AVALANCHE

Canadian Avalanche Association

NEWS

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Publisher: Jack Bennetto
Manager, Snow Avalanche Programs
Ministry of Transportation and Highways
940 Blanshard Street
Victoria, B.C., Canada, V8W 3E6
(604) 387-6931

Managing Editor: Alan Dennis
Associate Editor: Dan Nixon
Canadian Avalanche Centre
Box 2759, Revelstoke, B.C.
Canada, V0E 2S0
(604) 837-2435

Design and Layout: Traci Neale
Canadian Avalanche Centre
Box 2759, Revelstoke, B.C.
Canada, V0E 2S0
(604) 837-2435

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96/09/12

This Issue, #48 of the CAA Avalanche News, was produced in the spring of 1996 and was available at our Technical and Public Meetings in early May 1996, in Revelstoke. Due to this reason we did not circulate this issue by mail this past spring. We include Issue #48 in this package with Issue #49 for those who were unable to make it to our annual meetings.

Jack Bennetto, President
Canadian Avalanche Association

SARSCENE '96

Atlantic Canada

Search and Rescue Workshop
Dartmouth, Nova Scotia

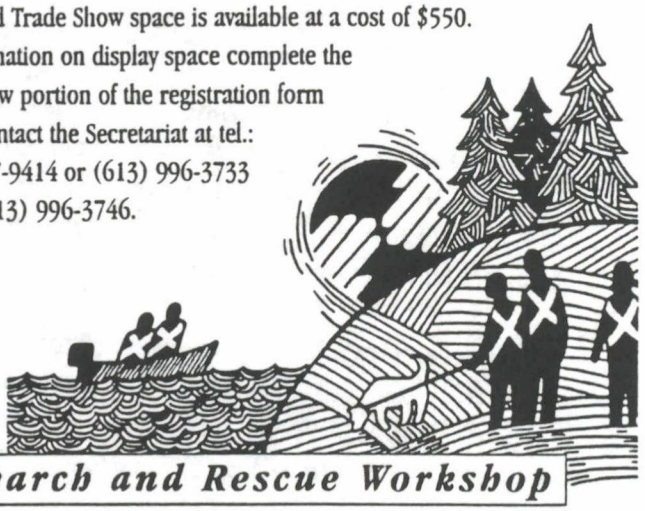
Pre-workshop: 16 October 1996
Workshop: 17-19 October 1996

The fifth workshop sponsored by the National Search and Rescue Secretariat will be held from 16-19 October at the Holiday Inn Dartmouth, Nova Scotia. The workshop will be organized in conjunction with Atlantic SAR agencies including the Nova Scotia Ground Search and Rescue Association and will present a wide range of sessions including "hands-on" demonstrations.

A registration fee of $55 will be charged, which includes a lunch with the exhibitors, an awards dinner, two social events and proceedings. Information packages are available from the Secretariat at tel.: 1-800-727-9414 or (613) 996-3733 or fax: (613) 996-3746.

Individuals must make their own hotel reservations. Accommodation is available at a special conference rate at the Holiday Inn Dartmouth at 99 Wyse Road, Dartmouth, Nova Scotia, B3A 4S5, tel.: (902) 463-1100, or fax: (902) 464-1227. Please inform the hotel if you will be bringing your SAR dog. Refer to SAR*SCENE* '96 to get the special conference rate.

Limited Trade Show space is available at a cost of $550. For information on display space complete the Trade Show portion of the registration form and/or contact the Secretariat at tel.: 1-800-727-9414 or (613) 996-3733 or fax: (613) 996-3746.



National Search and Rescue Secretariat
Secrétariat national de recherche et de sauvetage

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Search and Rescue Workshop,
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SARSCÈNE 96
Canada atlantique

Congrès de recherche et de sauvetage,
du 16 au 19 octobre 1996, Dartmouth (Nouvelle-Écosse)

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* *Cheques or money orders made out to the Nova Scotia Ground Search and Rescue Association should be mailed to the National Search and Rescue Secretariat with the registration form.* † *Veuillez faire votre chèque ou mandat à l'ordre de la Nova Scotia Ground Search and Rescue Association et le faire parvenir au Secrétariat national de recherche et de sauvetage avec le formulaire d'inscription.*

CANADIAN AVALANCHE CENTRE UPDATE

This special issue of the Avalanche News is being prepared at the Canadian Avalanche Centre by Traci Neale with assistance from Torsten Geldsetzer. Many thanks are owed to Karl Klassen for his work on past issues. We are going to try and produce the Avalanche News at the Centre with continued help of the BC Ministry of Transportation & Highways for printing and mailing. Dan Nixon continues to assist with editing.

