase in information available to them. Besides using their own observations, forecasters frequently exchange data with neighboring operations and make use of data accessible on the Internet. Although this exchange has been very useful, the task of processing all the information available can become overwhelming. It is our belief that there are three crucial measures to make information processing as efficient and objective as possible: 1) observation standards; 2) efficient data storage; and 3) meaningful data visualization at appropriate scales.

In this article we present SNOWBASE as an example of a database system that allows efficient storage and usage of data relevant to avalanche forecasting. Afterwards, appropriate presentations of avalanche forecasting data at different scales are discussed. Shown are visualization tools included in SNOWBASE to present observations on the slope scale and an ArcView extension for the visualization of data covering entire mountain ranges.

2. Snowbase

Roger Atkins started the development of the SNOWBASE program in 1982 at Alta Ski Lifts, Alta, Utah. The program evolves continually, and since 1994 Canadian Mountain Holidays (CMH), the worldwide largest helicopter ski operator, has provided the support for its development. SNOWBASE has been in operational use in all CMH operations since winter 1996/97.

SNOWBASE is used interactively during morning and evening guide meetings to record and access information pertinent to the decision making process (Fig. 1). This information includes local observations and assessments as well

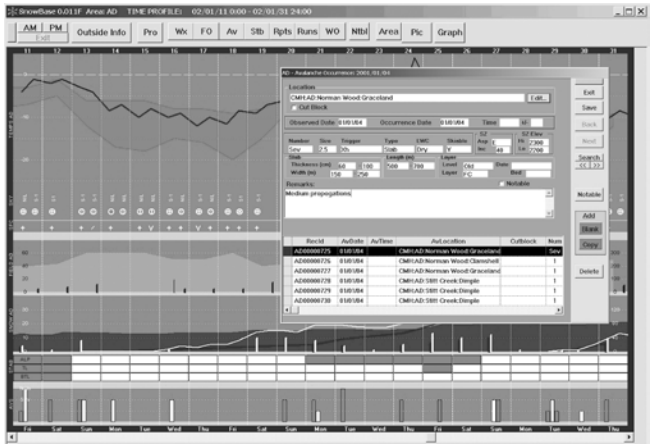

Fig. 1: Time series graphs presented in SNOWBASE: temperature, sky conditions, surface forms, snow observations in the field and at the study plot, stability ratings, and avalanche observations. Buttons at the top of the graph lead to individual entry screens, such as the avalanche data entry screen shown here.

as observations and assessments available via the Internet from other operations or agencies. Time varying information is instantly accessible in time-series graphs. Spatial information such as the location and extent of observed avalanche activity can be presented as a graphic overlay on a background photograph of the terrain (Fig.2). A combination of multiple monitors and/or LCD projectors allows all guides present at the

Fig. 2: Example of run photo overlaid with avalanche information. Image shows the outline of a size 3 avalanche that was remotely triggered by a skier.

meeting to be involved in the recording and assessment of the information in SNOWBASE. A great deal of information pertinent to decision-making for travel in avalanche terrain is more subjective than the collection of standard measurements of atmospheric and snowpack parameters. SNOWBASE allows such more anecdotal information to be recorded in text form and/or in visual form. To capture this information visually, overlays are drawn on top of background photographic images. Associated text can be accessed via links from these visual elements.

3. Visualisation

a) Photographic images in SNOWBASE

Included in SNOWBASE are photos of every single run of an operation. These photos are used during morning meetings to discuss possible ski lines under the given conditions and to point out important terrain features. Digital cameras are used to record images of significant avalanche events or other interesting features. These images can be incorporated daily into the knowledge base in relationship to the avalanche observations for that day. Such images can also be communicated to other areas via the Internet. All photographic images in SNOWBASE are stored in a database that allows the images to be related to terrain features such as ski runs and/or related to events such as observed avalanches.

SNOWBASE includes tools that allow overlays to be drawn on top of these background images. For example, the location and extent of each avalanche observation can be drawn over the background image of the terrain (Fig. 2). Querying tools allow the selection of the criteria for which overlays are made visible over the background image. This allows the identification of patterns of both human and natural activity in the terrain. It has proven particularly valuable for the capturing the location and extent of the more unexpected events that may have come as a surprise at the time. History shows that features in the terrain that may appear non-threatening are sometimes capable of producing unexpected avalanche events and these events are likely to recur, especially if the history of these events is lost. It is of great value to capture a readily accessible visual record of these events so that this information can be passed along to newcomers in an area or communicated to different operators. For example, Fig. 3 shows an avalanche that ran on a surprisingly low-angle slope. This photograph was taken by digital camera the day of the avalanche and distributed to all CMH areas that evening, thus globally enhancing the perception of the type of terrain capable of producing avalanches at that time!

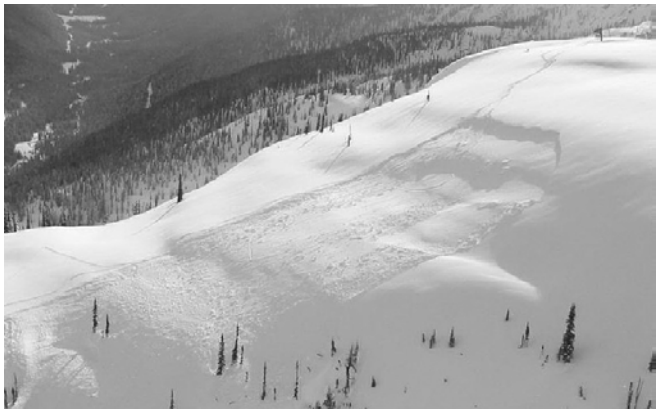

Fig. 3: A photographic record of a low-angle slab avalanche that failed on a surface hoar layer. The red flag marks the helicopter landing of this ski run (Photo courtesy of Colani Bezzola).

b) Large scale visualization

In order to facilitate the information exchange among CMH operations a visualization tool was developed by Pascal Hägeli that displays overview maps with data from all operations. The tool was developed as an extension of ArcView 3.2 (ESRI, 1999). With a CMH pull-down menu the user can easily view most information stored in SNOWBASE. Besides the traditional weather charts, the user can also look at overview maps of stability ratings, avalanche occurrences, snow profile observations, and drainage usage. The key of these overview maps is to present all information available in a summarized and more digestible way, while, at the same time, point to important detail information. Examples are the presentation of notable avalanches (avalanches with involvements or avalanches of special interest) on avalanche overview maps (Fig. 4) or special maps about avalanche activity

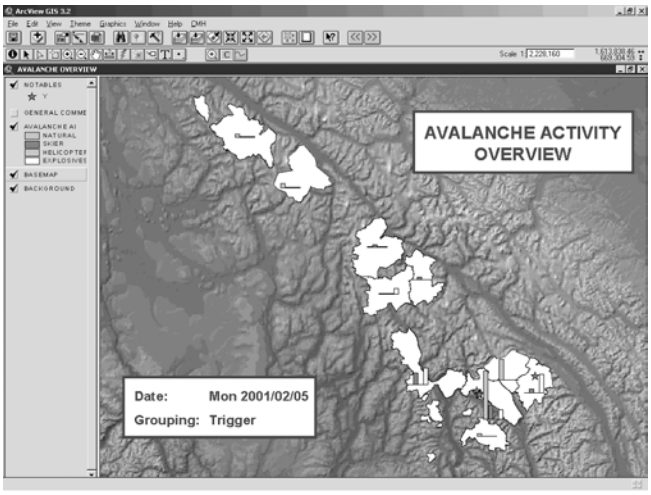

Fig. 4: Overview map of observed avalanche activity. Bar graphs show avalanche activity classified according to the four main trigger groups. Stars indicate individual avalanches with skier involvements. Clicking on individual operations leads to maps with more detailed information.

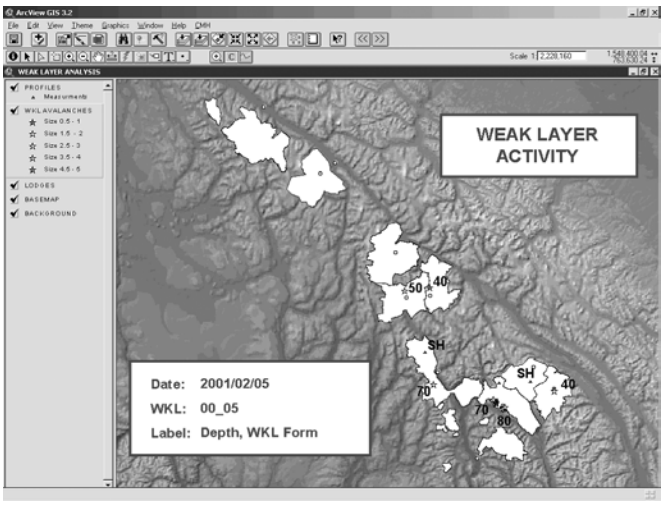

Fig. 5: Observed avalanche activity on specific weak layer together with relevant observations in snow profiles on February 5th 2001. Avalanches are labeled with slab thickness while profile locations show observed weak layer form.

characteristics on specific weak layers together with relevant snowpit results (Fig 5). More detailed maps of run usage or avalanche activity are accessible through double-clicking on individual operations on overview maps. Buttons for flipping through maps of consecutive days can help forecasters to identify large-scale trends early.

This type of visualization can be particularly useful for large operators or large umbrella organization with large amounts of data.

4. Final Remarks

Although this paper has primarily focused on the application in a helicopter skiing operation, similar systems could be developed for avalanche safety programs of highway operations or ski resorts. The individual tools clearly have to be tailored to the specific needs of the operation. For a successful implementation of such a system, two aspects seem to be most important. First, it is important that all these individual tools are integrated into one software package. The simplicity and user-friendliness of the entire system are crucial for its success. Second, a comprehensive integration of the system in the daily operational routines is key for the acceptance and future use of the system.

Additional tools, such as computer-forecasting models, could easily be integrated into such systems leading to a truly comprehensive tool that can help avalanche forecasters do their daily job most effectively.

This short article is a summary of a more extensive paper about data storage and visualization for avalanche safety programs, which was presented by the authors at the International Snow Science Workshop in Penticton (Hägeli and Atkins, 2002).

5. Acknowledgements

Roger Atkins and Colani Bezzola are principally responsible for development of the SNOWBASE program, which has only been possible due to the dedication of CMH to provide continuing support for the project. Past work for Alta Ski Lifts and for Parks Canada has also contributed to the evolution of the program.

