

## DEALING WITH AVALANCHE PROBLEMS IN HELICOPTER SKIING

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### Introduction

After having guided and conducted high mountain alpine ski tours for 12 consecutive seasons, I recognized one overriding difference when I seriously got involved in helicopter skiing in 1965: The exposure to avalanches is considerably greater in heli-skiing than in ski-touring. Table 1 summarizes the key reasons for this difference.

In planning our ski-tours, it was important to consider the avalanche hazard, but it was nonetheless always possible to choose a tour on any given day where this hazard was minimal. In fact, on most days, in most areas, you could always guide two trips and seldom feel that the risk was critical. The groups were small, you had altogether 12-15 skiers; their expectations were very reasonable and, hence, they were easy to control if conditions did get marginal. Further, on the climb or approach, you had sufficient time for observation. The climbs up the mountain took anywhere from 2 to 5 hours. With each push of the ski forward into the unbroken snow, with each plant of the pole, you got a message, and you had time to digest it. You could look around in all directions, you could listen, you could feel the temperature and the wind. Although all these impressions were measured by feel, rather than by instruments, they did give you tangible information because you carried these observations out every day, season after season.

On almost every count, the opposite holds true in skiing by helicopter. Because of the rapid uphill transportation, one or two runs a day is not enough. The average number of runs a day in our operations is seven, and there have been as many as 15. So even though you can find one or two runs that you feel comfortable about, you are called upon to produce more. The expectations of these skiers are very high, and tend to be more so if your operations have been restricted by bad weather for a few days. When the weather clears, you have 40 eager skiers making demands. They want to ski some new slopes; they have had enough of skiing in the trees. Now that there is a lot of fresh snow, they want to ski where the snow is deepest, and on the steepest slopes! Most of these people are very eager downhill skiers, and seldom impressed with the inherent dangers of the surrounding mountain country -- that is your

responsibility! It is only possible to control them by maintaining very clear and compelling communication. They are boiling with enthusiasm, -- and of the 40 skiers you have in one area, each wants to make his own tracks on every run. Each year the calibre of skiing increases, which only magnifies all these problems.

In addition, there is very little time for observation. The flight up takes only minutes and although, with experience, you can draw some conclusions as to the nature of the snow by inspection from the air, this kind of observation could not possibly compare with feeling the snow with your skis every inch of the way up the slope, as is the case in ski-touring. So, with a minimum of observations, the heli-skiing guide has to make some very difficult decisions. Often, he is called upon to make these decisions many times a day. Thus, the demands placed on the heli-skiing guide are severe, and, as just outlined, most of these demands are caused by the great frequency with which heli-skiing groups are exposed to potential avalanche hazards. How then do we cope with this problem? There are 5 different steps we take.

### Guide Training

We place the highest importance on the qualifications of our guides and their subsequent continuous training. Therefore, to become a full guide in our organization, one has to have a diploma from a member organization of the International Federation of Mountain Guides Associations. Where once we moved guides regularly from area to area, they now stay in one place and we have been able to maintain excellent continuity in our staff. The average number of years with Canadian Mountain Holidays (CMH) is  $4\frac{1}{2}$  for our 32 guides. This does not take into consideration that our guiding staff has increased from 6 in 1970 to 32 at present. Some of our guides have been with us now for 12 years. Most important, each year we invite some of the foremost authorities in snow craft and avalanche forecasting to work in one or several of our areas with the guides. During these sessions, they look at some of the slopes we ski, identify the problem areas on the slopes, dig snow pits and analyze the snow pack, and hypothesize as to what would happen under certain given conditions. These sessions have proven of great value for our guides. In addition to learning from the best teachers available, it gives them a chance to do their own evaluations, form an opinion, and test this opinion against an accepted and recognized authority. There are also training weeks which we conduct ourselves.

## Control of the Skiing Groups

Each guide is in charge of a group of 8-12 skiers. The groups are formed primarily on the basis of skiing ability. It is the guide's responsibility to bring his group down the mountain in such a manner that he has full control over them, especially when conditions are marginal. This necessitates very precise communication. First, he explains each run to the group in general terms, and then exactly how each stretch is skied. When conditions are stable, the guide might only say, "You can ski either side of my tracks, but keep it close together so there is some snow left for the other groups". Or he may say, "You have to stay to the right of my tracks, but don't go beyond that small ridge", and so on. If conditions are touchy, the guide will stop his group in a safe place and give a detailed explanation. For example:

"In order to get you down this slope safely I will need your full cooperation. By doing exactly as I explain, you will have nothing to worry about. So please listen carefully and, if you are not absolutely clear as to what you are supposed to do, it is better to ask me again before I start down. Now, I will test the slope first, and decide on the safest route down. When I ski down, I want you to wait here until I get to the bottom. Then every time I wave my pole, one of you can come down. I want you, in that case, to ski as close as possible to my tracks. If you are out of control, it is better to sit down. Whatever happens, don't cut out to the side. Any questions?"