The new office for the Canadian Avalanche Association opened just in time for the spring meetings in Revelstoke. At the Directors Meeting in March it was decided to move to a street level location that has a higher profile. So after moving from the end of the hall on the second floor across the street, there is now a very visible Canadian Avalanche Centre. A spectacular mural has been done on the inside wall of the main office by Zuzana Isert a local CARDA member. It shows the panorama from Uto/Sir Donald over the Illecillewaet to Glacier/Lookout, Youngs Peak and beyond. The art work of CAA members Diny Harrison and Bruce Kay is also on display.

This past winter has been remarkable and will be fully reported in the summer issue and the Spring Meetings in Revelstoke. Most noteworthy, from a public safety perspective, is that there were five avalanche fatalities. This is the lowest number of fatalities since 1984. Last winter was the highest number of fatalities in over twenty years. Part of that may be attributed to the nature of the snowpack in the Rockies and the Interior Ranges. However, lets hope it is also partly due to the much increased use of the Avalanche Information Services of the National Parks, Kananaskis Country and the Canadian Avalanche Centre.

It is interesting to note, in another area of public awareness, the difference in some of the popular journalism and videos between the way avalanche danger is presented now and what has been the "Warren Miller" approach of the past. The best two examples seen at the Centre were an article in Transworld Snowboarding by Erik Blehm and the video LocoMotion by Christian Begin. The photo captions in the extreme boarding article asked the question "does this guy know about the slope stability". In the video, the story was developed around the difference between the ignorant working victims of the Rogers Pass avalanches early in the century and the recreational pursuits that take place where the spirit of those pioneers still live. It's nice to see this change.

Notices

ISSW 96

The International Snow Science Workshop (ISSW96) will be held at the Banff Centre in Banff, Alberta from October 6 to 10, 1996 The theme will again be "A merging of theory and practice".

Workshop Format

Following an opening presentation and mixer on Sunday evening, there will be four days of meetings, poster displays, commercial exhibits, slide and video presentations, and a banquet. An optional overnight field trip to the avalanche control program at Rogers Pass will leave after the afternoon session on October 10th.

Topics

* Mountain Weather and Snowpack
* Avalanche Education and Warning Programs
* Avalanche Initiation and Forecasting
* Backcountry Avalanche Operations
* Boundary Issues in Avalanche Operations
* Remote Sensing of the Snowpack
* Data Management for Weather, Snowpack, and Avalanches
* Avalanche Hazard Management and Mapping
* Avalanche Dynamics and Defence Sructures
* Avalanche Control
* Avalanche Rescue

All persons interested in making a presentation are invited to send an abstract of 200-500 words or less by April 15, 1996

to: C.D. Johnston
ISSW 96 Papers Committee
Dept. of Civil Engineering
University of Calgary,
2500 University Dr. NW
Calgary, Alberta, T2N IN4
Canada
Fax: (403) 282-7026
Phone: (403) 220-6599
e-mail:
ISSWpapers@enci.ucalgary.ca

Papers and posters may be sent on disk or by e-mail in Word, WordPerfect, or text formats. Guidelines for effective use of the Banff Centre a/v equipment will be sent to all presenters. For papers to be included in the proceedings they should be received by Sept. 15, 1996.

Registration

Form below.
Before March 1, 1996 $Cdn 110 $US80
After March 1, 1996 $Cdn 125 $US90
Payment may be made payable to the Banff Centre for Conferences.

Job Opportunity

The position of InfoEx Manger at the Canadian Avalanche Centre will be available next winter.

We need someone with very strong computer skills as well as backcountry skiing experience.

The position is full-time and runs mid-October to mid-May.

Please contact...