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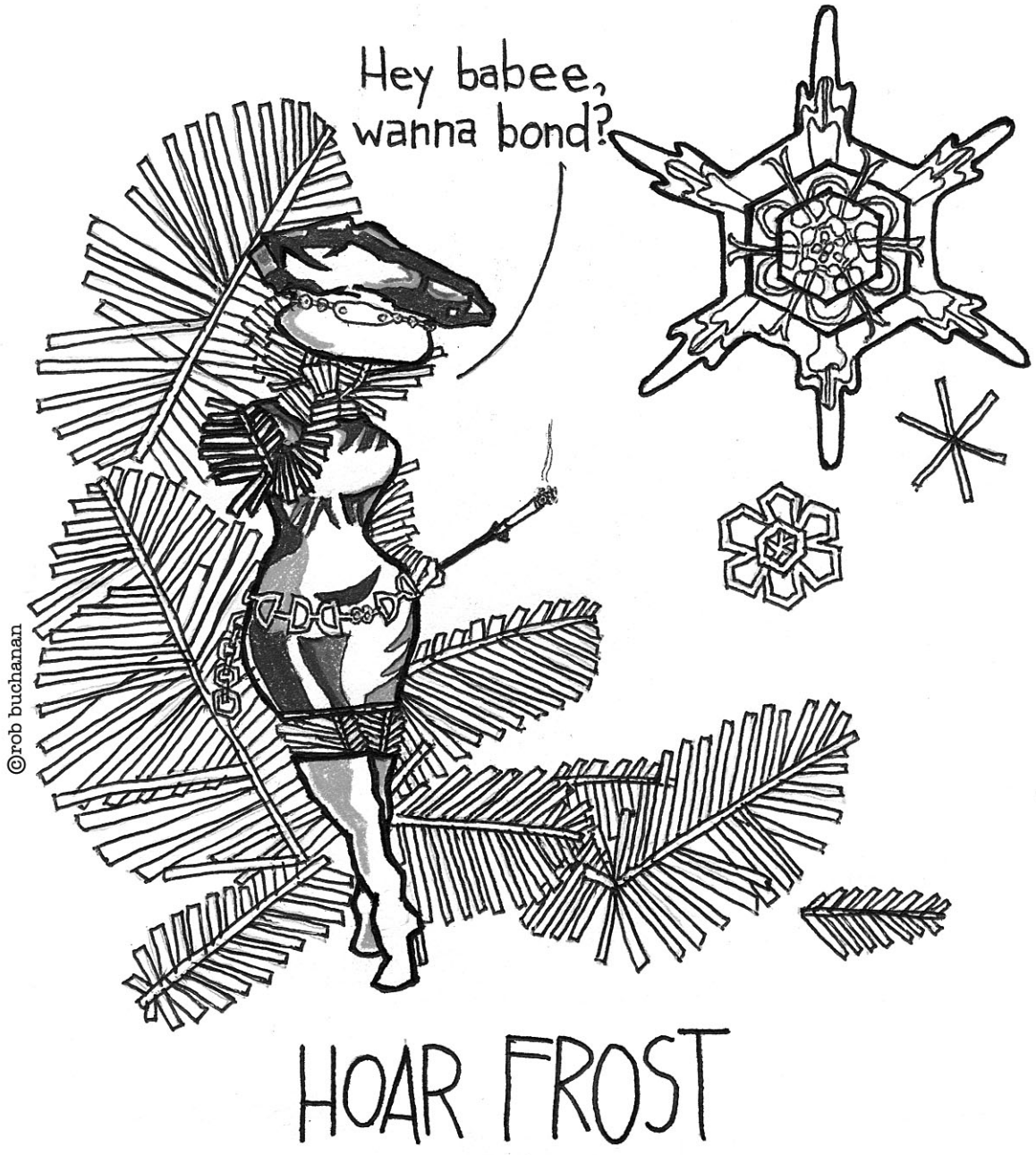
Cartoon by Rob Buchanan



Characterization of a deep slab avalanche cycle

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1. Introduction

Deep slab instabilities present a difficult forecasting problem for avalanche safety programs. This type of instability often causes large and dangerous avalanches with spatial and temporal patterns that are difficult to predict. In early January 2002, a warm and moist storm covered the snow surface in the Wasatch Mountains of northern Utah (Figure 1) with a hard ice layer. This layer was subsequently buried and faceted snow crystals formed above and below the crust. The faceted layers adjacent to this crust were responsible for numerous large natural, explosive released, and human triggered avalanches, including three fatalities. Large avalanches occurred with each major loading event for the duration of the winter and again during the first spring warm up. These spooky conditions persisted throughout the winter with human triggered avalanches occurring up to 70 days after the layer was buried. The purpose of this paper is to describe the formation, spatial and temporal patterns, and backcountry-forecasting issues associated with this deep slab instability.

2. Facets and crusts

Faceted crystals that grow near the surface of the snowpack have been classified into three formation categories: radiation recrystallization, melt-layer recrystallization, and diurnal recrystallization (Birkeland, 1998). In each category, a gradient in snowpack temperature causes water vapor transport to occur at a rate where snow grain growth is dominated by surface kinetics, which overcome the system's natural desire to reach thermodynamic equilibrium (Colbeck, 1983a). This results in rapid depositional growth forming angular shaped crystals and eventually striated faces and cups.

Faceted crystals have been observed adjacent to hard crust layers (Seligman, 1936; Moore, 1982; Fierz, 1998; Jamieson et. al 2001) and theoretical reasons for their development have been presented (Colbeck, 1983b; Adams and Brown, 1983; Adams and Brow, 1990; Colbeck, 1991; Birkeland, 1998; Colbeck and Jamieson, 2001).

Adams and Brown (1983 and 1990) used a heat and mass transfer model to examine the vapor-density difference (the difference in vapor density at pore center with an ice surface at the same temperature that is in equilibrium) in a layered snowpack. Their results indicate that the presence of an ice crust (high density layer) increased the vapor-density difference on both sides of the crust and could explain the growth of facets at a crust-snow interface. Colbeck (1991) investigated the transfer of heat and mass through the snowpack by examining the combined effects of conduction through the ice matrix and latent heat exchange from vapor diffusion through the pore space. He postulated that at the lower boundary of the ice-snow interface heat is readily transferred into the ice crust due to its high thermal conductivity, but the reduction in permeability would produce a locally higher vapor pressure gradient and possibly faceted crystal growth. At the upper ice-snow interface the high thermal conductivity of the crust could produce a locally higher temperature and temperature gradient, but this effect could be offset by increased sublimation at the crust's upper boundary. Colbeck and Jamieson (2001) examined a scenario where liquid water near or on the snow surface freezes forming an ice layer. As the liquid freezes it releases latent heat, which produces a temperature gradient. The temperature gradient produces faceted gains above the ice layer. In this case the freezing process produces both the ice crust and the temperature gradient that causes faceting.

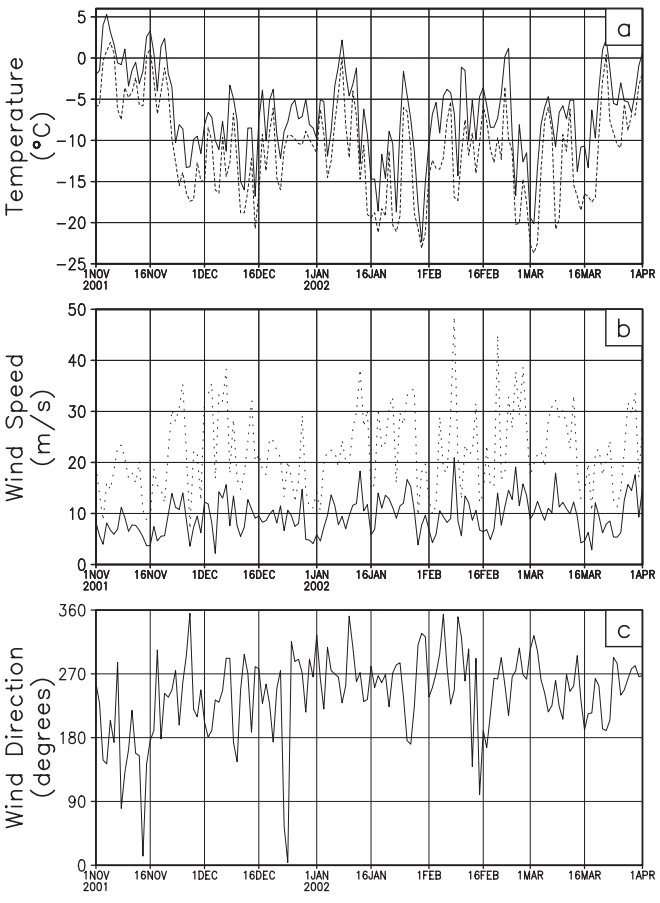

Figure 2: Daily averaged meteorological conditions form November 1, 2001 through April 1, 2002 at the Mt. Baldy weather station (3370m). a) maximum and minimum air temperature, b) wind speed and maximum gust, c) wind direction.

Observational studies have shown that in the presence of a strong temperature gradient facets can form on snow grains within a matter of hours and grow to an appreciable size within days. Fukuwaza and Akitaya (1993) found that under a strong temperature gradient (159 °C/m) highly developed faceted snow grains developed overnight. Birkeland et al. (1998) measured diurnal swings in the temperature gradient and found a layer of faceted crystals with an average grain size of 1 mm formed within 36 hours. Jamieson and van Herwijnen (2002) simulated melt-layer recrystallization in a cold laboratory. They filled an insulated box with two layers of dry snow separated by a layer of saturated snow. The cold laboratory temperature was maintained between approximately –7 °C and -16 °C. Temperatures within the snow sample (including the saturated layer) were recorded and snow grains were photographed every two hours. They observed sharp edges forming on the snow grains above the wet layer (within hours) and well-developed faceted crystals within 24 hours.

The factors that lead to avalanche activity on crust-facet interfaces have also been investigated. Jamieson et al. (2001) assessed the predictive merit of weather and snowpack parameters for over 700 natural dry slab avalanches in the Columbia Mountains of southwestern Canada. They found factors such as accumulated snowfall over 3 or more days, changes in air temperature over 4 – 5 days, shear frame stability index, and the difference in hand hardness between the facet layer and the crust are potential predictors.

3. Weather and avalanche observations

Meteorological conditions were recorded by automated weather stations in Little Cottonwood Canyon at Alta Ski Lifts' Collins (2945 m) and Mt. Baldy (3370 m) study plots. At the Collins study plot, air temperature, water equivalent of precipitation, and snow depth were recorded. The Mt. Baldy weather station provided air temperature as well as wind speed and direction. Hourly averages from both weather stations were converted to 24-hour averages and are shown in Figures 2 and 3. In Big Cottonwood Canyon, manual observations of snow depth and water equivalent precipitation were recorded at the Utah Department of Transportation's Silver Lake Study Plot (2600 m). Observations were recorded every 12 hours, but 24-hour averages were calculated for use in this study (Figure 3).

