AVALANCHE NEWS NO. 16

OCTOBER 1984

EDITORIAL NOTE

The intention of AVALANCHE NEWS is to assist communication between persons and organizations engaged in snow avalanche work in Canada. Short articles cover reports of accidents, upcoming and past events, new techniques and equipment, publications, personal news, activities or organizations concerned with avalanche safety, education and research. Contributions are expected from the readers.

AVALANCHE NEWS is issued three times per year, usually in January, June and October. There is no subscription fee. Requests for copies and notifications of changes of address should be sent to the publisher.

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AVALANCHE NEWS

Canadian Avalanche Association, 3904 West 4th Ave., Vancouver, B.C., V6R 1P5

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WEATHER FORECASTING WORKSHOPS

The Pacific Weather Centre of the Atmospheric Environment Service will regularly issue an alpine synopsis/mountain weather forecast again in the winter of 1984-1985. In order to prepare avalanche safety personnel for the interpretation of the synopsis and application of the forecast, the Pacific Weather Centre will hold two workshops:

a) Date and Place: November 19-20, 1984, in Vancouver, B.C.
Time: 0900 hours
Location: Alpha Room, Skyline Airport Hotel
No. 3 Road
Richmond, B.C.

b) Date and Place: November 22, 1984, in Golden, B.C.
Time: 0830 hours
Location: Canadian Legion (behind Overwaitea Store)
Golden, B.C.

Harold Bush and Vello Puss, senior forecasters and shift supervisors, will be the workshop instructors. The sessions will cover discussions on weather systems common in Western Canada, forecast products of the Pacific Weather Centre, format of the mountain forecast and problem solving. A visit to the weather office is included in the workshop in Vancouver.

The workshops are recommended to all those who receive the mountain weather forecast daily and apply it in the prediction of avalanche hazards.

Attendees of the workshop are requested to register by telephone or by mail to Peter Schaerer (see front page of Avalanche News) to allow for preparation of the course mail and the meeting room.

AVALANCHE COURSES
NATIONAL RESEARCH COUNCIL/B.C. INSTITUTE OF TECHNOLOGY

Training courses for persons working in operations concerned with avalanche safety will be organized again as a joint venture between the National Research Council (Division of Building Research) and the British Columbia Institute of Technology (Industry Services). The following courses are planned for the 1984-1985 winter:

Avalanche Safety for Transportation & Industry - Level I

November 26-30, 1984	Creston, B.C.
December 3-7, 1984	Creston, B.C.

Course fee: $250.00

Avalanche Safety for Ski Operations - Level I

December 9-15, 1984	Canmore, Alberta
December 9-15, 1984	Whistler, B.C.
January 13-20, 1985	Assiniboine Lodge
January 20-27, 1985	Assiniboine Lodge

Course fee: $400.00

Avalanche Safety for Ski Operations - Level II

January 5-13, 1985	Whistler, B.C.
March 2-10, 1985	Canmore, Alberta

Course fee: $465.00

The courses in Canmore are organized by request of the Association of Canadian Mountain Guides.

Avalanche Control

January 13-19, 1984	Whistler, B.C.

Course fee: $400.00

The course is concerned with operational avalanche control.

Avalanche Terrain

April 1-5, 1985	Revelstoke, B.C.

Course fee: $250.00

The course is concerned with the recognition and prevention of avalanche hazards in the planning of facilities.

Detailed information, brochures and registration forms may be obtained from the British Columbia Institute of Technology, Industry Services, School of Engineering Technology, 3700 Willingdon Avenue, Burnaby, B.C., V5G 3H2; telephone: (604) 432-8802.

Training Objectives: Level II Courses

The training objectives of the Level II courses for ski operations were discussed recently between representatives of the industry, course instructors and staff of BCIT.

In past years the participants of the courses were evaluated with respect to their skills in making observations of the weather, snowpack and avalanches and their ability to travel safely in avalanche terrain. Beginning this winter, the participants must demonstrate that they have the necessary skills and knowledge to enter employment which, with experience, may lead to a first-line supervisory position in an avalanche program. This means they must be able to judge the data, evaluate snow stabilities and make rational decisions even under stress. The rating system has been adjusted accordingly, giving more weight to the ability to make judgements and less to "book" knowledge.

