AVALANCHE NEWS NO. 15

JUNE 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.

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AVALANCHE NEWS
Canadian Avalanche Association, 3904 West 4th Ave., Vancouver, B.C., V6R 1P5
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SNOW AND AVALANCHE CONDITIONS IN WESTERN CANADA
WINTER 1983-1984

by Peter Schaerer

Climatic conditions characteristic for the winter of 1983-1984 in Western Canada were:

a) Low snowfall. The snowfall was on the average 80% that of a normal winter. Several areas reported record low snow depths in December.

b) Strong variation of temperatures in December and January. Periods of extreme cold weather (-30°C to -40°C) were interrupted by periods with above freezing temperatures.

c) Unusually mild weather for January through April. The average temperatures for February and March were 2°C to 7°C above normal.

d) Very strong winds in December and January.

At the end of December the variable temperatures and strong winds together with the low snowfall had produced an erratic snowpack in the Columbia Mountains and extremely shallow snowpacks in the Rocky Mountains and in Northern British Columbia. In the Columbia Mountains remarkable differences were observed sometimes within short distances: shallow snow containing depth hoar on exposed areas changed to deep stable snow within 10 m on slopes. Owing to the low average snow depth only small avalanches developed in December.

Only two major storms on January 2-5, 1984 and January 20-28, 1984 produced significant avalanches. The avalanches formed first by loading the weak layers that had formed in December and later as a consequence of rising temperatures. The avalanches effectively removed much of the unstable snow in regular avalanche paths. At low elevations (below 1000 m in Southern British Columbia), high temperatures produced rain instead of snow and floods instead of avalanches. Some avalanche technicians for the Ministry of Highways were busy with road closures due to floods and assessing water damage rather than with avalanche hazard control.

In February, the snowpacks consolidated under mild weather and light snowfall, but instabilities from the December weather persisted on northern exposures and at high elevations on slopes that had not been cleaned out by the January avalanches.

With rising temperatures in early March, skiers and explosives released a few unexpected and large avalanches on such slopes. Stable conditions with below average snowpacks prevailed in the second half of March and in April. The avalanches resulting from a few short snow storms and from high temperatures were small. The deep, large spring avalanches were almost absent.

AVALANCHE INCIDENTS IN CANADA
WINTER 1983-1984

by National Research Council Staff

The Avalanche Centre of the National Research Council received reports of 25 incidents with persons or equipment involved in avalanches between October 1, 1983 and April 30, 1984. It is likely that this is not the total number of avalanche incidents that have occurred; numerous involvements, particularly with backcountry travellers, usually go unreported. The sample, however, contains all major accidents and depicts the nature of avalanche accidents in the past winter.

Number of Incidents

6 incidents involved skiers close to a ski area (skier leaving the boundary)

1 incident involved a skier inside a ski area

11 incidents involved backcountry skiers

2 incidents involved traffic on roads

4 incidents involved snowmobiles

1 incident involved a structure

Of these incidents, five occurred in the Rocky Mountains, 11 occurred in the Interior Ranges, seven occurred in the Coast Mountains and two occurred on Vancouver Island.

Persons Involved

17 persons were caught by avalanches but remained on the surface

10 persons were partially buried and not injured

4 persons were partially buried and injured

1 person was completely buried and rescued alive by survivors who were guided by an object on the surface

4 persons were completely buried and found dead

Vehicles

2 vehicles were trapped

1 vehicle was partially buried

Comment

The small number of reported incidents reflects the stable snow conditions and low avalanche activity of the winter. It is interesting to note that 16 of the avalanches reported were size 1.5 to 2.5 and nine avalanches were size 3.0 to 3.5.

Fatal Accidents

All four avalanche deaths concerned snowmobilers. This is the largest number of snowmobile avalanche accidents per winter since this recreational activity was introduced in Canada. The winter of 1983-1984 was the first winter without a skier or mountain climber avalanche fatality since 1973. We suspect that the low amount of snowfall and warm weather might be one reason for the snowmobile accidents. The snowmobile operators who could not find enough snow in the valleys ventured to hazardous snow and terrain at high elevations in greater numbers than in other years.