Avalanche occurrence was recorded at the Forest Service Utah Avalanche Center (FSUAC) in Salt Lake City. These records are the combined observations of the FSUAC staff, numerous avalanche professionals that work and recreate in the Wasatch Range, and backcountry travelers. Within the Utah avalanche community several avalanche classification systems are used. These include the United States Avalanche Size Classification, the Canadian Avalanche Size Classification (McClung and Schaerer, 1993), and modified scales used for specific applications. Each classification system uses a scale from one to five. The Canadian classification is based on the estimated destructive effects of the avalanche, while the U.S. system is based on the volume of snow transported down the avalanche path relative to the path size. While all of the systems used have their

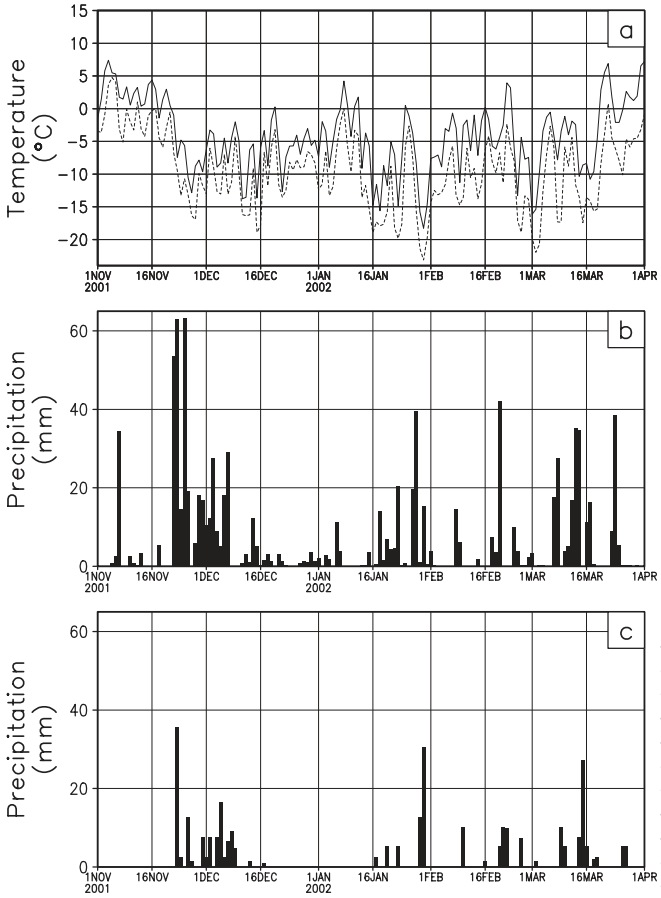

Figure 3: Daily averaged air temperature and precipitation from November 1, 2001 through April 1, 2002. a) maximum and minimum air temperature at the Collins study site (2945m ASL), b) precipitation at the Collins study site, c) precipitation

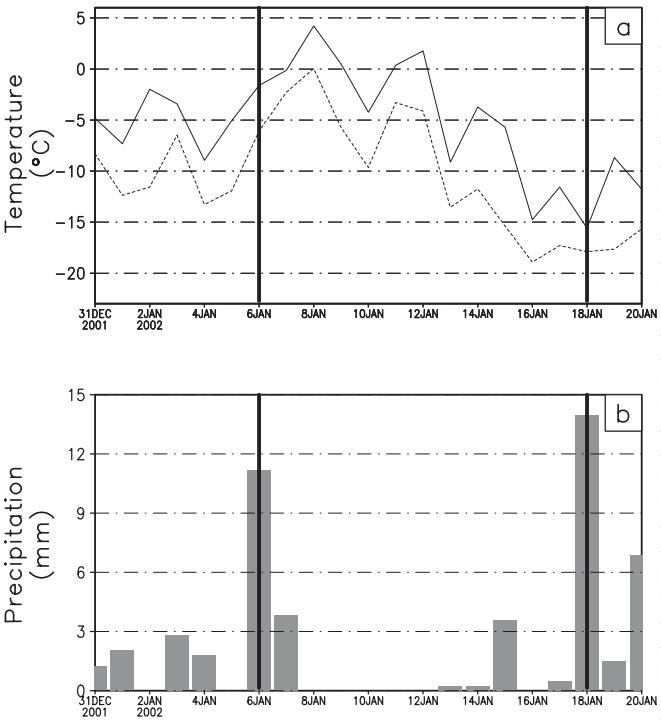

Figure 4: Daily averaged air temperature and precipitation at the Collins study site (2850m ASL) from December 31, 2001 through January 20, 2002.

Bruce Tremper investigating an explosive triggered avalanche in White Pine (March 20, HS-AE-3-0). Photo: Bruce Tremper

advantages the numerical categories are not comparable. For this study we used avalanche observations that were recorded in the U.S. or Canadian systems. Human triggered avalanches size 2.0 (both scales) or larger were used as well as natural and explosive released avalanches size 3.0 (both scales) or larger. This selection method generated a data set containing 211 avalanches. Of those avalanches 125 were triggered by explosives, 28 were triggered by skiers or snowboarders, 3 were triggered by snowmobilers, 54 were natural avalanches, and 1 was triggered by a cornice fall. Because of the inconsistent classification systems, discussions involving avalanche size are not possible.

The data set used in this study is comprised of avalanches that released on the January 6 layer and occurred in the Big Cottonwood Canyon and Little Cottonwood Canyon areas (Figure 1). Avalanches that occurred on either side of the bounding ridgelines were also included in the data set. Thus the data set includes some of the avalanche activity that occurred in Mill Creek Canyon, American Fork Canyon, and along the Park City Ridgeline.

4. Weak layer formation

In mid-November the Wasatch Mountains were nearly devoid of snow. A pair of strong storms moved through in late November dropping over 200 mm of water (250 cm of snow) at the Collins site in a 100-hour period (Figure 3). The beginning of December remained relatively wet with regular snow events. By the middle of the month the snowpack was generally stable and nearly homogenous throughout the range. The third week in December was marked by the return of high pressure and no significant snowfall occurred through the end of the month (Figure 3).

During the first week of January the amplitude of the high pressure ridge decreased allowing a moist northwesterly flow to move over the state. On the morning of January 6, 2002 the snow surface consisted of a shallow layer of recrystallized snow. A relatively warm and moist air mass moved into northern Utah. Air temperatures warmed during the day and precipitation began about midmorning falling as rain below approximately 2500 m and rime above (Figure 4). Above 2500 m a thin layer of rime ice immediately formed on the snow surface. By nightfall air temperatures dropped below 0°C, freezing the near saturated snow surface below 2500 m (Figure 4).

Overnight and early in the morning on January 7, 2002, 5 cm of snow fell at the Alta Ski Lifts' Collins study plot (2945 m ASL). Air temperatures warmed through January 8 with daytime temperatures rising above freezing at 3,300 m (Figure 2). Over the next six days the dominant weather feature over northern Utah was a low amplitude ridge of high pressure. This feature produced mostly stable weather and nocturnal temperatures in the -4°C to -10°C range (Figure 4). A cold front moved through northern Utah on January 15 dropping another 10 cm of snow. Only trace amounts of precipitation fell over the next three days and nighttime temperatures were in the -12°C to -19°C range (Figure 4). On January 18, a strong Pacific Storm moved through the Great Basin dropping 14 mm of precipitation (45 cm of snow) at the Collins study plot (Figure 4).

Without detailed snowpack measurements it is impossible to determine exactly what processes formed the layers of facets around the January 6 ice crust (subsequently referred to as the January 6 layer). However, by examining the meteorological conditions and the theory discussed above we can suggest a likely scenario.

During the rain/rime event of January 6 latent heat was added to the snowpack. Due to the large time duration and prevalent turbulent mixing of the depositional event (wind speeds at the Mt. Baldy weather station averaged over 10 m/s on January 6), latent heating of the snow surface was probably minor in areas where riming was dominant (Brownscombe and Hallett, 1967; Seinfeld and Pandis, 1998). In areas below about 2500 m faceting due to latent heat release is more likely. Once the ice crust was formed it remained on or near the surface for nearly 12 days. During this period there were large diurnal temperature

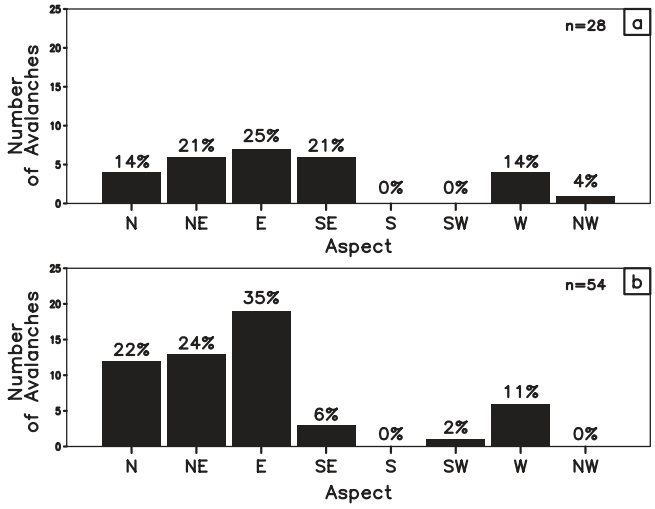

Figure 5: Avalanche occurrence by aspect. a) skier and snowboarder triggered avalanches, b) natural avalanches.

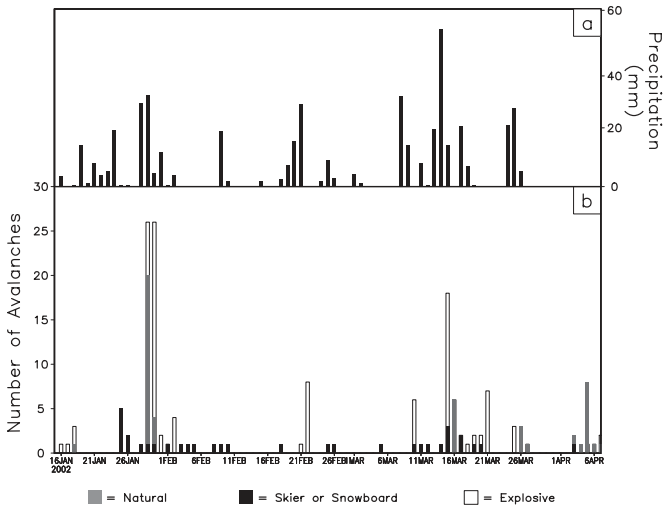

Figure 6: Timeline of avalanche cycle from January 16, 2002 through April 7, 2002. a) precipitation at the Collins study site (2850m ASL), b) number of avalanches separated by trigger.

fluctuations with nocturnal temperatures in the -4°C to -19°C range. The ridge of high pressure allowed periods of cloud cover with observations ranging from clear to overcast. These conditions (cold clear nights) were favorable for diurnal recrystallization and this process may have been enhanced by the presence of the crust. By January 11 there were faceted snow grains under the crust 1 mm in size.