There is no distinction between courses for ski area personnel and professional guides because all course participants must be able to evaluate terrain, snow conditions and avalanche hazards outside organized ski area territory. The courses are held in ski areas only for the convenience of easy access, availability of weather and snow observation instrumentation and support staff, but most field work is done outside the ski area boundary.

ESTIMATES OF THE NUMBER OF AVALANCHES IN WESTERN CANADA

by Peter Schaerer

Sometimes the question is asked: "How many avalanches do occur in an average winter in Canada?" In response to several requests for information about the extent of avalanche problems, I have made a rough estimate.

Number of Avalanche Paths

The number of avalanche paths was counted for sample areas (for example, a whole valley) through ground surveys, from avalanche atlases and on air photos. A major avalanche path was defined as having at least 200 m difference in elevation and avalanches that could reach the valley bottom. Major avalanche paths are relatively easy to identify in the terrain and on air photos. The samples yielded the following average densities of major avalanche paths:

Coast and Northern Selkirk Mountains	35 paths per 100 km^2
Monashee, South Selkirk, Purcell, Cariboo Mountains	20 to 30 paths per 100 km^2
Rocky Mountains	12 to 15 paths per 100 km^2

Apart from the major paths, there are a greater number of minor slopes capable of producing avalanches. A minor path was defined as being bounded by terrain features such as ridges or rock outcrops, and having avalanches large enough to bury a person.

Sample counts on air photos and maps revealed strong variations between 100 and 600 minor paths per 100 km^2. Three hundred minor paths per 100 km^2 would be about an average for all mountain areas.

It must be stressed that the density numbers are averages for mountain ranges including valley bottoms and other surfaces with a low incline. The density of minor avalanche paths would be greater for steep areas above the tree line, which includes terrain usually found in ski areas.

The total number of avalanche paths was obtained by multiplying the average path densities by the areas covered by mountains (Table 1).

Table 1: Number of Avalanche Paths

	Major Paths	Minor Paths
Coast Mountains (incl. Vancouver Island)	30,000	260,000
Selkirk Mountains	3,400	40,000
Monashee Mountains	1,900	20,000
Purcell Mountains	3,000	40,000
Cariboo Mountains	1,700	20,000
Omineca, Skeena, Cassiar Mountains	1,500	40,000
Rocky Mountains (incl. Yukon)	6,000	180,000
TOTAL	47,500	605,000

The Coast Mountains are dominant because:

1. they cover a large area, 700 km long, and an average of 50 km wide;
2. they are steep;
3. they receive large amounts of snowfall.

Number of Avalanches

The number of avalanches that run in each path depends on the local climate, as well as on the incline and exposure to wind. Most major paths produce at least one small avalanche per year, with more than one avalanche per year in heavy snowfall areas. Confident estimates of the average number of occurrences in major paths were made based on experience and studies of avalanche frequencies at Rogers Pass. The average number of avalanches in minor paths, however, was a wild guess. Steep, minor paths produce avalanches with every significant snowfall. Others have natural avalanches only occasionally, but of course most can produce avalanches when they are skied or treated with explosives. After much discussion, assumptions of the average number of avalanches per year in minor paths were made and multiplied by the number of paths (Table 2).

Table 2: Average Number of Avalanches Per Year

		Avalanches	
Mountain Range	Size 2	Size 3	Size 4
Coast	950,000	180,000	6,000
Selkirk	140,000	26,000	600
Monashee	45,000	7,000	200
Purcell	90,000	12,000	600
Cariboo	45,000	7,000	200
Omineca, Skeena, Cassiar	20,000	2,000	50
Rockies	100,000	5.000	100
TOTAL (rounded off)	1,400,000	240,000	8,000

The large number of avalanches is startling, but one must not forget that Western Canada is covered by numerous mountains, some of which receive large amounts of snow. Furthermore, the low avalanche activity in the past five years may have given the impression that not many avalanches actually occur.

<u>Avalanche Hazards</u>

Although the number of avalanches is impressively large, only 2% of them occur near settled areas or regularly travelled routes, and another 5% might be encountered by backcountry travellers. A summary of the operations which have avalanche hazards is presented below.