On January 7, 1984 a snowmobile operator was buried in an avalanche in the Prairie Hills near Golden, B.C. A second driver with his machine was about one km ahead on the trail and turned around when he missed his friend. He found the overturned machine on an avalanche deposit, panicked and drove immediately to the Royal Canadian Mounted Police at Golden, approximately 50 km by road. The police organized a rescue party which arrived at the scene 3 1/2 hours after the accident. The victim was found immediately lying on his stomach under the upside down machine. He died from suffocation.

On January 29, 1984 a party of three snowmobilers were on a day trip at Flathead Pass near Sparwood, B.C. The drivers ran their machines up an obvious avalanche path. While one driver made a second run and the other two waited at the bottom, an avalanche released about 300 m above them. Two drivers were caught while they were trying to escape and the third one was caught as he crouched behind his machine. The first two drivers were partially buried and were able to free themselves with the assistance of other people in the area. The driver who was immobile when the avalanche hit was found five hours later by a dog and probing by an organized rescue party. He was 2 m from his buried machine under 2 m deep snow. The avalanche dog was at the scene 2 1/2 hours after the accident, but snowmobiles driving across the deposits, helicopters landing on the avalanche deposits, parts of snowmobiles and lunch remains made a dog search very difficult.

On February 11, 1984 an avalanche swept down on a five man snowmobile party in the Red Fern Lake area of the Rocky Mountains south-west of Fort Nelson. Two snowmobilers were buried. The other three escaped because they were behind a knoll which split the avalanche. The two dead party members were not recovered until the next day.

Structure Damaged

On January 26, 1984 an avalanche struck the aerial tramway of the asbestos mine at Cassiar B.C. The avalanche, about 100 m wide, crossed the tramline between two towers and derailed the cables which in turn pulled down one of the towers. The replacement cost of the tower was $100,000 and the mine lost two weeks of production.

CANADIAN AVALANCHE ASSOCIATION

The Canadian Avalanche Association held its Annual General Meeting on May 4, 1984 at Revelstoke, B.C. The Association has 57 active members and 13 associate members. The Directors had meetings on January 23, 1984 at Rogers Pass and on May 3, 1984 at Revelstoke in order to conduct the business of the Association.

The Directors elected at the Annual General Meeting are:

Fred Schleiss (Parks Canada, Rogers Pass)	President
Clair Israelson (Parks Canada, Lake Louise)	Vice President
Peter Schaerer (National Research Council, Vancouver)	Secretary-Treasurer
Geoff Freer (B.C. Highways, Victoria)	Membership Committee Chairman
Chris Stethem (Consultant, Whistler)	Director at Large
Jeff Boyd (Canadian Mountain Holidays Heli-Skiing, Banff)	Director at Large
Brian Weightman (Ortovox Canada, Calgary)	Representative of Associate Members

The Membership Committee consists of Geoff Freer, Willi Pfisterer (Parks Canada, Jasper) and Paul Anhorn (National Research Council, Revelstoke).

The Explosives Committee with Roger McCarthy (Whistler Ski Corporation, Whistler), Bill Moffat (B.C. Highways, Victoria) and Clair Israelson (Parks Canada, Lake Louise) as members was confirmed - see report of Technical Meeting.

The annual membership fees remain at $30 for active members and $75 for associate members.

The Directors reported that they had investigated liability insurance for members of the Association, but found that the cost would be too high because of the small number of members and the diversity of work carried out by them. It was resolved not to proceed with the insurance.

TECHNICAL MEETING OF THE CANADIAN AVALANCHE ASSOCIATION

Submission by Peter Schaerer

The members of the Canadian Avalanche Association met on May 3-4, 1984 at Revelstoke, B.C. for the purpose of exchanging ideas, brushing up on knowledge and renewing personal contacts. The meeting was attended by 50 persons. Following is a summary of the major topics that were discussed.