5. Spatial and temporal patterns

The spatial patterns of avalanche cycles in the Wasatch Mountains are heavily influenced by the characteristics of the range (Bruce Tremper, personal communication). Although the wind direction fluctuates due to the combined affects of local orography and weather systems, the predominant upper level wind direction in the Wasatch Range is westerly (Figure 2). Winter precipitation events that favor Big and Little Cottonwood Canyons typically occur during periods of northwest flow at the 700 mb level (Dunn, 1983). As a result, avalanche activity is most prevalent (although not confined to) easterly aspects.

Natural and skier or snowboarder-triggered avalanches that released on the January 6 layer are displayed in Figure 5 by aspect. Over 60% of both natural and human triggered avalanches occurred on aspects with an easterly component, while less than 20% occurred on westerly aspects. There were no natural or human triggered aspects on south facing slopes and no natural activity on northwest facing slopes.

The majority (91%) of the avalanche activity occurred within the 2744 m to 3353 m (9,000 ft to 10,999 ft) elevation band (Table. 1). All of the natural and human triggered activity occurred above 2440 m (8,000 ft). These patterns are also greatly affected by the characteristics of the Wasatch Range. Precipitation patterns in the Wasatch Mountains are heavily affected by orographic forcing, increasing by a factor of five or more from Salt Lake City (1288 m) to Alta (2945 m) depending on the dynamics of the event (Dunn, 1983). This causes more rapid loading rates to occur at higher elevations. In addition, the 2001/2002 winter featured uncharacteristically long periods without precipitation causing the low elevation snowpack to remain relatively thin.

A timeline of the avalanche cycle is shown in Figure 6. In general the greatest number of natural and explosive triggered avalanches occurred either during or directly after a major precipitation event. Precipitation events that triggered widespread activity occurred at the end of January, end of February, and middle of March (Figure 6). The only exception to this pattern occurred during the first week of April. This was the first wet avalanche cycle of the spring and occurred after several days with strong daytime heating and nocturnal lows near 0°C.

An interesting aspect of this event was the duration of the avalanche cycle. Although the most widespread avalanche activity occurred during or directly after the first major loading event, significant avalanche activity continued throughout the winter (Figure 6). Explosive testing in backcountry areas produced several slides with crowns greater than 3 meters in depth and 100 meters wide. Backcountry travelers were able to trigger very large avalanches (2+ m deep and 100+ m wide with one over 600 m wide) after the January 6 crust had been buried in excess of 50 days and human triggered avalanches continued into early April over 70 days after the layer was first buried.

6. Deep slab avalanches and the avalanche danger scale

Backcountry avalanche advisories or bulletins rate the avalanche danger using a five level rating system or Avalanche Danger Scale (Table 2). This scale takes into consideration both the probability of triggering an avalanche and the spatial extent of the instability. The scale has been proven effective for many different scenarios,

An explosive triggered avalanche on the north-west face of Red Baldy (March 20, HS-AE-0). Photo: Bruce Tremper

Elevation Band		Number of Avalanches	Proportion of Total* n = 211
11,000-11,500 ft	3354-3506 m	9	4%
10,000-10,999 ft	3049-3353 m	120	57%
9,000-9,999 ft	2744-3048 m	71	34%
8,000-8,999 ft	2440-2743 m	8	4%
7,000-7,999 ft	2134-2439 m	3	1%

*Table 1: Avalanches on the January 6 layer by elevation band. * Rounded to the nearest whole percent.*

Danger Level (color) ...What...	**Avalanche Probability and Avalanche Trigger** ...Why...	**Degree and Distribution of Avalanche Danger** ...Where...	**Recommended Action in the backcountry** ...What to do...
LOW (green)	Natural avalanches very unlikely. Human triggered avalanches unlikely.	Generally stable snow. Isolated areas of instability.	Travel is generally safe. Normal caution advised.
MODERATE (yellow)	Natural avalanches unlikely. Human triggered avalanches possible.	Unstable slabs possible on steep terrain.	Use caution in steep terrain on certain aspects (defined in accompanying statement).
CONSIDERABLE (orange)	Natural avalanches possible. Human triggered avalanches probable.	Unstable slabs probable on steep terrain.	Be increasingly cautious in steep terrain.
HIGH (red)	Natural and human triggered avalanches likely.	Unstable slabs likely on a variety of aspects and slope angles.	Travel in avalanche terrain is not recommended. Safest travel on windward ridges of lower angle slopes without steeper terrain above.
EXTREME (red with black border)	Widespread natural or human triggered avalanches certain.	Extremely unstable slabs certain on most aspects and slope angles. Large and destructive avalanches possible.	Travel in avalanche terrain should be avoided and travel confined to low angle terrain well away from avalanche path run-outs.

Table 2: The United States Avalanche Danger Scale. Modified from Dennis and Moore, 1996.

however in practice the increments tend to be more representative of snow stability than danger to people. The Canadian Avalanche Association defines avalanche danger as the potential for an avalanche to cause injury or death to a person (CAA, 2002). When a deep slab instability is present, the Avalanche Danger Scale does not communicate a complete picture of the danger to the public because the rating system is based in spatial extent and does not consider avalanche size.

Deep slab instabilities often attain a moderate or considerable rating on the Avalanche Danger Scale. This rating arises from a combination of factors. First, deep slab instabilities often affect a small percentage of the terrain described in an avalanche advisory. Second, in the absence of loading events, natural avalanches are often unlikely but human triggered avalanches are possible and sometimes probable. Since deep slab instabilities are infrequent, the public often associates a moderate or considerable danger rating with a more widespread instability that produces avalanches with a lesser destructive force. During a deep slab instability it may be possible to travel safely in many areas, but if an avalanche is triggered it is likely to be a very large and destructive event. This presents a confusing situation for the public and a difficult situation for the forecaster. The public struggles to determine which type of moderate danger is occurring on a particular day, while the forecaster frets over using the same danger rating for two very different situations.

The Forest Service Utah Avalanche Center (FSUAC) was presented with communicating the danger of the January 6 layer from the end of January through mid April. While none of the staff felt the avalanche danger was adequately described as moderate, the majority agreed that the definitions dictated this rating. The forecasting staff generally used a moderate or considerable danger rating and attempted to describe the complex nature of the conditions in their advisory. This approach is probably adequate for users that both read and understand the entire advisory. However, users that rely heavily on the danger rating may not get enough information to travel safely in the backcountry.

We do not have a solution to this deficit in the Avalanche Danger Scale. One method would be to use a danger scale that weighed instability, spatial extent, and size equally. Over the past few years the FSUAC has attempted to add a factor into internal avalanche danger worksheets that accounts for danger to humans. This so called "pucker factor" represents the level of danger the avalanche conditions present to an individual backcountry traveler. While this is not an explicit representation of avalanche size it does represent destructive force.

7. Concluding Remarks

The avalanche cycle that occurred around the January 6 layer contained several unusual aspects. During the twelve days between the formation of the crust and the next major snow event, facets grew on adjacent snow grains both above and below the ice crust. During the first period of avalanche activity (in the end of January), avalanches released on faceted layers both above and below the ice crust. As the season progressed the faceted snow below the ice crust became the dominant failing layer. This suggests that while both layers were gaining in strength, the snow under the crust gained strength slower. If this observation is correct it would support some of the theoretical work reviewed above.

Although the most widespread avalanche activity occurred during and after the first major loading event, avalanches released near the January 6 layer for the duration of the winter. Large explosive triggered avalanches occurred after every major loading event and human triggered avalanches occurred over 70 days after the facet-crust layer was completely buried. During the first spring warming event large natural avalanches occurred.

The January 6 layer posed a serious forecasting problem for all of the avalanche safety programs that operate in northern Utah. The Forest Service Utah Avalanche Center approached this problem by both using an Avalanche Danger Scale rating and describing the complex nature of the avalanche cycle in the advisory. It is our belief that the Avalanche Danger Scale alone does not adequately communicate the avalanche danger to the public and that a danger scale rating should be augmented with a more detailed discussion of snowpack conditions.

The west side of Mill D South shows evidence of natural and explosive activity that occurred during and after the January 28-29 snowstorm. Photo: Ethan Greene

8. Acknowledgements

We would like to thank the snow safety programs at Alta Lifts Ski Area, Snowbird Ski Resort, Solitude Ski Area, Brighton Ski Area, Park City Ski Resort, The Canyons Ski Resort, Utah Department of Transportation, and Wasatch Powderbird Guides for sharing the data they collected during their daily operations. In addition Dan Howlett (Howie), Jim Collinson, Sam Davis, Eric Wright, and Greg Dollhausen went above and beyond the call of duty to help us get the data for this paper. We had many useful discussions with Bruce Tremper, Evelyn Lees, Tom Kimbrough, Carol Ciliberti, Drew Hardesty, Robert Athey, Craig Gordon, Karl Birkeland, and Alan Jones. Jim Steenburgh provided portions of Figure 1 and Bruce Tremper, Craig Gordan, and Edger Webster provided photographs for this article.

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Brad Geisler: A Tribute to a CSPA Pioneer By Peter Spear and Eric Geisler

The summer of 2002 marked the passing of Brad Geisler at the age of 77. Mountain recreation was a primary interest for Brad and enjoyment of the mountains came second only to safety. He dedicated more than 25 years of his life to the safety of others through ski patrol, avalanche training and mountain rescue. Brad was a volunteer ski patroller in Western Canada with the Canadian Ski Patrol System and renowned as a visionary in public avalanche education.

Born in New York City and raised in Portland Oregon, Brad was a decorated member of the 10th Mountain Division of the U S Army and served in Italy during WW II. Upon his return to the US, he completed a geology degree at the University of Colorado where he joined the National Ski Patrol System, mainly patrolling at Arapahoe Basin. In 1955 with his wife Nancy, Brad moved to Calgary to work in the oil industry.

Brad joined the Canadian Ski Patrol System and spent his patrolling years at the Lake Louise Ski area where he influenced many people in the avalanche community. Teaming with Russ Bradley, a local ski mountaineer, Brad began writing and teaching public avalanche education programs. These included course outlines, student materials and A-V materials. This program, started 35 years ago, was a two and a half-day course of theory and field practice. This course kept up with the times, and in a team effort, in 1996, Gordon Ritchie of the CSPS and Randy Stevens of the Canadian Avalanche Association co-authored the Recreational Avalanche Course, now known simply as RAC. It has become so popular that course providers are challenged to handle the high demands.

Brad was a doer. When a Calgary group put in a bid for the Olympic Winter Games in the 1960s, Brad spent two winters on weekends climbing to his snow plots high on the Lake Louise ski area to collect snowfall data for the bid committee. When the wooden parks rescue sleds were outdated and crumbling, Brad, Colin Johnson and George Ennis designed "the yellow truck", a fiberglass version that was used in 1988 at the XV Olympic Winter Games in Calgary, and all subsequent World Cup events held at Lake Louise. The ones built for the ski hill are still in service at the ski hill 25 years later. Brad also was the first to use a backpack instead of a fanny pack for patrolling as it carried a probe and shovel for avalanche rescue. The CSPS national organization had to revise its equipment standards to accommodate this.