A total of 45 public roads are affected by avalanches. They include several sections of the Trans-Canada Highway - in the Fraser Canyon, at Revelstoke, Rogers Pass, Yoho National Park - and access roads to ski areas. The British Columbia Ministry of Transportation and Highways and Parks Canada together spend about $4 million annually on avalanche control.

In addition, numerous forest roads, roads for mining exploration and production, access roads to microwave relay stations and powerline service roads are exposed to avalanches. These roads are often used only part time during the winter, but when they are in use avalanches can be a serious hazard.

The three major railways in Western Canada - CP Rail, CN Railway and BC Rail, operate lines through a total of 15 avalanche areas. Each area is between 2 km and 50 km long and contains between 3 and 40 avalanche paths.

Of the ski areas in Western Canada, 6 areas have major avalanches and carry out extensive avalanche control programs, 6 areas have a moderate avalanche hazard that requires occasional control and 7 areas have a minor avalanche problem. The ski areas spend about $1.5 million annually on avalanche control.

Much helicopter and snowcat skiing is done in potential avalanche terrain, and consequently the evaluation of avalanche hazards is a continuous concern to the 15 helicopter and 3 snowcat ski operators. The helicopter skiing industry spends about $0.5 million annually for avalanche safety measures, such as training of staff, observation flights and equipment.

In addition to the public and commercial operations mentioned, a large number of backcountry skiers, mountain climbers and snowmobile operators travel through avalanche terrain, but their number and extent of exposure is difficult to estimate.

MOUNTAIN WEATHER FORECAST

The mountain weather forecast was reviewed on May 24, 1984 at a meeting between senior officers of the Pacific Weather Centre (Atmospheric Environment Service) and avalanche hazard analysts. The following points are of significance to users.

1. The Atmospheric Environment Service is most interested in receiving information on the value derived from the weather forecast. Examples of how the forecast assists operations are: scheduling of equipment and personnel for snow removal and ice control on highways, opening and closing of roads, closing of ski runs, avalanche control, snow grooming, daily selection of areas for helicopter skiing. Information about the commercial impact of the mountain weather forecast will be used by the Atmospheric Environment Service in justifying the expense of providing the service. It will benefit all users to draw attention to the value of the forecast and the benefits created by it.

2. Although the weather offices have a lot of information available, not all of it is transmitted because of insufficient skills in communication. It is important that the users ask the right questions when calling the weather offices. Conversely, the weather office staff must know the requirements of the avalanche safety operations. With the latter point in mind, short avalanche courses will be held for staff of the Atmospheric Environment Service, and they will be encouraged to visit avalanche forecasting operations.

3. It was noted that the computer-derived predictions of upper winds were not used much, either because the users did not know about it or had no ready access to it. Attention is again drawn to this valuable information.

4. The mountain meteorology courses held on November 3-4, 1983 in Vancouver and on November 10, 1983 in Revelstoke were found most valuable. It was decided that they be continued with some improvements in the coming winter (see Weather Forecasting Workshops, page 1).

5. The future of the Canadian weather forecasting system is under study. Considered are a decentralization with more forecasting offices which will concentrate on one-day forecasting and computerization of forecasts beyond 24 hours. New communication systems will be introduced. Users who plan to introduce communication and computer systems should consider the type of equipment used by the Atmospheric Environment Service in order to ensure reception of forecasts and weather maps.

AVALANCHE RESCUE TRANSCEIVERS

Information from the International Committee
for Alpine Rescue

submitted by Peter Fuhrmann,
Parks Canada, Banff

During the meeting of the Executive of the International Committee for Alpine Rescue (IKAR) May 28, 1984, guidelines for avalanche transceiver units were established. This was done in consultation with electronic specialists and as recommended at the meeting of the delegates of the IKAR, October 15, 1983 (see Avalanche News #14, pages 2-4). The only factors taken into consideration were the well-being of the avalanche victim, and that time is most important in order to accomplish a live rescue.