The Explosives Committee consisting of Clair Israelson, Bill Moffat and Roger McCarthy reported on the discussions with the Workers' Compensation Boards of Alberta and British Columbia. Al Clausen, Safety Officer and Blasting Examiner of the Workers' Compensation Board of British Columbia presented an outline of the new regulations and requirements for blasting certification. The new British Columbia certification standards will come into effect in the late summer of 1984 and those for Alberta in 1985. Information about the proposed regulations is contained under a separate heading in this issue of Avalanche News.

A major topic of discussion was the training of personnel in the application of hand charges, avalaunchers and helicopter bombs. The attendees of the meeting generally expressed the view that central training courses would not be practical because the applications often are site-specific. Preferably the training should be carried out within the industry through mutual co-operation of operations; for example, ski area staff could be trained in other ski areas of the region. The Canadian Avalanche Association and the Workers' Compensation Board would assist in making expert instructors available.

Bruce Walker representing the Explosives Division of Dupont stressed that orders for explosives for hand charges and avalauncher projectiles should be placed by July 15, 1984. This allows the manufacturer to schedule the production of these special products.

The Guidelines for Observations were discussed with Walter Schleiss chairing snow and weather observations, Fred Schleiss chairing snow profiles, Clair Israelson chairing test profiles and Chris Stethem chairing the recording of avalanche occurrences. Dave McClung reported the latest scientific findings about snow metamorphism. Several points about the Guidelines were clarified.

Vello Puss, Special Forecaster with the Pacific Weather Centre in Vancouver, reviewed the mountain weather forecast and reported the initial results of a verification of the amounts of snowfall forecasts. The attendees of the meeting considered the technical synopsis of the forecast most valuable. Together with their own local observations and discussions with the weather offices, the synopsis allowed them to make adequate forecasts.

The Directors of the Canadian Avalanche Association tabled a draft of a code of ethics for the members. Peter Schaerer discussed the objectives and content of the code.

Other topics of the meeting concerned accidents, transceiver frequencies, radio frequencies for information exchange and planned avalanche courses.

REPORTS OF THE EXPLOSIVES COMMITTEE

Alberta (by Clair Israelson)

In September 1983, the Alberta Proposed Explosives Safety Regulation draft was circulated to Committee members. In early November a meeting was held in Edmonton with Alberta Workers' Health, Safety and Compensation (WHSC) representatives Munroe and Novynka, and Parks Canada representatives Israelson, Auger and Everts.

The Alberta WHSC position is that the new regulations are to be performance standard legislation to define a safe end product. Innovative procedures that provide worker safety greater than or equal to what is specified in the WHSC Regulations will be acceptable. Each employer must submit a code of practice for their operation clearly outlining explosives use procedures. WHSC will scrutinize each employer's procedures and, if they are acceptable, issue a formal letter of receipt. This will constitute formal approval of the explosives use procedures specified and replace the practice of issuing variances.

Numerous changes, clarifications and rewordings to the draft Regulations were discussed.

Blaster certification was discussed. Alberta will proceed with personal licensing rather than licensing through the employer. The Canadian Avalanche Association Explosives Committee recommendations regarding licensing for avalanche control in three classes (safety fuse, avalauncher endorsement and helicopter endorsement) were agreed on in principle. The onus is still on the employer to ensure adequate training in explosives use techniques. Proposed written exam questions for the three classes of avalanche control licenses were submitted to WHSC for their use.

Joint WHSC-Canadian Avalanche Association training sessions for avalanche controllers were discussed. WHSC was supportive but no formal commitment was obtained, pending Canadian Avalanche Association decisions regarding explosives training responsibilities and roles.

The Alberta WHSC Regulations are to be finalized by January 1985. Further changes or additions should be directed to J. Rasheed, Director of Operational Support Services, WHSC, Occupational Health and Safety Division, 10709 Jasper Avenue, Edmonton, Alberta.

Further questions regarding this subject should be directed to C. Israelson, telephone 403-522-3866.