Brad was a visionary. Peter Schaerer relates an event in 1968 at a meeting of snow science people in Calgary. Brad predicted that without major public avalanche courses the sports of snowmobiling and heli-skiing would create a major increase in avalanche incidents and deaths. Quick access to the backcountry and inadequate forecasting methods at the time would lead to these problems. How right he was 35 years ago!

Brad was a seeker of new ideas, technology and practices. Parks Canada staff, the British Columbia Institute of Technology, and local ski hill operators often heard from Brad about what they were doing right… and wrong. In the 50s, 60s and 70s everyone in the avalanche business in Western Canada knew the name "Brad " would come up in discussion as they were challenged to meet his standards.

Brad was a special mentor. His enthusiasm in avalanche education created a core of instructors in the CSPS that included Tony Daffern, Colin Johnson and Peter Spear. Tony created the book *Avalanche Safety for Skiers and Climbers* that has sold more than 30,000 copies – a classic on the Canadian Rockies avalanche phenomena. Colin was an engineering professor at the University of Calgary, who on a chance meeting with one aspiring grad student, Bruce Jamieson, created a phenomenal flow of technical avalanche theory and practical application from the University of Calgary that continues today. Peter Spear worked with Brad for 10 years to upgrade public avalanche courses and continued with the development of a one-hour High School Avalanche Awareness program and the Snowsmart program for teens.

Brad was never a quitter. In 1977 he suffered a major stroke and for the next 16 years struggled to learn to walk and then to ski again before he finally gave up his skiing hopes in 1993.

Brad was a very private individual. He shunned public recognition and was hard to get to know on an individual basis. The CSPS, with more than 100,000 members in their 62-year history, has awarded only 46 life memberships. Brad was # 8. He did not go to Banff in '96 during the ISSW, to receive an award. Instead, Gordon and Deb Ritchie delivered the award to him. Brad never became a Canadian citizen but contributed so much to Canada. His efforts to promote safe skiing were recognized by the Premier of Alberta with the presentation of an Achievement Award in 1978. At his request, no funeral or memorial services were held.

Nancy Geisler, his son Eric, daughter Gretchen, and four grandchildren survive him.

A celebration of his life was held at Lake Louise on December 28th, 2002.

Donations in Brad's memory can be forwarded to the Canadian Avalanche Foundation at 409-8 the Ave., Canmore, AB T1W 2E6 in remembrance of Brad's efforts in avalanche safety.

Origins and Meaning of the "CONSIDERABLE" Rating

On February 10th, the CAA met with officials from the B.C. Ministry of Public Safety and Solicitor General. Together, we concluded that we need both immediate and long-term plans to deal with public avalanche safety. Among the items included in the preliminary list for immediate action is a targeted public awareness campaign that will profile the Public Avalanche Bulletin and explain the international avalanche danger scale, with special attention to the rating "considerable". With this action in mind, we have invited several people involved in the development of the danger scale to discuss the origins of the "considerable" rating, its meaning and its effectiveness. Their responses follow.

Origins of the "Considerable" Rating

by Peter Schaerer

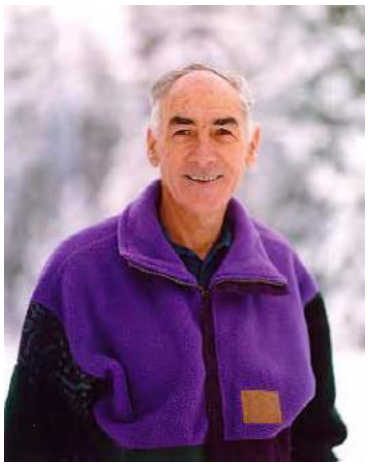
Canada adopted the European avalanche danger scale in 1994, which was developed in tough discussions among the alpine countries, mainly Switzerland and France. Before its adoption, the Western European countries each had their own ratings (i.e., France had seven danger classes and Switzerland had three with sub classifications), but finally the countries yielded to the pressure of producing an unified system.

In Canada, the five danger levels (low, moderate, considerable, high and extreme) were adapted from German and French danger scales. While most descriptors are straight forward translations into English, there was some discussion required in choosing the translation for level 3, *considerable*. The German word for the danger level *considerable* is *erheblich*, which translates into *important, considerable, elevated*. The French word is *marqué*, which might be translated as *significant*. As such, the avalanche danger descriptor of *considerable* means that there is an important hazard which must be taken into serious consideration. It means that skiers could start avalanches and natural avalanches are possible. Backcountry users must consider the possibility of avalanches on slopes where avalanches may form. The Swiss danger scale contains explanations in greater detail about the danger *erheblich* than the Canadian scale; they are as follows (my translation):

- The snow cover is moderately stable to weak at numerous steep slopes.
- The start of avalanches is possible with a low additional load, particularly at steep slopes that are identified in the avalanche bulletin (elevation, aspect, shape of terrain). A low additional load means individual skiers and pedestrians. A few natural, medium size avalanches, but also isolated large natural avalanches are possible.
- Exposed parts of roads and settlements are endangered. Safety measures are recommended.
- Partially unfavorable conditions for persons outside of controlled areas. Experience in avalanche hazard evaluation is required. If possible, avoidance of steep slopes of identified exposures and elevations.

Experience in France and Switzerland has shown that most backcountry avalanche accidents have occurred when the danger was rated considerable. Most likely, the reason is that skiers think the avalanche hazard is really not serious. At a high danger rating, skiing and snowmobiling usually are not enjoyable due to bad weather and deep new snow, therefore few backcountry users are exposed. At a low and moderate danger, of course, few avalanches are released and fewer people are involved. It would also be interesting to correlate avalanche involvements in Canada with the danger ratings of the bulletin at the time of the involvements.

We had extensive discussions about the wording of danger level 3 when we adopted the European danger scale, but finally we settled on considerable. The avalanche centres in the US chose to call the level *moderate to high*, but after two years the they also adopted *considerable*.



Peter Schaerer, often considered the grandfather of avalanche safety in Canada, initiated and held the lead role in developing professional level avalanche training programs in Canada. He retired as the head of the Snow and Avalanche Research Branch of the National Research Council of Canada in 1991 and was awarded the Order of Canada in 1999 for his contributions to avalanche safety work in Canada and the world.

A Scottish View on "Considerable" and the Difference Between Hazard and Danger

by Blyth Wright, Co-ordinator, Scottish Avalanche Information Service (SAIS)

In Scotland we have been using a five-point rising scale for description of avalanche hazard since forecasting operations started in winter 1988-99. This rated hazard as Category 1,2,3,4,5 and adjectivally Very Low, Low, Medium, High and Very High. The only problem was with the word "Medium", which tended to be interpreted as "Average" and therefore OK.

We were not present at the Wildbad Kreuz meeting of the European Avalanche Warning Services Working Group, when the European scale was first adopted, along with an English translation of it. However, we were made aware of the proceedings through Alan Blackshaw. I don't know whether he or perhaps someone at the Institute made that translation. This, however, was where the use of the term "Considerable" originated.

Origins and Meaning of the "CONSIDERABLE" Rating Continued...

At the Davos meeting of the Working Group in May, 1994, various modifications to the French and German originals of the scale were lengthily and bloodily debated. After this, I was asked to revise the English translation. I did this, keeping as close as possible to the meaning as expressed in French and German, given that the protagonists had invested so much time, effort and national pride in the outcomes.

From the institute I phoned Peter Schaerer and asked him for comments on my revision. He seemed broadly to agree with the points I offered. The revision was then accepted by the 1994 meeting and remains the official English version of the scale in Europe. This appears to be recognized in the use of much of the terminology in the Swiss leaflet in English, titled *Caution - Avalanches*.

When in winter 1994-95 we started using the European scale, one benefit which almost immediately became obvious was that the media, if not the climbing public, interpreted "Considerable" as being high hazard. That winter was the worst we have ever had for avalanche fatalities. We had one high-profile double fatality with Considerable hazard as the forecast and the media gave us no problems.

It is perhaps worth mentioning that since winter 1990-91, we have split the Category 3 level into 3+ and 3-. Originally, this was to enable us to assess the accuracy of our bulletins (and later, computer forecast models), but it has proven useful. A 3+ is advertised to the public by the use in the bulletin of the words "avalanches are likely" related to the slope altitudes and aspects concerned. Analysis shows that avalanches are about twice as likely with a 3+ as with a 3-. Perhaps it rather betrays the principle of the Common European five-point scale, but the French do it too with their Indice 5 Bulletin d'Alerte, which is really a Category 6.

In Scotland, we do not have a problem with the fact that many accidents occur with "Considerable" hazard in force. That is the degree of hazard which exists in our mountains most commonly. Also, the borderline has to exist somewhere and as it happens it is with Considerable (Category 3). It doesn't matter what you call it, there is a threshold where judgments on avalanche hazard are at their most difficult.

It looks as though the European scale has settled down and most people have accepted it as a good compromise. Recent meetings have seen no calls for changes in wording. In Scotland, we certainly don't envisage changing the English version.

Avalanche Education Grants

Backcountry Access, Inc. (BCA) of Boulder, Colo., worldwide distributor of the Tracker DTS avalanche transceiver, is offering $20,000 US in funds and equipment this season to avalanche educators across the U.S. and Canada. To qualify, educators must show a long-term commitment to the education of winter recreationists and a compelling need for funds and/or products. Products being offered include the Tracker DTS, BCA's Companion and Tour shovels and probes, and Stash packs.

"As the industry leader in beacon sales, we felt it was our responsibility to get more people educated so they stay out of avalanches in the first place," said BCA Vice President Bruce Edgerly.

In addition to supporting educators across the country, BCA will accelerate its own education program. BCA principals and technical representatives will provide avalanche awareness presentations at key locations across North America in 2002-03. The objective, according to Edgerly, is to get consumers interested in the subject of snow safety and to drive them into on-snow Level I avalanche courses.

"Our goal isn't to compete with existing avalanche educators, but to make more people aware of their courses," Edgerly said. "By keeping people out of avalanches in the first place, we can encourage the growth and safety of backcountry skiing and snowboarding – and, of course, the proper use of rescue equipment."

BCA will also continue to offer its existing educational materials for teaching students to use avalanche transceivers. This includes the Tracker DTS Instruction Guide and BCA's popular life-sized vinyl flux diagram. This sells at their cost of $35 (Cdn), but is also available free of charge to educators who qualify for grants.

For more information on BCA's education support program or to schedule an awareness clinic in your area, contact BCA at (303)417-1345 or info@bcaccess.com.