Alan Dennis
Canadian Avalanche Centre
Box 2759
Revelstoke, B.C.
V0E 2S0
(604) 834-2435

ISSW 96 Registration Form

Name:_____ Affiliation:_____

Address:_____

Tel:_____ Fax:_____ Email:_____

Amount Enclosed:_____ ☐ $US ☐ $Cdn

☐ Will Attend Conference

☐ Interested in Bus Trip to Rogers Pass (fee not included)

☐ Plan to submit paper. Title:_____

☐ Plan to submit poster. Title:_____

☐ Commercial exhibit. Description:_____

☐ Film/Video/Slide Set. Desc./Length:_____

Submit to: Banff Centre for Conferences
Box 1020, Station 15
Banff, AB
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Notices

Publications

Avalanche Prediction for Persistent Snow Slabs,
by Bruce Jamieson

Price: $30.00 Candian

Available at:

Snowline Technical Services
7943-48 Avenue NW
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APATIT JSC PROCEEDINGS
SEPT. 2 - 6, 1996
Note: Change of Address for submittal to APATIT

APATIT Glaciological Association

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☐ Plan to submit poster. Title:_____
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Submit to: 50 years of october st. 33a,
Kirovsk, Murmansk Region
184230 Russia

The "Terminology Salad"

...from the snow stability rating system to the avalanche danger scale...

Walter Bruns

Danger Level *Colour* —WHAT—	Avalanche Probability *Trigger Size* —WHY—	Recommended Action —WHAT TO DO—
LOW GREEN	Natural slab avalanches highly unlikely; human triggered releases unlikely; sluffs possible.	Travel is generally safe; normal caution advised.
MODERATE YELLOW	Natural slab avalanches unlikely; loose or human triggered slab avalanches possible.	Use caution in steeper terrain on certain aspects.
CONSIDERABLE ORANGE	Natural or loose avalanches possible; human triggered slabs probable.	Use increasing caution. Be aware of potentially dangerous areas.
HIGH RED	Natural and human triggered slab or loose avalanches likely.	Travel in avalanche terrain not recommended; safest travel on windward ridges or lower angle slopes without steeper terrain above.
EXTREME RED with BLACK BORDER	Numerous natural avalanches certain and slabs easily triggered by humans.	Travel in and near avalanche terrain should be avoided; travel only in low angle terrain well away from avalanche path runouts.

We are now using a revised snow stability rating system [1] and the new avalanche danger scale shown above. Many in the avalanche community have wrestled with these developments for some time, agonizing over the precise wordings. Some have also experienced indigestion from the ensuing "terminology salad"[2].

The understanding of the stabilty rating system or avalanche danger scale will vary as their interpretation of such probabilistic terms as: mostly, marginal, very, can be expected, possible, probable, (un)likely, may, isolated, specific, certain, etc. Of great interest — or concern, depending — are the recommended actions included with the new avalanche danger scale. The merging of Canadian and American danger scales has evidently encompassed recommendations as found in the European scales.

I will toss the "terminology salad" once again, in an attempt to rationalize concepts and critically examine what we are trying to accomplish.

Relationships

The data required for judgment of avalanche danger can be broadly categorized into three classes of factors [3]. Meteorological factors are measurable numerical observations; snowpack factors are largely qualitative observations of snowpack structure; stability factors are mostly subjective observations of snow mechanics. There is a forecasting sequence of class III → II → I following the chain of causation of avalanche events, with a decreasing number of factors in each successive class and a corresponding decrease in uncertainty [4]. The relevance of the factors in each successive class to the actual judgment of danger increases. This is summarized in tabular form:

Class / Data	Nature	Relevance
III / Meteorological factors	Quantitative	Indirect
II / Snowpack factors	Qualitative	Semi-direct
I / Stability factors	Objective/Subjective	Direct

Table 1.

There is a general correspondence between the classes of data and the space/time domain over which the data applies [5]. Domain is quantified by overall scale, specific resolution of extent, and timeframe. The correspondence is illustrated by overlaying table 1 onto table 2 and relating the cells:

Scale	Resolution	Timeframe
Synoptic	Mountain range	Future
Meso	Drainage/run/path	Near-future
Micro	Single slope	Present

Table 2.