British Columbia (by Bill Moffat)

Committee members met with B.C. Workers' Compensation Board (W.C.B.) and Transport Canada representatives at W.C.B. offices in Richmond in November 1983 to discuss avalanche control blasting procedures. Meeting participants were:

B.C. Workers' Compensation Board

Steve Duffy (Blasting Co-ordinator)
Dick Shaw (Accident Prevention Officer)

Transport Canada

Vince Edwards (Rotorcraft Inspector)
Pat King (Dangerous Goods Inspector)

Canadian Avalanche Association

Roger McCarthy
Clair Israelson
Bill Moffat

On November 22, 1983 the procedures for helicopter bombing in Canada were discussed and Transport Canada finalized their explosives use requirements for avalanche control blasting (see attachments).

On November 23, 1983 the Explosives Committee met again with W.C.B. representatives and procedures for avalanche control including hand charging, avalauncher use, cornice control and helicopter bombing were discussed.

During the fall of 1983, the W.C.B. asked for resubmission of procedures from all B.C. companies involved in avalanche control. To clarify the industry's perspective, the Explosives Committee detailed industry operating constraints and the range of reasonable methods employed in Canada. The W.C.B. appears to understand the necessity for a range of acceptable operating techniques, and accepted that procedures do vary from operation to operation (see attachments).

Variances to W.C.B. Regulations are available to operators who are able to show, through detailed operating procedures, that specific variances to the regulations increase worker safety. Each operation is required to submit their own requests for variances to the W.C.B. Recent variances granted to some users involve the use of signals, pre-assembly of charges and cornice control techniques.

Recommendations for minimum certification requirements and technical material suitable for examinations were provided to the W.C.B.

TRANSPORT CANADA GUIDELINES FOR HELICOPTER BOMBING

1. The Blaster shall have a valid W.C.B. Blasters' Certificate certifying him for avalanche control and for the type of work being performed. The blaster shall be familiar with the area, equipped with a timing device and a blaster's log book.

2. A preflight crew familiarization with procedures and equipment to be used is required to be conducted daily.

3. Primers are to be made up prior to entering the helicopter. Charges shall be made up at the last most practicable moment and as close to the helicopter as safety permits.

4. All primers shall be transported in the helicopter in containers that are secured and capable of being easily jettisoned.

5. At no time shall a primer be assembled or dismantled in a helicopter.

6. The blaster and assistant(s) are to be suitably restrained by safety belts designed and attached to prevent them from falling from the helicopter.

7. There shall be direct communication between the blasting personnel, the pilot and ground personnel (guards).

8. No equipment that will interfere with the dropping of the primer shall be attached to the helicopter skid.

9. Once over the drop location and immediately prior to dropping the primer, the pull wire lighter shall be placed on the safety fuse assembly.

10. The primers shall be dropped only when the aircraft is in a slow flight condition. Once the safety fuse is ignited the primer shall be dropped down and away from the helicopter.

11. If possible a right-handed blaster shall drop the primer with his right hand from the right side of the helicopter. The reverse will hold true for a left handed blaster. Seating arrangements may vary according to the type of helicopter and the individual helicopter company procedures.

12. Immediately after dropping the primer(s) the helicopter shall proceed to a safe area and observe the results of the blast. Any misfire shall be handled in accordance with established procedures.

13. All results shall be recorded in the blaster's log.

14. Helicopter companies must have authority to transport Dangerous Goods from Department of Transport, Regional Officer.

The following helicopter operators in British Columbia have authority to bomb avalanches (June 1984):

ALC Airlift Corp.
Alpine Helicopters Ltd.
Highland Helicopters Ltd.
Northern Mountain Helicopters Ltd.
Okanagan Helicopters Ltd.
Quasar Helicopters Ltd.
Yellowhead Helicopters Ltd.

GUIDELINES FOR AVALANCHE CONTROL BLASTING PROCEDURES

by Workers' Compensation Board of British Columbia

The purpose of this guideline is to provide an outline of the procedures required by Industrial Health & Safety Regulation 46.136. This guideline is intended to assist those persons who are designing proposed work procedures for avalanche control blasting.

General Procedures

The general procedures should include work procedures which are of a fundamental nature. They may also include any procedures which are common to the specific applications of explosive materials.

Where a blasting operation will be conducted at a predetermined location, please include a map of the area. NOTE: The storage of explosive materials beyond the normal working hours is governed by the "Explosives Act" (Canada).