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Winning the Media Game by Bruce Tremper

I seem to have become an unabashed media hound. I would like to think it's because I'm irresistibly charismatic, handsome and well spoken, but the sad truth is that it has a lot more to do with the geography of Utah than anything to do with me. For instance, as far as national television, our office is conveniently located just across the runway from the Salt Lake International Airport. They can get off the plane at 10:00 am, be in our office by 10:30, get the sit-down interview in front of appropriately techie computer screens by noon, be at Alta in a snowpit by 1:00 pm, be back on the plane by 4:00 and be home for dinner. You can't do that in Colorado or Seattle and it's twice as expensive in Bozeman or Alaska—so they usually come to Utah.

Looking back through our annual reports I see that our staff usually fields about 60 media contacts each season, which include an average of four national television interviews, 20 local television interviews, eight national print interviews and dozens of local print interviews. Like it or not, we have had to learn how to effectively deal with the media and here are some of the things we have learned.

The media is your friend

In this day of cars and hockey teams named "avalanche", 500 cable channels and thousands of magazines, most every avalanche professional will have to deal with the media throughout their career. Avalanches seem to be vogue these days. We're all sitting on top of a media slam-dunk that is the envy of most public relations firms and I don't think many avalanche professionals do a very good job of capitalizing on it.

With our pitiful funding, the only way we can realistically afford to preach the avalanche gospel to a wider audience is to skillfully utilize the media. We're all in the same business—keeping people on top of the snow instead of buried beneath it—and it's all of our jobs to help educate the public in this seemingly loosing battle. It's probably the only way we will ever put a dent in the skyrocketing avalanche fatality statistics. The media needs us and we need them. It's a partnership. They want to report on the latest accident or do a feature piece on something exciting and we want to educate the public about avalanche hazards.

First, let's start with the more mundane nuts and bolts of how to deal with interviews.

Talking points

In both print media and especially television, even if the reporter spends half the day with you, they will use only one, two or at the most, three quotes or sound bites. Also, they want quotes to be concise, plain spoken and colourful. Before you talk with any media, be sure to write out a list of what we call "talking points". In other words, sit down and write out a short list of the most important points you want to get across. Develop perhaps 10 talking points but realize that you will be lucky to get three of them in the story. Then write them down and rewrite them again and again until you can get them under about 10 seconds, and practice saying them until you have them memorized.

Don't use jargon. The public doesn't know what avalanche "control" is or "hazard reduction" or "hand charge", "aspect", "faceted layer" or "wind slab". Most newspaper articles and television news programs are targeted to an eighth grade level and only a tiny portion of the audience have any kind of science background—especially the journalist doing the story. Keep it simple, colourful and short. Use active voice in short, declarative sentences. Spend time thinking up easily understandable, visual, metaphors. Pretend you're explaining it to your grandmother. For instance, to explain a hard slab on depth hoar I might say, "Imagine taking a pane of glass and setting it on top of a stack of champagne glasses, then slowly add a pile of bricks on top." Here's more examples:

Bad talking point
"We performed hazard reduction with a full round of hand charges but this kind of deep slab instability on depth hoar is unpredictable." (The only part of this sentence that would make it into the article is "unpredictable".)

Better talking point
"We regularly knock down avalanches with explosives each morning and we have not had any avalanche fatalities in our 30 years of operations." (This shows you are doing something about the problem and that it's successful.)

Bad talking point
"Wind slabs on many different aspects were created by this latest wind event with sympathetic fractures 1-2 feet deep." (Jargon and passive voice. They won't understand it. They won't use it.)

Better talking point
"The strong winds yesterday deposited snow on the downwind side of ridges, making it unstable and sensitive to the weight of a person." (Active voice, simple and visual.)

Don't get too sidetracked from your talking points. If they ask you an unrelated question or something you would rather not answer, simply practice what politicians do with gusto—use bridging. In other words, pretend like you're answering the

question but instead just bridge back to your main message. Ronald Reagan was a master at bridging. "I'm glad you asked me that question because it's just like the old story… blah blah… and that's why we need to get big government out of people's lives."

Develop a Media Packet

When you start a business you develop a business plan and when you deal with media you develop what is called a "media packet". For instance, the Utah Avalanche Center media packet contains the answers to frequently asked questions, simple primers on avalanches and how our operation works, staff biographies, all the latest statistics and some nice graphics to illustrate points. The media will need all these things to do their story anyway so you're just making it easy for them. For print media, it a good idea to include a CD of high resolution digital photographs of avalanches, snowpits, staff photos and staff in action.

For television interviews, give them a copy of a video tape of what they call "B-roll" material, which means generic shots of avalanches in motion, avalanche control, digging snowpits, avalanche rescue dogs or any other "cut-away" shots they might use in their piece. You can either shoot this yourself or collect footage from other television stories on your operation. Be sure to get permission from whoever shot the video before passing it out. You should have it available in a "beta SP" format or a digital tape. VHS tapes are useless to media because of their poor quality.

We also have a media packet posted on our web site (www.avalanche.org and click on Salt Lake). This has saved me countless hours patiently explaining the well-worn basics. Media is used to being handed media packets during interview. It helps them to produce their stories and it helps to reduce the inevitable misinformation and misquotes. We always keep a media packet handy in our office and I always carry one in my briefcase and I just hand it out to anyone who interviews me.

Dealing with print media

I love dealing with print media. They don't shove cameras and microphones in you face, you usually talk with them over the telephone, they're usually on a much more relaxed deadline than television and they can put about 10 times more information into their story than television. Here's how to do it:
Unless they work for a big-budget national magazine, they almost never record the interview. They all operate on a tight time deadline and they don't have time to play back a recording. Ninety five percent of the time, they will either write or type as you talk.

First rule: We talk about 10 times faster than they can write. If you don't want to get misquoted, then you must talk SLOWLY…and…repeat…everything…twice. I usually tell them right off the bat what I'm doing so that they don't think I'm weirder than I already am. They usually say, "Oh, don't worry, I do this all the time." Don't believe them. Try writing as someone talks and you'll see what I mean. Talk slowly, repeat everything twice. No exceptions.

Second rule: You WILL get misquoted. Get over it. In the thousand-or-so of times that I have been quoted in newspapers and magazines, I can count only a couple times that I have been quoted accurately. They usually get it sort of right or half right but never, never completely right. Sometimes it's atrocious. They are on very tight deadlines and with nothing recorded there's no accountability and they suffer absolutely no penalties for misquoting, especially if you work for the government. Unfortunately, misquotes and misinformation are very rampant. It's just the way it is. I thought I would never find myself saying this, but dealing with the media gives me a lot more sympathy for politicians. It also makes me very skeptical of everything else I read in the newspapers because they almost always get avalanche stories wrong. This is the best reason to have a media packet.

Third rule: It's always OK to say, "Yes, I would love to talk with you. Can I collect my thoughts and call you back in 10 minutes." Remember that this is a partnership. They want a good story with good quotes and you want to represent your organization well or get critical information out to a wider audience and most important, look good to your bosses.

Fourth rule: At the end of the interview ask them to read back your quotes to you so you can "help them catch any obvious errors that could embarrass them" as I usually put it. They will almost always comply and I almost always find a number of quotes that are incorrect to the point of being dangerous. Remember they are your quotes and you have a right to review them for accuracy.

Dealing with television

Television. It's all an illusion - all theater - and if you know how to play the game it can be a very powerful tool. But if you don't have the patience of a saint and the inclination to do some simple work on your thespian skills then you will find it to be a nerve-wracking, humbling experience.

Here's how to do it

First, television requires some training. Work with your public affairs people to get some media training. If you don't have access to media training, you can train yourself. Get a video camera, put it on a tripod and spend as much time as you can in the hot seat. Work with a partner and trade off asking and answering questions. Do it over and over until you feel comfortable with how you look and sound when you play back the tape. This takes time, so don't expect to be an instant master. Here are some basic pointers for doing a television interview:

What to wear

Wear dark, solid colors. Checkered shirts flicker on camera and bright colors look like neon. Also, make sure you're showered and shaved. I used to come in for my forecast day without taking a shower or shaving because when I wake up at 3:00 am, any time I can save helps. But I don't do that anymore. Any time an avalanche fatality occurs all four of our local TV stations usually descend on our office with their cameras and I catch hell from my bosses every time our staff looks like a terrorist or a climbing

bum on the evening news. We always keep a dark Cashmere sweater at the office for interviews and a Forest Service shell for the outdoor interviews. We have a Forest Service shield with Velcro on the back so we can always place it strategically in every shot. Our public affairs folks love it.

Having said this, remember we're avalanche people and they expect us to be colorful and eccentric. The media wants the real deal, not a company spokesperson. Be yourself.

Also, comb your hair (if you're lucky enough to have some left) and most important, go into the bathroom and pat your face down with a paper towel to get rid of the shine. In my case I do this for the top of my head too. Don't drink too much coffee. The interview, alone, will keep you wide-awake. Coffee just makes your voice dry and jittery. Drink lots of water. It makes your voice sound better.

How to sit or stand

Television likes to zoom in on your face. Too much movement makes your head wobble in and out of the frame. Plant yourself firmly in the chair with good posture and prop your elbows on the armrests. Watch out for swivel chairs or ones with wheels. For stand-up interviews, put one foot in front of the other with your back foot sideways and your front foot straight out in a "T" shape so you won't be tempted to sway from side to side. At a podium, pretend like your belly button is glued to the podium. Any gestures you make with your hands needs to be done right near your face and do them slowly so the camera operator has a chance to zoom out to catch it.

How to talk

A lot of us tend to talk in a very monotone voice that puts people to sleep. Concentrate on making your voice very animated and talk with the pitch of your voice moving up and down more than you do in normal conversation. Act excited about your subject. Talk in plain, colorful language, and remember, no jargon, no scientific terms. Get to your point quickly. Slow talk and long pauses will kill any sound bite. By now, you should have worked with your talking points enough to make them short, colourful and plain spoken. Remember, anything longer than about 10 seconds is usually unusable or will be either thrown out or chopped up. This takes LOTS of practice. Remember you can do several takes on each question to get it right.

Doing the interview

Television news programs operate on incredibly tight time constraints. Their deadline is the 6:00 pm news or the 10:00 pm news and if you don't return their call immediately, well, they will just find someone else in a New York minute. It's a good idea to develop a relationship with the local news channels and make sure they know your cell phone number and always carry it with you. These kinds of opportunities to preach the avalanche gospel to a wider audience don't come very often so you have to strike while the iron is hot.

When you meet the crew, find out the focus of their piece and what length of sound bites they want. For instance, for the standard evening news show, you will probably only get one 5-10 second bite. A half-hour documentary is luxurious by comparison and it allows for longer sound bites and more of them. They will also have a larger budget to spend more time with you.

Find out the focus of their program and what questions they want to ask and rehearse your answers over and over in your head while they are setting up. They usually take a long time to set up so you will usually have time to rehearse while you're tidying up and patting down your face down with a paper towel.

