

The New Avalanche Control Programme at the Lake Louise Ski Area

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ABSTRACT

Avalanche control operations at the Lake Louise Ski Area have a history spanning nearly thirty years. Originally a small resort which did not extend above treeline, the ski area grew to include many avalanche paths on all aspects and elevation zones.

For over 20 years avalanche control services were provided by Banff National Park Wardens. The Warden Service continually improved and upgraded the programme and it grew to be highly respected within the industry. In 1988, however, the Lake Louise ski area initiated a process which handed control of the operation from the Warden Service to ski area employed Snow Safety staff. This paper discusses the new avalanche control programme at Lake Louise the challenges of creating an operation that suits the requirements of ski area guests, management and staff.

In 1930 The Ski Club of the Canadian Rockies built Skoki Lodge in the backcountry east of Lake Louise. This was the first step towards what was to become the Lake Louise Ski Area now located on Mounts Whitehorn, Richardson and Lipalian across the valley from the Village of Lake Louise. The current resort lease area encompasses 1000 meters of relief over 17 square kilometres of terrain and includes over 100 avalanche paths located on all aspects and elevations.

Three lodges, ten lifts, an extensive snowmaking system and a staff of 500 provide services to 500,000 guests per year. Adjacent to the ski area but outside the operational boundary, extensive areas of uncontrolled avalanche terrain are accessible to skiers from a variety of lifts and with a minimum of effort.

A cold, relatively thin continental snowpack results in the formation of significant basal and mid-pack facet layers throughout the season. Usually covered by hard slabs, these facet layers present a persistent instability which often does not react to normal control methods and is difficult to forecast.

Avalanche control at Lake Louise began in the late 1960s, with the Banff National Park Warden Service providing all services. Initially this was a small operation involving just a few paths. As more lifts were added, going to higher elevations, the control programme grew as well. Warden Clair Israelson became the Avalanche Forecaster in 1972 and remained in that position until the spring of 1990. In that time, Clair formed a snow research and avalanche control programme which was well known in the industry for its effectiveness.

In 1978 the ski area decided it was in its own best interest to have a presence on the avalanche control team. As a result, four ski patrollers were attached to the Warden operation. At this point, the ski area paid the wages

of its four avalanche control staff, half the wages of the six Wardens posted at the hill, the entire cost of explosives and a capital depreciation rate on all equipment used, such as explosives magazines and avalaunchers.

Ten years later, in 1988, ski area management began a process aimed at attaining complete control of the operation. This was essentially a political decision, taken due to various disagreements between the two parties, many of which had nothing to do with avalanche control. Thus, the scene was set for the Warden programme to evolve into one which would need to be more accountable to the ski area and its guests.

Two years were needed for the changeover to be fully completed. Initially, the major problem concerned staffing. For some time the Ski Patrol had experienced a high turnover rate and no formal training programme existed. As a result only the four patrollers working with the Wardens had any significant avalanche related training. This required hiring staff from outside the ski area to fill positions in the new programme. Will Devlin, who had worked with the Warden Service team for many years, was taken on in the fall of 1989 as the future avalanche forecaster. By this time, six ski area staff were working with six Wardens. The plan called for a season of "coaching" by the Wardens to occur before the ski area took over. Although this was easier said than done, some valuable lessons were learned and in November, 1990, Lake Louise staff began overseeing all avalanche control operations at the ski area - just in time to deal with the largest single month snowfall ever recorded at the area!

Many problems soon became apparent. Infrastructure such as office space, radios and weather instrumentation was not ready in time for such an early and fast start to the season. Most of these difficulties were rectified within a short time. Several longer lasting issues presented themselves, however: a new department, called "Snow Safety", was created to replace the Ski Patrol, and its mandate and structure were unclear. As well, a newly emerging outlook present at a modern ski area required a decision be made as to whether the new programme should continue to provide avalanche control services in much the same way as previously, or if a new perspective on the job was required.