1. Closure Procedure
   - 1.1 Physical barriers
   - 1.2 Warning signs
   - 1.3 Visual sweeps

2. Communication Procedure
   - 2.1 Type of equipment
   - 2.2 Location of equipment
   - 2.3 Use of equipment

3. Emergency Procedure
   - 3.1 Type of equipment
   - 3.2 Location of equipment
   - 3.3 Use of equipment
   - 3.4 Emergency crew(s)

Specific Procedures

The major applications of avalanche control blasting include hand charges, cornice blasting, helicopter bombing and the avalauncher. For each blasting technique that will be undertaken, the work procedures should include the following information.

1. Components of the Explosive Charge
   - 1.1 Type of explosive(s)
   - 1.2 Type of detonator(s)
   - 1.3 Type of blasting accessories

2. On Site Transportation of Explosive Materials
   2.1 Equipment and container(s)
   2.2 Separation of detonator(s), explosive(s) and ignition device(s)
   2.3 Personnel restrictions
   2.4 Safety precautions

3. Blasting Crew
   3.1 Minimum number of members
   3.2 Minimum qualifications and training
   3.3 Responsibilities of each member
   3.4 Safety equipment

4. Assembly of the Charge
   4.1 Location of assembly operation
   4.2 Maximum number of charges
   4.3 Transportation of charge(s) and ignition device(s)
   4.4 Safety precautions

5. Placement of the Charge
   5.1 Equipment used for placement
   5.2 Method(s) of placement
   5.3 Safety precautions

6. Initiation of the Charge
   6.1 Device(s) used to ignite the charge
   6.2 Location of charge when ignited
   6.3 Notifying crew members of ignition
   6.4 Handling of ignited charge(s)
   6.5 Safety precautions

7. Control of the Danger Area
   7.1 Determination of the danger area
   7.2 Guarding the danger area
   7.3 Warning device(s) and signal(s)

8. Disposal of Unused Charges
   8.1 Location of disposal operation
   8.2 Method(s) used for disposal
   8.3 Safety precautions

9. Locating Misfired Charges (duds)
   9.1 Method(s) of locating
   9.2 Equipment used
   9.3 Securing the (blasting) area
   9.4 Posting of warning signs
   9.5 Recording location in blaster's log

10. Destroying Misfired Charges (duds)
    10.1 Device(s) used to destroy
    10.2 Method(s) used to destroy
    10.3 Safety precautions

PROPOSED REVISIONS TO BLASTING CERTIFICATION STANDARDS BY THE WORKERS' COMPENSATION BOARD OF BRITISH COLUMBIA (FEBRUARY 1984)

(shortened for information relevant to avalanche control)

General

The Workers' Compensation Board of British Columbia is undertaking a revision of its activities pertaining to the certification of blasters. A new certification code and minimum standards for blaster certification will be introduced.

The need for revision stems from the recent development of sophisticated explosive products and specialized blasting techniques. Although the current system for certifying blasters is one of the most advanced in Canada, there is room for improvement.

Certification imposes enormous responsibilities. The certified blaster is responsible for the safety of himself, his fellow workers and the public.

Proposed Certification System

The proposed revision to Industrial Health and Safety Regulation 46.08, which is currently under review, would require that:

A blaster shall:

a) be physically capable of conducting or directing a blasting operation;
b) be able to understand and give oral and written orders in the English language;
c) be competent in the use of any explosive materials and any blasting methods that he may employ; and
d) have satisfied the requirements for certification as determined by the Board.

The proposed certification system establishes distinct categories with well defined minimum standards for each category. These standards describe the required practical experience and/or acceptable training as well as the minimum level of knowledge and skills to qualify for each category.

Certification Categories

Under the proposed system, a blaster will be restricted to the initiation system(s) and blasting technique(s) for which he is qualified.

The proposed coding system reflects the major applications of explosives in British Columbia. The "General" is the most advanced certificate. There are two "Surface" categories, one "Underground" category and three "Seismic" categories. The ten "Limited" categories apply to specialized applications of explosives, among them "Avalanche Control".