Any determination of broad categories and general correspondences will be at the expense of sub-structure and subtler relationships. There is clearly some overlap among factors and there exists a continuum of observability, relevance, and domain.

Now consider the thought processes that take the classes of data and apply them to the domain in order to arrive at a judgment of avalanche danger. There is a cognitive sequence of:

Information → Knowledge → Wisdom [6].

The word information here represents raw data (signals) before processing. The acquisition and dissemination of information occurs over the entire domain, for all classes of data. Knowledge, with the given information, resides in individuals or groups of people on the basis of their skills, experience, training and education. Information does not automatically give rise to knowledge. Wisdom represents the final state of understanding what is true. Wisdom does not necessarily follow from knowledge either. Good judgment requires wisdom.

Table 3 categorizes the sources of information, the people that process it, and the state of understanding which they arrive at in a format consistent with the first two tables:

Information	Knowledge	Wisdom
Advisories/bulletins (AES, CAC)	All avalanche people	General overview
Internal/operational/CAC INFOEX	Groups/agencies/operators/teams	Action plans
In-field/on-site	Teams/individuals	'Go/no-go' decisions

Table 3.

Processes

With headings omitted, picture a 3x3x3 cube by overlaying tables 1, 2 and 3. 'Decision stuff', if you will, flows through the 27 cells roughly from left to right columns, upper to lower rows, and top to bottom through the cube by a myriad of paths. The process minimizes uncertainty (and maximizes certainty) to arrive at the proverbial bottom line of a 'go/no-go' decision.

The conventional process of avalanche forecasting is such a flow pattern. It synthesizes some deductive logic with mostly inductive logic in a (mostly) scientific method. An iterative procedure employs redundancies to minimize uncertainty [4]. These are like vortices and eddies in the flow of 'decision stuff' through the cube. The process is overlaid on the terrain, as selected by scale, resolution, and the desired timeframe. The limiting case of a forecast for the future is a 'nowcast' at the present.

Numerical or statistical prediction systems [7] apply more over the upper rows of the cube. In other words, the analysis of mostly class data over the synoptic scale yields a quantitative general forecast, with indirect relevance over entire mountain ranges which targets many people. Rule or knowledge base expert systems (artificial intelligence) [8] apply more over the middle rows. In other words, analysis of mostly snowpack factors by qualitative rules by groups of specialists will yield semi-relevant forecasts and area specific action plans over the meso scale for the group concerned. These systems will not directly apply to individuals facing on-site, right-now, 'go/no-go' decisions; that would be a stretch of their domain of validity.

The Salad

Now back to the stability rating system and avalanche danger scale. One must ask what the purpose of the exercise is. Who wants what, where, when and why? There is everyone from the general public to specific interest groups to individual decision makers, who want anything from a general overview to specific plans or real-time decisions. They need these for entire ranges, certain drainages or individual slopes to plan in advance, at point of departure, or on-site. The only common point is "why?". Everyone eventually needs to decide whether to go or not to go.

The snow stability rating scale represents a summary of subjective *estimations* of class I stability factors. *Estimation* is used rather than *evaluation* because we are dealing with "judgment based on rather rough calculation" [9] rather than setting a value on something.

The domain of validity of the rating scale extends over the lower rows of tables 1, 2 and 3. It is most relevant to a real-time 'go/no-go' decision by on-site individuals over the micro scale of terrain slope by slope. You will have a hard time getting a numerical, statistical or expert system to give you a meaningful snow stability rating for a single slope. You will have a hard time applying a meaningful snow stability rating to a larger extent of terrain (even though we attempt to do it every working day in the field)! The rating scale is one of many tools to shape the flow of 'decision stuff' through the lower rows. As such, a snow stability rating is exchanged among specialist groups in similar situations, and then as one of a number of pieces of processed information (knowledge). Probabilistic terms are generally understood within the context of common usage.