Over the years, low wages, poor hiring practices and the disinterested attitude of management towards the Ski Patrol had resulted in a department which, although made up of a well-intentioned group, lacked the experience and training needed to meet the demands of modern public safety standards. Once the process of taking responsibility for avalanche control began to be taken by the ski area, the Warden Service stressed that a lower staff turnover rate and a greater emphasis on training was needed to maintain the present high standards. This was considered especially important as great emphasis is placed on local knowledge when assessing stability in a continental snow-

pack at both the forecasting and team leader levels. To this end, an Avalanche Safety Plan was written and agreed to by both parties outlining how the programme was to be operated. This plan included minimum certification requirements for staff involved in avalanche control:

- Avalanche Control Team Members: Canadian Avalanche Association Level 1 certification.
- Avalanche Control Team Leaders: CAA Level 2 certification, Explosives Use Permit.
- Forecasters: In addition to the above certification, must be members of the CAA.

As a result of these requirements, a more selective hiring process was instituted and more training occurs both before and during each season. Wages have been increased and, as a result, turnover is less of a problem. All this in turn raised standards in the other aspects of the department as well, most notably in pre-hospital care.

As this developed, a reassessment of the responsibilities of the old Ski Patrol occurred as management began a process of defining the new Snow Safety department. Whereas in the past pre-hospital care was the major responsibility of the Ski Patrol, now avalanche control, risk management and trail work are all Snow Safety's responsibility. This combined the workings of what had essentially been three departments: Ski Patrol, Warden/Ski Patrol Avalanche Crew and Trail Crew. The work required from the previous three "departments" often overlapped, and with integration it became possible to combine and reduce personnel requirements while maintaining adequate coverage on the mountain. The resulting streamlined crew, however, required all staff to pull together and work at whatever job required the most attention. During a given week, everyone, from the Supervisor to a rookie patroller, might be required to work on slat fence used in "snow farming", attend an injured skier or participate in an avalanche control route. To help assess what job is most important at any given moment, a priority list was developed to assist the Supervisors in allocating occasionally scarce personnel:

- Have personnel in position to respond to all accidents and lift, avalanche and other emergencies inside the ski area; maintain avalanche closures.

- Perform avalanche control within the ski area.
- Respond to emergencies outside the ski area.
- Perform risk management and related trail work duties.
- Perform other trail work, snow farming and other duties requested by ski area management.

With its new responsibilities came the need for structure in the Snow Safety department. It became obvious a new chain of command was needed. This has been a long process which continues to be refined. In 1990, the avalanche forecaster also acted as Snow Safety Supervisor. He had two assistants: one to help with avalanche forecasting and one to help oversee the other aspects of the department. The Supervisor liaised with management and other departments in addition to overseeing all daily avalanche, pre-hospital care, risk management and trail work. The staff most experienced in all aspects of ski patrolling were involved in avalanche control, and as such they became the nucleus of the new department and the supervisory team.

The problem with this scenario was one of an overload of responsibilities. There was not enough personnel or experience for the Supervisor to stand back and oversee the entire department, he was required to be closely involved in daily avalanche operations. This resulted in avalanche forecasting overshadowing other aspects of the job. After two seasons this was mitigated by the addition of a Snow Safety Manager position which was meant to take on most of the responsibilities for liaison with upper management and other departments. A good concept, this did not work well until the job was taken by someone with broad experience in all aspects of snow safety. We have found it best that this position be filled by someone with this background. The Snow Safety Manager frees the three Snow Safety Supervisors (two avalanche forecasters and a patrol leader) to concentrate on daily operations.

Working under the Snow Safety Supervisors are 4 Senior Avalanche Patrollers. Their main duties are as team leaders in snow research and avalanche control. In addition, they have become involved in other facets of the department such as training and acting as roving "troubleshooters". They are not scheduled into the daily routine