The Code for Avalanche Control states:

Description: All phases of blasting in avalanche control operations.

Restricted from blasting operations covered in all other Code categories.

Minimum experience/training: One season practical experience in blasting.

Requires successful completion of the Basic Exam, Safety Fuse Exam, Avalanche Control Exam and related oral questions.

Experience and Training

The proposed certification system establishes, for each category, the minimum practical experience and/or acceptable training course. Practical experience refers to the active handling of explosives by candidate.

The examining officer must be satisfied that, during the practical experience or the formal training course, the candidate has prepared, placed and detonated the quantity and type of charges to render him competent to use explosive materials, as described by the category in which he has qualified, without further supervision.

Knowledge and Skills

Prior to certification, a candidate is required to successfully complete an examination of his knowledge and skills. The examination utilizes several types of tests which are designed to provide reliable indicators of the candidate's knowledge and skills in the safe handling of explosives.

The examination consists of three parts. The candidate will write the basic exam which covers standards common to all blasting operations. The candidate will then write the exams in the initiation system(s) and the end use(s) for which he wishes to qualify. Practical tests and related oral questions will be used as the final determination of the candidate's competence in handling explosives.

To successfully complete an examination, the candidate will be required to achieve a grade of at least eighty percent (80%) on each part of the examination. Candidates failing any portion of the examination may be required to wait thirty days before rewriting.

The proposed certification system is designed to provide an incentive for blasters to improve their knowledge and skills.

W.C.B. Blasters' Handbook

As study material for candidates and reference material for certified blasters, the Board will introduce the W.C.B. Blasters' Handbook. This handbook contains information on the Basic Standards and the Information Systems.

Implementation

The introduction of the proposed certification system is scheduled to coincide with the promulgation of the revised blasting regulations (Section 46 of the Industrial Health and Safety Regulations).

Upon implementation, the new blasting codes and examinations will be in effect. A "grandfather" clause, however, will apply to existing certificates; they will be valid until the expiry date of the certificate.

AVALANCHES COURSES: NRC/BCIT

Courses Winter 1983-1984

All avalanche courses for professional staff this past winter concerned avalanche safety for ski operations. The planned courses for Transportation and Industry, Avalanche Control and Avalanche Terrain had to be cancelled due to an insufficient number of participants. The low interest was the result of financial restrictions by industry and restraints by the Government of British Columbia.

Courses were held as follows:

Date	Location	Level	Number of Participants Registered	Passed
December 3-10, 1983	Whistler	2	18	18
December 11-17, 1983	Whistler	1	27	25
January 8-14, 1984	Whistler	1	30	27
January 15-21, 1984	Mt. Assiniboine Park	1	26	26
March 18-23, 1984	Canmore, Alta.	1	13	13

Courses Winter 1984-1985

Courses planned for the coming winter are:

November 26-30, 1984	Creston	Transportation and Industry, Level I
December 3-7, 1984	Creston	Transportation and Industry, Level I
December 1-8, 1984	Whistler	Professional, Level II
December 9-15, 1984	Whistler	Ski Operations, Level I
January 13-20, 1985	Mt. Assiniboine	Ski Operations, Level I
January 20-27, 1985	Mt. Assiniboine	Ski Operations, Level I

Due to changes in staff at the British Columbia Institute of Technology, there may be changes in the administration of the courses. The standards of instruction and instructors will be the same as last year for the Level I courses, but the training needs and standards of the Level II course will be reviewed prior to the winter.