The avalanche *danger* scale ought to be a tool to shape the flow of 'decision stuff' through the upper rows. *Danger* (not *hazard*) is the proper term for this scale because it is "the least specific" [9]. Class III data can be synthesized to a longer term forecast for entire mountain ranges and disseminated by bulletin to interested parties to provide a general overview. But can it be taken further than that? Here is where previous attempts have foundered. Once snowpack factors become inputs and unstable slabs are discussed, we are into class II data. Relating their location to certain aspects takes us to the meso scale. Assessing the probability of unstable slabs as a function of slope angle implies class I data on the micro scale. So does any reference to natural or human-triggered avalanche activity. Finally, and most crucially, any scale of recommended action — WHAT TO DO — takes us directly to specific plans and 'go/no-go' decisions on behalf of individuals. Probabilistic terms within the scale are wide open to interpretation.

The avalanche danger scale could address the meso/micro scale given a sufficiently complete class II/class I database and enough processed information. It would need to become area and time specific over the appropriate domain. Trouble is, to do so requires that qualitative and subjective estimations on the part of an increasing number of knowledgeable individuals enter the process. It then ends up becoming an expert opinion poll. Do we want non-experts to govern themselves on the strength of these opinions?

Suggestions

The snow stability rating system is one of many tools to facilitate "information exchange between the wide variety of avalanche safety programs in Canada" [1]. That has been achieved very nicely within the framework of the INFOEX. The avalanche danger scale was to conform with international efforts towards a standardized format for "advising about avalanche conditions in a variety of languages for people who go into the mountains in different countries" [2]. It seems that in the latter, well-intentioned effort to be as helpful as we can to as many people as possible, we are stepping beyond the domain of validity of what we set out to do. The overarching goal is increased safety for all persons exposed to the possibility of avalanches. Through its courses and published materials, the CAC has already made a significant contribution. The question here is, to what extent does the one want to use an avalanche danger scale to offer the public just information, to share some knowledge, or actually to try and impart some wisdom by such means?

I would suggest that, for day to day purposes in the public domain, we restrict ourselves to the conveyance of information only. Let the people that use this additional information to apply their own knowledge, to reason through to their own understanding, and make their own decisions on that basis.

References

[1] CAA Observation Guidelines and Recording Standards, May 1995, appendix H
[2] Avalanche News Number 44, Fall 1994, page 1
[3] McClung and Schaerer, 1993. The Avalanche Handbook, chapters 6 and 7
[4] LaChapelle, E.R. 1980. The fundamental processes in conventional avalanche forecasting. Journal of Glaciology 26(94): 75-84
[5] Dave McClung, presentation to CMH guides' training session, December 1994
[6] "In praise of knowledge", The Economist May 27 1995, page 20
[7] Weir and McClung, Avalanche News Number 43, Summer 1994, page 2
[8] Weir and McClung, Avalanche News Number 42, Winter 1993/94, page 2
[9] The American Heritage Dictionary of the English Language, 4th printing, 1970

Whumps, Subsidence and Snow Quakes:
the Terminology Salad revisited
First Draft, 16 November 1995
Anonymous

We need a clear consistent term for fractures that propagate along weak snowpack layers or interfaces. Ideally, the word we pick should also make sense to recreationists. If possible, the word should be consistent with Earth Sciences and Engineering since avalanches are a part of these fields. Words such as slab, crown, flank, stauchwall and propagation were chosen for this reason. A few words and their definitions follow. Let's discuss them, and any other promising terms, this winter.

Settlement: Gradual compaction of porous media such as soils under their own weight or additional load (building, etc.). This is ideally suited to the gradual compaction of snow layers under their own weight. Although it is potentially misleading to use this term to describe fractures that propagate along weak snowpack layers or interfaces, the usage is common among recreationists and ... well, we have all used it.

Subsidence: Gradual or sudden downward displacement of surface caused by natural or artificial removal of liquid or solid material (mining, wells, etc.). This term is used in some avalanche safety operations to describe fracture propagation along weak layers or interfaces.

Whumpf: Words that sound like physical phenomena (thunder, trickle, crash, squeak, bang, crunch, pop, thump, etc.) are common and are clear to recreationists. In technical and informal writing in German, the phenomena of propagating fractures along weak layers or interfaces are called "whums". Nevertheless, some avalanche professionals in Canada are reluctant to use the word, particularly when communicating technical information.

Snow Quake: A new term that might suit our needs. For snow that has survived the summer (firn), a firn quake is fracture that propagates parallel to the surface and usually identified by distinctive traveling sounds. Downward displacement of the surface is often reported. Munter's book on avalanche craft notes that the term was first used by Amundsen in 1911. "Firn quake" remains in use by glaciologists.