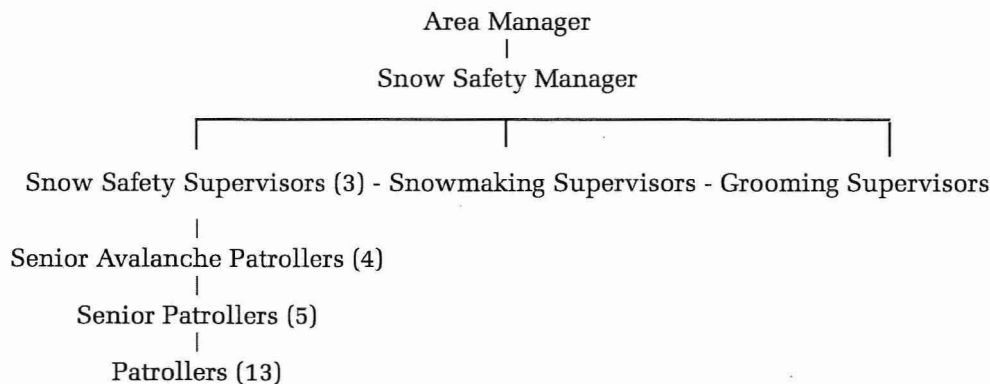


Table 1

of run checks and accident coverage or to patrol specific areas which other patrollers are subject to. This has occasionally raised charges of elitism but we feel it is important to have an experienced core at the centre of our avalanche operations to track the long term instabilities inherent to the area. It has also proven beneficial to have these experienced patrollers roaming the entire mountain on the lookout for problems of all sorts and in position to respond rapidly to various emergency situations.

In addition, there are 5 Senior Patrollers and 13 Patrollers who have as their primary responsibilities pre-hospital care and risk management (in the form of run checks and trail work). These 18 people also act as avalanche team members on a rotating basis whenever needed. Generally 2 - 5 teams are used daily for research and control, depending on conditions.

The key to the current programme now is integration. While each employee has primary responsibilities, they all must be able to help in the other aspects of the department to a certain degree. To do this, training and communications are paramount. The hierarchy now stands as shown in Table 1.

With responsibilities and structure in place, it became possible to review operational procedures. In regards to avalanche control, the Warden operation had as its hallmarks a methodical and thorough approach to research, control and record-keeping, employing a well-trained crew with appropriate certification. In spirit, this has remained the same. What has changed in the six years since Skiing Louise took over the programme is the financial attitude of the company and the expectations of our guests.

Two years of difficult financial times for the company in the early 1990s made cost reduction an overriding concern. This has been addressed within our department in several ways.

As mentioned previously, personnel has been reduced. The workforce performing pre-hospital care, risk management, avalanche control and trail work that consisted of over 40 staff spread over three departments is now 25, supervised by a single department: Snow Safety. While this has increased workload somewhat, it has also allowed wage increases, in some cases significantly, while keeping wage costs below previous levels. In addition, scheduling techniques are used to save money as well and staff need little encouragement to take extra time off when things are slow.

The "bootpacking" crew, which consists of casual employees who work in return for a season pass, has also been reduced. This crew packs slopes by foot in the early season to provide compaction in thin, weak snowpack areas. This downsizing has happened inadvertently. Originally, management wanted to open areas as soon as possible for the marketing benefits of an early opening date. After some debate, areas were bootpacked less and we experimented in opening slopes to skiers earlier. Traditionally these runs were kept closed, not because of an avalanche hazard, but more because of bad skiing and often they were bootpacked several times before opening.

We have found that if we open these slopes earlier, some guests, if warned adequately at the base of the lift, do not mind going into this "bad" snow. This is especially true of snowboarders who have far less trouble with the prob-

lems of a thin snowpack because of the extra flotation of the board. We have gone so far as to recommend certain lifts or runs for snowboarders only, early in the season. Once they have provided some compaction, we then recommend the area for skiers as well and persistent deep instabilities are effectively eliminated for the remainder of the season. We are now opening some slopes which have smooth ground almost before there is enough snow to cause an avalanche problem. With the advent of "fat" skis at ski areas we feel adequate early season compaction will become even less of a problem in the future.

Explosives, and how they are used are also an area where savings have been gained. A less expensive brand of explosives has resulted in significant cost reductions. In addition, 5 - 15 kg ANFO charges are used extensively. It is utilized for nearly all major cornice work and when an early season or deep instability requires a widespread, hard thump. This saves money in two ways: ANFO itself is inexpensive, and fewer individual charges are required for any particular job resulting in fewer hours being expended. This method also maximizes an instability "window" because it is possible to hit more slopes in shorter periods of time. Although accuracy of placement is more important than the size of charge, a large blast does give some feeling of security by covering a large area. Handcharges are used for most normal explosives work; whenever practical they are preferable to the avalaunchers due to high cost of avalauncher payloads. Releasing avalanches by ski cutting is also broadly used on smaller slopes when surface instabilities are forecast.