SNOW RESEARCH IN CANADA

In January 1984, a Snow Research Advisory Group reporting to the National Research Council sent a questionnaire to snow researchers in Canada requesting them to identify their areas of interest and needs (see Avalanche News #14). Ninety replies were received which indicated that research is conducted by a large number of people who devote a small fraction of time to snow problems. The projects can be broken down as follows:

Studies of snow cover distribution in arctic, alpine, prairie and forest environments	27 projects
Prediction of snow melt and runoff	26 projects
Interaction of forests and vegetation with snow	13 projects
Collection of snowfall data and development of instrumentation for data collection	13 projects
Properties of snow: mechanical, thermal, electro-magnetic, metamorphism	11 projects
Avalanches	10 projects

Chemistry and impurities of snow	7 projects
Snow drifting	6 projects
Influence of snow on traffic, mobility	6 projects
Influence of snow on soil freezing and soil moisture	6 projects
Snow and buildings	3 projects

A high interest in improving communication among people working with snow was expressed. The most frequently mentioned common problem, with the exception of lack of funds, is the measurement of various snow properties. In response to this need, a workshop is planned around the theme: SNOW PROPERTY MEASUREMENT.

The workshop will provide an opportunity for an exchange of experiences about the collection of field data, their assessment and interpretation. Contributions dealing with all aspects of this topic including novel techniques or instruments, quality of existing data sources and index measurements are invited. Sessions are being planned in the following areas:

Snow cover distribution - precipitation measurements
- water equivalent

Blowing or drifting snow

Snow structure and its changes

Mechanical properties

Electro-magnetic properties

Thermodynamic and chemical properties

Sessions will be organized to encourage a maximum of formal and informal discussions. At the beginning of each session, papers will be summarized and compared by a general reporter after which the session will be open for general discussions. A panel of three or four members will be present to lead the discussion.

Date of Workshop: April 1-3, 1985

Location: Chateau Lake Louise, Alberta

Registration fee: $50.00

Rates for accommodation including meals: $50 per day (double)
$78 per day (single)

People who are collecting data on snowfall, snow distribution and snow properties (for example: snow profiles, shear tests, ram profiles) for avalanche hazard forecasting are encouraged to make a contribution to the workshop. Abstracts of papers should be sent to Peter Schaerer (address on front page of Avalanche News) by July 1984. The preliminary program and registration form will be mailed by October 31, 1984.

PUBLICATIONS

McClung, D.M. Derivation of Voellmy's maximum speed and run-out estimates from a centre-of-mass model. Journal of Glaciology, Vol. 29, No. 102, pp. 350-352, 1983. NRCC 21278; price: $1.00.

The commonly used maximum speed and run-out equations for flowing avalanches given by Voellmy's method are considered from a more general model proposed by Perla. Equations analogous to those of Voellmy are derived and the approximations are defined from the point of view of the more general model.

McClung, D.M. and Schaerer, P.A. Determination of avalanche dynamics friction coefficients from measured speeds. Annals of Glaciology, Vol. 4, pp. 170-173, 1983. NRCC 22701; price $1.00.

An avalanche dynamics model developed by Perla, Cheng and McClung in 1980 has two friction terms. By introducing speed maxima for avalanches, along with start and stop reference positions, it is possible to determine the two constant friction coefficients. When this is done, it is found that speed data often exceed a model speed limit. This effect is illustrated by analytic solutions of the relevant equations, as well as numerical solutions for actual avalanche paths. Some limitations and properties of the fundamental modelling are outlined and suggestions given for future use of such models.

Schaerer, P.A. and Fitzharris, B.B. Estimation of the mass of large snow avalanches. Canadian Journal of Civil Engineering, Vol. 11, pp. 74-81, 1984. NRCC 22922; price $1.00.

The mass of major avalanches which occur once in three to twenty-five years at each avalanche path was investigated using two series of observations made at Rogers Pass. The mass of major avalanches greatly exceeds that of annual maximum avalanches. An empirical predictive equation for the mass of major avalanches is presented. The equation was applied to avalanche paths at Rogers Pass and in the Rocky Mountains, and the predicted values were close to the observed mass of apparent 100 year maximum avalanches.

The three publications may be obtained from Publication Sales, National Research Council, Ottawa, Canada, K1A 0R6, by referring to the NRCC number and mailing a cheque or money order (made out to the Receiver General of Canada).

AVALANCHE NEWS MAILING LIST

A new mailing list is currently being compiled. Anyone wishing to continue to receive Avalanche News should indicate this by forwarding name and current address.

Names of Canadian Avalanche Association members will automatically be added to the mailing list and they need not send in a reply.

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