It is a fact that transceiver units which work on two incompatible frequencies can present problems when dealing with avalanche incidents. This is not the case if all units are working on the same frequency or if compatible double frequency instruments are being used. Survival chances depend on numerous factors. The capabilities which the transceiver should have include transmission, reception distance, operational area, cover, fine probing and so on. It has been found that double frequency units are not an ideal situation. They can at this point only be considered a compromise. Considering these aspects, the Executive Committee of the IKAR has therefore prepared a recommendation for the upcoming meeting of the delegates of the IKAR in Malbun, Liechtenstein in the fall of 1984. To prepare delegates for this issue, which will have to be approved at the meeting, the following points should be considered.

1. The future generation of transceiver units should have a transmission distance of at least 80 metres. (This constitutes a useable search distance of 16 metres and a search pattern of 32 metres).

2. All transceiver units should work on one frequency. The two frequencies presently being used should be evaluated as to the following criteria:

   - minimal outside interference;
   - the ability to be licensed in most countries;
   - reliability of the instrument;
   - reasonable production and market price.

   This frequency has to be decided upon at the latest during the fall of 1986.

3. Beginning in the winter of 1989-1990, only those new generations of single frequency units are to be marketed.

4. For the interim period of approximately five years, starting in the fall of 1984, only double frequency transceiver units are to be produced.

5. The IKAR and all member nations will, in conjunction with all official bodies, ensure that new guidelines are established which are based on the above recommendations. Furthermore, the IKAR and member nations will notify all manufacturers that instruments in accordance with the above noted guidelines are going to be produced and distributed. The IKAR does not attempt to recommend or to insist what frequency is going to be used. Their concern, in thinking about the avalanche victim, is to develop a system by which the burial point can be determined with the utmost speed. We hope that the producers working with the regulatory bodies of the various countries will accept this recommendation so that a single frequency instrument of a high quality can be marketed at acceptable prices within a short period of time.

Comment by the Editor

The problem is not as serious in Canada and the U.S.A. where one frequency only - 2275 Hz - is used. The developments in Western Europe, however, will determine the availability of transceivers on the market now and in the future, and therefore could be of considerable concern.

CANADIAN AVALANCHE RESCUE DOG ASSOCIATION

submission by Rod Pendlebury,
President, CARDA

On January 13, 1984, the Canadian Avalanche Rescue Dog Association (CARDA) was incorporated as a non-profit society under the B.C. Society Act. CARDA's main aims are to represent and assist people who are engaged in the training of avalanche search and rescue dogs and to maintain high standards of competence for both dogs and masters. People who are already training or who are interested in training their dogs for this purpose are invited to join CARDA. There is no initiation fee and annual membership dues are $20.00 per year. People who are not involved in the training of avalanche dogs but wish to support CARDA's efforts and be informed of their activities are also invited to join as associate members. The fee for associate members is $20.00 per year.

The annual training clinic for dogs and masters with previous search training will be held February 21-24, 1985 at the Wheeler Hut, Rogers Pass, B.C. Introductory courses will be scheduled according to demand. Information can be obtained by writing Canadian Avalanche Rescue Dog Association, Box 364, Fernie, B.C., V0B 1M0.

NATIONAL AVALANCHE FOUNDATION

Notice Received From the National Avalanche Foundation

This is to bring you up-to-date on the activities of the National Avalanche Foundation.

The Board of Directors has been expanded and slightly reorganized. They are:

President	Andrew Daly, Copper Mountain, Colorado
VP and Treasurer	Roy Feuchter, USDA Forest Service, Washington, D.C.
Secretary	Gary McCoy, Mammoth Mountain, California
	Nick Badami, Alpine Meadows, California
	Rob Faisant, NSPS, Palo Alto, California
	Kent Hoopingarner, Snowbird, Utah
	John Leasure, USDA Forest Service, Washington, D.C.
	Lynn Sprague, USDA Forest Service, Washington, D.C.

Warren Walters, who directed the 1983 National Avalanche School in Reno, Nevada, has been hired as a part-time Executive Director of the Foundation. The Foundation now maintains an office in Walnut Creek, Calilfornia.

Preliminary planning has started for the 9th National Avalanche School. This is scheduled for Reno, Nevada, November 4-8, 1985. Almost 1500 ski areas, guide services, search and rescue groups, individuals, offices of government agencies and other organizations have been sent a card reminding them of this School.