Lastly, the programme has had to adjust to meet the demands of a changing attitude in our guests recently. The ski area has seen an increase of over 100,000 more users per season in the last few years. These skiers and boarders seem to be more aggressive in their search for snow and the manner in which they ski and ride. There are likely several reasons for this. More Europeans, with a different tradition of skiing and unused to our system of avalanche closures, come every year. Similarly, snowboarders not only seek out steeper and more radical terrain (often with a disregard for closures) the way they use it puts more stress on a snowpack. The proliferation of extreme skiing/boarding films and magazines also seems to have worked its way into the psyche of the everyday skier, again often to the point of ignoring our closures. All this has put increasing pressure on the avalanche programme, especially on the traditional system of permanent closures. Other resorts in North America may have dealt with this problem earlier; in Lake Louise, with its continental snowpack and whose traditional visitor was a conservative local skier, it is a relatively new situation.

The pressure on radical terrain and untouched snow is not only happening within the ski areas, but in the backcountry as well. This is evident by the increased number of searches and rescues performed by the Warden Service and Skiing Louise over the past few years, in terrain adjacent to the ski area.

This has raised a complex series of questions: Can we, or should we, cater to this aggressiveness? Or should we continue with our original thinking which says we can never open certain slopes? If we continue to keep these areas closed can we justify the closure even when stability is good?

Traditionally, many of the steeper or more complex pieces of terrain at the ski area have been closed all season. The reasoning behind this has been that in a cold, thin snowpack not enough skier compaction can be guaranteed in the early season when the skiing was poor. If an area is kept closed until more snow arrives and then opened later in the season, there is potential for a long term instability to become buried, only to react later in the winter. There have been instances of avalanches occurring even after ski compaction has taken place, and each year isothermal avalanches run at ground level in many heavily compacted areas. Deep release events in the mid-winter are not common but always a concern in areas of less compaction.

Over the past few years we have begun to re-think traditional closures. Whereas before, a "buffer zone" of less serious terrain on the edge of the closure ensured most closure violators would remain away from the main area of concern, we began to see more and more serious infractions occur deep within the closures. This culminated in several serious avalanche involvements in permanent closure areas. The most notable of these was the complete burial of a "poacher" resulting from the triggering of a deep instability that had not reacted to explosives a few hours earlier. Luckily the victim was rescued with no injuries, but this type of event was clearly unacceptable even if it did occur in a closed area.

More closure signs and a zero-tolerance enforcement policy helped to a point. We also considered opening some closures when stability was rated Good or Very Good, but the risk of a forecasting error, or of a temporary closure not being respected because the slope would only be open infrequently, seemed to be too high. In the end, we feel the best way to deal with the situation is to have these areas fully compacted, resulting in easily forecasted surface instabilities being the only concern for the majority of the winter and the areas being open more often than closed.

Could we do this? We felt we could. Based on our experience with early season ski and snowboard compaction in our less serious terrain, we began to experiment working our normal closure areas a bit more at the beginning of the winter. We found that with a combination of regular early season explosives work, combined with saturation bombing using ANFO and handcharges when a bit more snow blows in, we were able to open several traditionally closed areas. In the past, the skiing would have been considered poor at the initial opening, but the new breed of aggressive skiers and snowboarders jump in regardless and are quite effective in compacting the slopes. Although it is not the first time some of these areas have been opened, they are now being opened earlier and more consistently than in the past. Presently we are slowly expanding our horizons in this regard and are continually reassessing traditional closures in attempts to open more terrain for our guests. As a result, we are providing a better product for our customers, a better ski area for management to advertise, an interesting challenge for our staff and above all, a safer environment.

In conclusion, the evolution of the new avalanche control programme at the Lake Louise Ski Area has been an interesting process, one which has taken far longer than initially expected and one which continues to evolve. We have found it essential that the Snow Safety programme be efficient, integrated and open to the idea of change so it can respond to the shifting demands of guests, management and staff. What has emerged is an operation whose staff are well-rounded in their skills and flexible in responding to the variety of public safety problems faced at one of Canada's major ski areas.