Let the debate continue...

Chris Stethem & Associates Ltd.
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Canmore, AB. Whistler, B.C. Terrace, B.C.

April 1, 1996

Dear Fellow Avalanche Workers:

ISSW '96 is coming to Banff, Alberta, Canada next October. I'm writing this letter to underline how good these workshops can be and invite you all for a visit to the magical terrain of the Canadian Rockies. There aren't very many worthwhile workshops of one day for $125 (US$90), let alone a four day workshop where you can meet a large chunk of the people who work in your profession.

It will be 20 years since the 1976 Banff workshop on Avalanche Control, Forecasting and Safety. At that workshop there were 129 participants, mostly from Canada and the U.S., with 3 participants from Japan and Norway. In 1976, Ron Perla brought together avalanche control personnel and snow scientists from far and wide. He convinced many of us that yes we could in fact write a paper and then stand up and talk about what we did in our work, whether it was avalanche control, safety operations, forecasting or research.

But the most important part of that 1976 workshop, at least for myself, was the contacts I made, many of whom still work in this business and have become close friends. I have read a variety of opinion lately where the writers are trying to define what an ISSW should be or perhaps to save what they truly believe is the essence of the workshop.

The essence of the workshop is the people who are there. The thrust of the papers are the thoughts and work of those who come forward to speak. The topics of the 1996 workshop are wide ranging. You can present a paper on the problems of avalanche protection along ski area boundaries or in backcountry heli-ski operations. You can discuss your recent work in forecasting or avalanche dynamics. Personally, I'm very interested in hearing from both the practitioners and the scientific community - the merging of theory and practice.

And if you have seen something truly amazing, there's nothing like a good story. So come to Banff. Meet the people in your field. Argue the meaning of snow over a Canadian beer.

If you need help to write or edit your work contact the ISSW '96 committee.

See you there,

Chris Stethem
ISSW '96 Organizing Committee

Helicopter Bombing with ANFO

Mike Boissonneault
Chairman, Explosives Committee

Over the past several years Avalanche Control agencies who use ANFO products for helicopter bombing have praised two methods. One method calls for bags of ANFO to be primed on approach to targets while the other involves leaving a helicopter staging area with bags of ANFO already primed.

The rational for priming on approach to targets reflects compliance with Workers' Compensation Board (WCB) guidelines which require that primed explosive charge(s) in a helicopter be easily jettisoned in the event of machine failure. However, the process of inserting a primer into a bag of ANFO at a critical point in the mission represents other operational concerns. The most significant concern is that accurate placement of the ANFO bag may, be compromised as it is often difficult to find the desired target area after the ANFO has been primed. As such, the time of a mission can be extended and its efficiency reduced.

The rational for departing with ANFO already primed in the helicopter is to eliminate the process of inserting a primer into a bag of ANFO at a critical time of the mission. Preprimed bags of ANFO allow the bombardier to concentrate on the process of accurately dropping charges on target lōcations. As such, successful results (producing artificial avalanches) are more likely. This procedure also requires that all primed bags of ANFO be jetti soned in the event of machine/weather problems. The amount of time to perform this act would likely be more than the time required to jettison a single box of primers.

The requirements of helicopter bombing are such that proximity to a slope is minimal and speed is slow. Elevation may vary considerably which would ultimately determine the urgency of jettisoning primed explosives. Although most agree that it would be quicker to jettison a box of primers it would not take too much longer to jettison primed bags of ANFO.

Although most ANFO helicopter bombing procedures praised within the province are similar between agencies, specific operational needs require slight variations. Each procedure must be approved by WCB prior to if s use.

Please come to the Spring Meeting in Revelstoke prepared to discuss this issue. At the present time WCB GUIDELINES FOR AVALANCHE CONTROL BLASTING stipulate that primers onboard a helicopter must be easily jettisoned. Paul Orr, Blasting and Diving Co-ordinator for WCB is aware of this issue and has suggested alternate procedures which ensure safety to the blasting team on board the helicopter as well as ensuring an efficient avalanche control mission.

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