They will help you get the microphone in place. (The cord usually goes under your shirt or jacket and the transmitter goes in a side or back pocket.) Plant yourself in a position so you don't move your head too much and you're ready to roll.

First rule: It's not about you, it's about the message. I have always liked the advice that Paul Newman gave to Mathew McConaughey early in his career, "Take your work seriously, don't take your self seriously."

"opportunities to preach the avalanche gospel to a wider audience don't come very often so you have to strike while the iron is hot."

Some people think that being on television is a big deal, but it's not. It won't change your life in any way even if you appear on national documentaries. At least it never did anything for me. So leave the ego out of it. This is often more easily said than done and here are some techniques. If you are feeling shy, nervous or self conscious, do what champion athletes and Zen masters do, turn off your mind and focus your awareness on here and now. Look intently at something—the back of the chair, the reporter's eyes—anything. Notice the texture, the color, the details. You can also focus on your breathing. Feel everything, hear, smell, taste and look. Drop into the calm infinity of total awareness—the "zone" as athletes call it or "shikentaza" as it's called in Zen practice. The ego and the mind are only an illusion anyway, and they dissolve like a desert mirage when you ask them to take a couple steps back and focus on total awareness.

Second rule: Unless it's a live, panel discussion format, you NEVER look at the camera. Always look at the interviewer. Don't look down or up when you're thinking. It looks stupid on TV. Better to look to the side when you're thinking.

Third rule: Unless it's a stand-up interview with a hand-held microphone, the interviewer doesn't have a microphone so the audience can't hear the interviewer's questions. ALWAYS include the subject in your answer: This takes a lot of practice and it's easy to forget. For instance,

Interviewer: "How do avalanches occur?"
Wrong answer: "They occur when.…"
Right answer: "Avalanches occur when.…"

Interviewer: "Are you concerned about these conditions?"
Wrong answer: "Yup."
Right answer: "I'm very concerned about these conditions because…."

Fourth rule: Video is cheap. You can answer the question over and over until you are satisfied with your answer. For instance I almost always give at least two takes on every answer. After my first take I'll say, "Let me try that again and see if I can give you a shorter sound bite" or "Let me try that again a different way." Remember this is your interview, it's not theirs and they want a good sound bite just as badly as you do. Sometimes I'll do five or six takes until I feel like I've got it right.

Fifth rule: When it's over, it's over. Dealing with media is often a slam-bam-thank-you-man experience. By the time the show airs, or the story runs in the newspaper, they will be off working on their next project. They will be hard-pressed to remember your name. No, they won't give you a copy of the videotape or mail you the article even if they promise to do so. Don't be offended. They're just busy.

Also, realize that the reporter turns their story over to an editor and then moves on to the next story. Editors will rewrite the story and chop it up depending on the space left over after the advertisers are taken care of. Editors know nothing about avalanches so they will make plenty of mistakes. Also, yet another person writes the titles for newspaper and magazine stories, and they will also make mistakes. It's just the way it is, so don't expect perfect stories.

Dealing with Press Releases

Press releases are a very powerful tool when you need to get the information out to a wider audience. For instance, sometimes we use them on Friday when we know that Saturday will have the usually-deadly combination of sunny skies and very unstable snow. You can also use a press release to announce critical changes to your operation or announce important upcoming events.

First, work with your public affairs people to develop a template for a press release. Second, keep a list of local media fax numbers programmed into your fax machine. Write up the press release, have it proofed by someone, throw it in the fax machine, push the button and you're done. We have found it to be a very effective tool.

News stories have a very short shelf life and once misinformation gets out, it's impossible to retrieve. They will almost never do follow up stories. So when things are happening, you need to furiously go into overdrive, get your side of the story together and get it out to the media as soon as possible. Minutes count. For instance, since we usually leave our office at noon (we start at 4:00 am.), if an avalanche accident occurs, we usually don't hear about them until about dinnertime, often on the evening news. The initial news stories are often wildly inaccurate, so we usually jump on the phone and gather as much information as possible and then either issue a press release or call around to all the local TV stations and newspapers to get our story out. Most of the local TV stations know where I live and I've done at least a dozen interviews on my front lawn in the evening. Even if you don't know the details of the accident, it's still a good opportunity to explain the kind of instability that caused the problem, promote your program and especially, get the avalanche hotline number out to the public.

It's also important to conduct media events proactively. For instance, there's nothing quite as media-friendly as either dogs or rescue, and when you combine them together, you've got a killer media event. During the Olympics and the World Cup, we organized media events at both Snowbasin and Snowbird to demonstrate their avalanche rescue dog programs. We called these events "Buried Alive" and we advertised them widely. The media folks loved being buried in the snow with their cameras (make the holes luxuriously large) and they love filming dogs. While they are there, you can preach the avalanche gospel—talk about

A good example of a media packet photo: Dean Cardinale and dog, Snowbird, Utah.

the dangers of ducking rope lines, advertise the services of the local avalanche forecast information and promote the avalanche control programs.

Alpine Meadows in California is the master of this game. They sell t-shirts throughout the season featuring all their rescue dogs with their names and most of the local media know the dogs by name as well. They also do programs for local school children. It not only gives the rescue dogs more practice, but it helps to socialize them, build positive relations with the local community and to educate the public about avalanche hazards—a quadruple-win situation.

When things go wrong

Luckily, we work in a business that the public and media find glamorous and most media stories are positive. But sometimes things go wrong and we suddenly find our usually friendly media camped outside our door wanting to know exactly what happened and whose is to blame.

First rule: You are in control. The media have to report something so make sure it's your side of the story. Stonewalling rarely works. Furiously gather as much information as possible, write out your talking points, clear them with management, practice them with a friend, then go face the wolves.

Second rule: Don't get sidetracked from your talking points. Once released, words can't ever be stuffed back into a mouth, especially with a foot in it. If you say something stupid, they WILL use it. If they ask a question you would rather not answer, just bridge back to your talking point, just like a skilled politician. They can't ever use a sound bite you didn't say.

Third rule: We all naturally feel sympathy for the victims and their loved ones so don't be afraid to let it show. Words like "tragic" and "unfortunate" are never wasted words in any sound bite.

Example:
Interviewer: "Were those snowmobilers being stupid going out without beacons on a day like that?"
Wrong answer: "Only an idiot would go into avalanche terrain without a beacon." (Yes, I once said something to this effect after stumbling off a helicopter, exhausted from probing, very hungry, very grumpy and not feeling particularly empathetic. Hot tip: Don't talk to media until you are ready.)
Right answer: "To help avoid tragic accidents like this, people who go into the backcountry should do three things: first call the avalanche report before you go out; second always wear a beacon and a shovel; and third, cross avalanche terrain one at a time."

Fourth rule: Never lie, speculate or judge. If you don't know the answer, say you don't know. If you made a mistake, admit the mistake, then bridge to a positive answer. For instance: "The storm came in much stronger than we expected so we should have called it a high danger instead of considerable, but 95 percent of the time, our forecasts are very accurate, which is why our service is so popular."

Fifth rule: Even if negative stories do come out few people will remember them in a month or two. In fact some people say that there's no such thing as bad publicity. Just ask Madonna, who is a master at this game. For instance, it's not always bad for people to associate a particular ski area with avalanches because it means that it really IS a big time, gnarly place instead of all the other imposters we see in the ski magazine ads.

Media can make the difference

We have a chance to help reduce the epidemic of avalanche deaths in Canada, and considering our woeful funding to combat the problem, the only way this will realistically happen is for us all to become media savvy. Develop a media packet (or copy the Utah Avalanche Center's) develop talking points and practice, practice, practice. Get to know your local media. Regularly stage media events. Issue press releases when accidents happen or during times of high danger. Spend lots of time getting ready and strike while the iron is hot. We can make a difference.

Bruce Tremper is the author of Staying Alive in Avalanche Terrain *(2001 Mountaineers Books). He has worked as Director of the Utah Avalanche Center since 1986; he previously worked at the Alaska Avalanche Center, Big Sky Ski Area, and Bridger Bowl Ski Area. He has a Masters Degree in Geology and is a professional member of the American Avalanche Association.*

Mountain PhD Assistantship Montana State University

The Department of Earth Sciences at Montana State University has a PhD Research Assistantship available for a graduate student interested in snow and avalanches starting Fall 2003. Our funded project focuses on the spatial variability of snow stability and microstructure, and how they change through time, and it involves intensive field work in a variety of locations. The student we are looking for will have an MS degree in the Geosciences or a related field, excellent quantitative and computing skills, advanced backcountry avalanche knowledge, extensive field experience (preferably in the snow), and an ability to work independently. A working knowledge of geostatistics and professional avalanche experience would also be helpful. We encourage women and minorities to apply.

For more information, please contact either Kathy Hansen (khansen@montana.edu) or Karl Birkeland (kbirkeland@fs.fed.us).

Applications can be accessed at www.montana.edu and are due by March 15th, 2003.

late breaking news

Weather Service Modernizing to Bring Better and Broader Range of Services to Canadians

700-1200 West 73rd Avenue
Vancouver, BC
V6P 6H9

March 13, 2003

Subject: Modernization of the Meteorological Service of Canada

I am pleased to provide for you today's attached announcement by the Minister of Environment, the Honourable David Anderson, concerning the modernization of the Meteorological Service of Environment Canada.

You will note in particular that Vancouver will be one of Canada's five major forecast centres with a focus in Vancouver around Coastal and Mountain Meteorology. In addition to the major forecast offices there will be three National Service Offices. One of these National Service Offices will be in Kelowna with an emphasis on road Weather and support to Avalanche related activities.

Today, the Minister's announcement is being shared with staff and media. We will be in contact with you in the coming weeks to discuss how the changes to Meteorological Service of Canada will meet your organizational needs.

If you have more immediate requirements for information, please call me, Don Fast, Regional Director General of Pacific & Yukon Region at (604) 664-9145 or Brian O'Donnell, Director of Meteorlogical Services of Canada for the Pacific & Yukon Region at (604) 664-9090 or e-mail at brian.o'donnell@ec.gc.ca.

Yours sincerely,

Don Fast
Regional Director General
Pacific & Yukon Region
Environment Canada

Press Release

OTTAWA, March 13, 2003 – The Honourable David Anderson, Minister of the Environment, today announced an investment of $75 million over five years that will allow the Meteorological Service of Canada (MSC) to improve the quality of its forecasts and its service to Canadians in all regions.

Canadians will benefit from more accurate and timely weather information while a broader range of specialized services will be available to groups with specific needs, such as the agriculture, aviation, forestry, marine, transportation, and tourism industries, as well as municipal governments, provincial emergency organizations, the media, and universities.