Several people have expressed an interest in having the Foundation offer training in the use of military weapons for avalanche control purposes. We are seriously considering this for 1985 and subsequent years. We are also considering offering training in the use of the avalauncher and hand charges if there is sufficient demand.

If you have questions about the Foundation, or want to contact us, please write or phone:

National Avalanche Foundation
2638 Dapplegray Lane
Walnut Creek, California 94596-6699
Telephone (415) 937-9338

BANFF FESTIVAL OF MOUNTAIN FILMS

The 9th Annual Festival of Mountain Films will be held November 2-4, 1984 at The Banff Centre. As in the past two years the festival includes many films, with an award for the best one on mountain safety.

Tickets are available at the Box Office of The Banff Centre; The Hostel Shop, 1414 Kensington Road N.W., Calgary, Alberta; and Fresh Air Experience, 8537 109 Street, Edmonton, Alberta.

PUBLICATIONS

Perla, R. and Beck, T.M.H.

Experience with shear frames. Journal of Glaciology; Vol. 29, No. 103, pp. 485-491; 1983.

ABSTRACT: The shear frame is a simple in situ device for indexing the shear strength of thin weak layers. The index is sensitive to shear-frame geometry, rate-of-pull, and shear-frame mass. It is time consuming to carefully align the device on the Gleitschicht (shear failure plane) in a slab avalanche zone. The ratio shear frame index/shear stress of the Gleitschicht has a high variance, and may not be a fundamental measure of slab avalanche stability. Corrections for the normal stress on the Gleitschicht reduce the variance only slightly. Despite these limitations, the shear frame is a useful tool for gathering statistical data on strength distributions and anisotropies of the Gleitschicht until a more fundamental technique is developed.

Judson, A. and King, R.M.

Spatial variations in snow stability inferred from artillery control. Journal of Glaciology; Vol. 29, No. 103, pp. 508-511; 1983.

ABSTRACT: Decisions on snow stability are strongly influenced by the presence of fresh avalanches. An analysis of 18 pairs of controlled avalanche paths in Colorado indicates most behave independently. The study supports the hypothesis that spatial variations in slope stability are common in unstable snow.

Buser, Othmar.

Avalanche forecast with the method of nearest neighbours: an interactive approach. Cold Regions Science and Technology; Vol. 8, No. 2, pp. 155-163; 1983.

ABSTRACT: Avalanche forecasting by statistical methods is seldom practiced, because the forecaster does not know how to apply the results. The method of nearest neighbours is introduced to visualize these results, e.g. ten days most similar to a given situation are selected from a period of 20 years. These ten days serve as a basis for decisions, as well as enabling a control of the accuracy of past avalanche records. Some examples are given. The results of three methods (Obled and Good, 1980) are compared and examples of the computer outputs given. A suggestion is made for improving the model by evaluating an a posteriori probability.

Gardner, James S.

Observations on erosion by wet snow avalanches, Mount Rae, Alberta, Canada. Arctic and Alpine Research; Vol. 15, No. 2, pp. 271-274; 1983.

ABSTRACT: Study of two avalanches. One moving over snow had no erosive effect, the other one produced measureable erosion; the amount of avalanche debris is listed.

NOTE OF INTEREST

by Eric Burr,
Liberty Bell, Mazama, Washington

A late June slab avalanche cycle of interest occurred in the North Cascades this year. A one inch thick rain crust lay over old temperature gradient snow from December's cold spell. After an unusually stable snowpack for spring heli-skiing, the largest crown fractures of the season were observed in the eastern-most sections of North Cascades National Park. Fracture depths exceeded one metre, with fracture lines over half a mile long. The largest avalanches occurred on northern exposures just above 2000 m. Many of them ran to the ground.

PERSONAL

Alan Dennis who was in charge of avalanche safety at Granduc Mine at Stewart, B.C. until the mine closed in the summer of 1984, has been hired as an avalanche hazard analyst for the Milford Road in New Zealand. The Milford Road crossing the Southern Alps of New Zealand has been closed for long periods of time by avalanches. In 1983, a road foreman who was clearing an avalanche deposit with a bulldozer was killed in a second avalanche.

Bill Moffat has resigned from his position with the Snow Avalanche Section of the Ministry of Transportation and Highways in order to become a full time student of science at the University of Victoria.

—*Keep*—