"With this new funding, Canadians will see an improvement in the accuracy and timeliness of day-to-day forecasts, longer-term forecasting, and in the prediction of extreme weather events," said Minister Anderson. "The investment will also allow the Meteorological Service of Canada to strengthen its research capability and partnerships with weather-sensitive industries, other levels of government, and the university community across the country. The highly skilled and dedicated staff of the MSC will also be provided improved working conditions, greater access to training, and better equipment to do their jobs."

The staff will be able to make improved use of weather data, such as information that is collected from our recently established Doppler radar and lightning detection networks as well as new U.S. satellites, so they can better detect, understand, anticipate, and forecast extreme weather events. Forecasters will be able to work more closely with Environment Canada's own meteorological research laboratories, scientific staff from universities, other government agencies and the private sector to develop new forecasting tools and models.

We will now have forecasting and research staff working as integrated units in five offices across Canada - Halifax, Montreal, Toronto, Edmonton, and Vancouver. This approach is based on a highly successful pilot project initiated in Halifax in 1997. Co-locating research and operational staff in this way allowed a storm surge model being developed by researchers to be translated into an effective forecast tool far more quickly than would otherwise have been the case. This new tool was used for the first time to provide a warning of a dangerous storm surge in Charlottetown in January of 2001, giving emergency measures officials timely and accurate information to evacuate residents - saving lives in the process. This model has proved its worth many times since.

Today's announcement will also result in the recruitment and training of new technicians and meteorologists as well as a realignment of the responsibilities of individual MSC offices across the country in order to develop and deliver service improvements. All offices will remain open. Some employees will be relocated over a two-year period and there will be jobs for all employees.

All Canadians will benefit from improved local weather forecasts and warnings however they wish to receive them - Internet, pager, or through the media.

The investment will also allow better services for different kinds of specialized users:

- Overall, the number of staff assigned to consult with weather sensitive industries will increase, resulting in services more closely aligned with clients' needs than ever before.
- Farmers will be better able to make decisions based on more accurate and localized short- and long-term weather forecasts - from when to spray their crops to when to begin their harvest.
- Improved precipitation monitoring and prediction will provide more precise information to those concerned with drought.
- As well, emergency organizations responsible for responding to floods can expect improved precipitation and stream flow information.
- Municipalities, provinces, and territories will be better able to plan and manage road maintenance and snow removal as this funding will allow the MSC to be an active partner in a road weather information system, leading to a reduction in fatalities, injuries and maintenance costs.
- In addition to the recently established lightning detection network, the forestry industry will also benefit from improved modeling of wind patterns and precipitation. As with the other weather-sensitive sectors, more staff will be assigned to consult with the forestry industry - helping them to identify and extinguish forest fires earlier.
- By strengthening its forecasting operations, the MSC will be able to provide more precision to the 400,000 aviation forecasts Environment Canada issues each year.
- Fishermen and sailors will be able to set out to sea with more accurate five-day forecasts, more precise storm warnings, and better longer-term outlooks, adding to their security and ability to plan.
- There will be staff assigned specifically to focus on the needs of people and industries operating in mountain terrain prone to avalanches. This will result in improved services to the Canadian Avalanche Centre and other similar agencies.

"This initiative will allow our staff to not only maintain their high standard of service but create a more accurate and responsive weather forecasting system that ensures Canadians have access to excellent meteorological services in the 21st century," said Minister Anderson. "We will have new equipment that will allow us to benefit from improved data. We will replace some of our older equipment, and we will provide our staff with the training they need and deserve," said Minister Anderson.

The MSC is part of a globally integrated system which includes 174 countries with whom Canada exchanges data 24 hours a day, participates in international research, and whose standards Canada helps to develop and follow. Today's announcement will allow the MSC to keep pace with advancing meteorological developments and continue to work effectively with its global partners, while providing improved working conditions for its employees.

There are MSC offices and staff in 62 locations across the country, serving Canadians from coast to coast to coast - this will not change. As part of the stronger focus on building expertise in areas of meteorological science related to the specific needs of Canadians, and on providing the best possible service to clients, staff across the MSC will be given new opportunities for learning, professional development, and career choices.

For other documents related to this Press Release please visit:

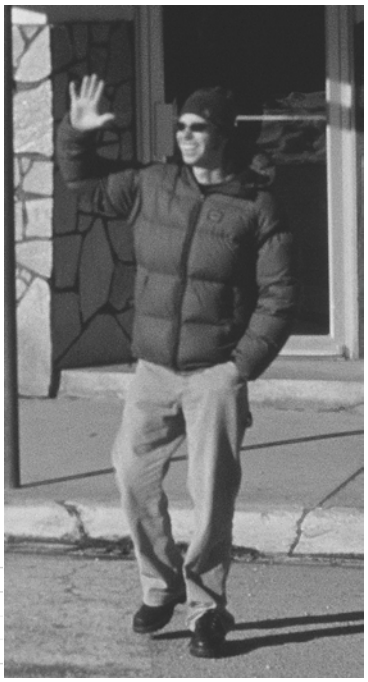
http://www.ec.gc.ca/press_e.html

For more information contact:
Kelly Morgan
Director of Communications
Office of the Minister of the Environment
(819) 997-1441

Suzanne Meunier
A/Chief, Media Relations
Environment Canada
(819) 953-4016

Sad But True…Phil Johnston is Leaving the CAA

"Although I'm not quite ready leave Revelstoke or the CAA, the time has come for me to press on…next stop… Southern Hemisphere. Tracy, my better Kiwi half, and I are returning to New Zealand."



Off to NZ, see you later folks!

Thanks to Phil, our Sponsorship & Events Coordinator, the CAA has raised the bar on the way we work together with our corporate friends to raise awareness and financial support for our public safety services. His dedication to working with community groups across Canada has brought events like Avalanche Awareness Days to the next level. Described as "a man of few words…rarely" and by the ladies in the office as "a breath of fresh air," his hard work, harmonica jams, and hilarious voice mail messages will be missed by us all.

"Keep us in mind next time you're down under. We will always have an open couch policy." Feel free to drop Phil a line at chickenphiller@hotmail.com. Good luck in NZ Philly!

Phil and Tracey celebrating their 30th birthdays last summer.

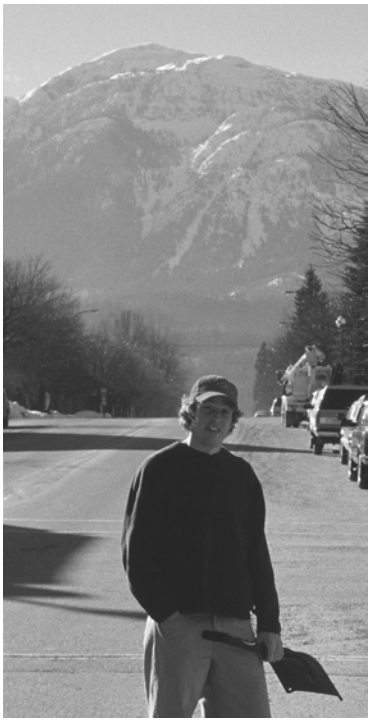
The Human Face of the InfoEx

To those new to the CAA's daily InfoEx reports, it might seem like they're written by an ancient Navajo code talker. Five out of seven days per week though, the seemingly dry summaries of avalanche shorthand are compiled by youngest addition to the CAA's staff, 24-year old Owen Day. He's stoked to be at the hub of avalanche safety.

"Basically, I see the snow stability in Western Canada, almost every day of the season," says Owen "I love it because I get to see where the best skiing is, not to mention that it's probably kept me alive this year."

A recent graduate of Vancouver Island's COLT leadership training program, Owen volunteers as a tail guide for Revelstoke's CAT Powder and as a patroller for Powder Springs Resort. When he's not volunteering or toiling at the CAA's InfoEx computer, he's out ski touring and racking up experience toward becoming a ski guide.

Before joining the CAA, Owen worked evenings for CMH Revelstoke as a cook and bartender. Prior to that, he managed the infamous La Crevasse Discotech in Champery, Switzerland, "so the schedule of working at night, skiing during the day was revived again this season" with the nightly caffeine-fueled mission of filing InfoEx reports. Earlier this season Owen completed the CAATS Level 2 Terrain Module and he has recently started co-instructing RAC courses at the Revelstoke campus of the Okanagan University College.



Owen Day – the new InfoEx Dude for the 2002-2003 season

Owen is keen to volunteer with avalanche research teams doing backcountry snow studies, so if you're ever in need of someone who can write everything in OGRSpeak, call him at the CAA or drop him a line at owen_day@hotmail.com.

Help Wanted: A Few Good Cowpokes That Can Ride Fast and Shoot Straight

Data and Computer Systems Technician

Anticipatory. Full time seasonal, must reside in or relocate to Revelstoke, BC. Database management using Microsoft Access and SQL, management of Windows 2000 Server and Unix client/server environments, website design and maintenance, design and/or maintain 24/7 web and ftp servers on-line, support firewall and virus safety services, maintain 10 node LAN, support hardware and software for Microsoft Office and Adobe graphical workstations. Formal computer training an asset.

Sponsorship and Events Coordinator

Full time seasonal, must reside in or relocate to Revelstoke, BC. Develop and maintain CAA sponsor relationships, plan and deliver special events in various communities, market CAA to industry and public sectors. May include development of public messaging products depending upon incumbent skills. Deadline for Expressions of Interest is April 15, 2003.

Editor, Avalanche News

Contract, approximately 200 hrs/year, no residency restriction. Develop themes, plan and solicit content for four quarterly newsletters. Subscriber base, layout, technical review, printing and distribution will be managed by the Canadian Avalanche Centre in consultation with the Editor. Deadline for Expressions of Interest is April 15, 2003.

canadianavalancheassociation

For more information on any of these positions contact the Canadian Avalanche Centre at 250-837-2435 or canav@avalanche.ca.

New Members of the Canadian Avalanche Association

associate members

Oso Negro Coffee	Nelson, BC
Revelstoke Edventures-OUC,	Revelstoke, BC
Selkirk Lodge	Revelstoke, BC
Selkirk Wilderness Skiing	Meadow Creek, BC

affiliate members

Bonnie Hooge	Prince George, BC
Chris Dyck	Chilliwack, BC
Chris Joseph	Vancouver, BC
Chris Link	Agassiz, BC
Colin Carver	Penticton, BC
Cornelius Amelunxen	Garibaldi Highlands, BC
Derek Willmott	Smithers, BC
Dirk Nannes	Vermont, Australia
Eric Geisler	Mead, WA
Felix Camire	Canmore, AB
Garth Lemke	Jasper, AB
Gary Brill	Seattle, WA
Gary Edwards	Dewinton, AB
Graeme Marshall	Pemberton, BC
Harlan Sheppard	Leavenworth, WA
James Funk	Whistler, BC
Jason Olsen	Whistler, BC
Jean-Raphael Lemieux	Sherbrooke, QC
Jerry Casson	Seattle, WA
Jim Bishop	Whitehorse, YT
Joshua Milligan	Kelowna, BC
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