The guide would then make one or several cuts across the slope to see if it will actually slide. If not, he then skis down along that line which he considers safest. In such cases, the guides are able, from time-to-time, to actually trigger such a slope, while test skiing it, and it has also happened a number of times that the guide was carried down part way.

## Study Plots

As the next measure, we maintain very simple study plots, and do some crude forecasting before we go skiing. This is done more so at Bugaboo and Cariboo Lodges, to a lesser degree in our other areas. It has to be kept in mind that, because of the immense size of the areas, it is physically impossible to do as thorough a job as one would like. This would probably mean more observers in an area than skiers.

At both Bugaboos and Cariboos, we have our snow-plot near the lodge. These plots consist of a 12-hour stake, a storm stake, a season stake, plus minimum and maximum thermometers. At two other locations in each area, near timberline, we maintain storm and season stakes. By comparing the readings at the two upper and the base stations, one can deduce the difference in the snowfall amounts between higher and lower elevations and one gets a very clear picture of the settlement ratio of the new snow as well as the whole snow-pack. To further evaluate the information from the study plots, we also take snow profiles near these plots as well as other places we consider strategic.

### Stabilization With Explosives

When conditions are particularly severe, we carry out stabilization with explosives from the helicopter. This programme is usually confined to those slopes that we ski with great frequency, even under marginal weather conditions. Here we have two objectives:

- a) We try to stabilize certain key slopes by dropping these bombs into their trigger zones; and
- b) We also blast those cornices which threaten the slopes that we ski.

For this purpose, we use several types of bombs: Nitron S-1 primer in one pound cans as well as Amex, which we mix ourselves, boosted with one or two sticks of Forcite. The nitron bombs are made up in loads of 2 to 5 kg. The Amex bombs are of similar size. The latter are contained in heavy plastic bags with a burlap cover. In each case, we use blasting caps with a 1 m fuse, already assembled by the factory.

Usually three bombs are lit at once and are then tossed out of the helicopter in quick succession while the helicopter flies a prescribed course over the target area. To facilitate this, one of the guides rides in the front as a spotter, one sits in the back next to the lefthand door and his job is to ignite and toss the bombs. These two guides, plus the pilot, talk to each other via intercom. The spotter points the target out to the pilot. Then he informs the guide in the back how many bombs to get ready. As they come near the target, the spotter gives the order to drop the bombs. Depending on the nature of the trigger zone or cornice, anywhere from two to four bombs are dropped on a line. Since they explode almost simultaneously, the shock wave is spread over the whole trigger zone, or along 30-45 m of cornice.

All this bombing can be applied only to a small area compared to all the ski terrain available in each location, and then only to selected targets. But at least it allows us then to ski in that small area, test the snow first-hand, and see how the snow on the various exposures differs. These findings can then be transposed to other areas that have not been bombed. And so, step by step, we can reach out into the whole skiing area.

It might be argued that all areas that we ski should be bombed after every snowfall. However, we don't have a situation where hundreds or thousands of people are brought to the mountain tops, and therefore we feel that saturating the mountain slopes with explosives is not justified.

### Rescue Transceivers

We equip each one of our skiers with a Skadi avalanche transceiver. We have been doing this since 1970, and this measure has so far saved at least two lives in our operation. There are a number of reasons why we use Skadis over other similar devices. Skadi was the first practical device of this type available. When other transceivers came on the scene, we found the Skadi more reliable than Pieps, for example, and we decided against Autophon, although highly impressed by its quality, compactness and range; because of its different frequency.

Rather than just handing the Skadis to our guests, we follow some very strict procedures. All the Skadis are numbered, and each skier for the week has a Skadi with a specific number. This gives much better control in case of a Skadi malfunctioning and also serves as additional control in case of accidents.

At the beginning of each ski week, the Skadi and its functions are thoroughly explained to the skiers by the guides. Then the skiers practise with the Skadis until everyone has twice located a Skadi which is buried in the snow. The skiers are then instructed how to wear their Skadis, preferably in a pocket that can be closed with a zipper or around the neck and tucked right inside the shirt. This is most important! There have been a number of disturbing cases where Skadis have been lost in avalanches. The guide checks that each Skadi is transmitting. In the evening, the Skadis are collected and recharged overnight. Next morning they are all turned on, and again the guides hand them out to the respective groups. While the skiers walk to the helicopter, the guide checks again that all Skadis are transmitting properly.

## Conclusion

We have had fatal accidents in spite of all these measures. Such happenings do throw open a lot of questions. The most fundamental; "Can heli-skiing be conducted in such a way that it is completely safe to its participants"? After 12 years in the business and being responsible for 90% of the helicopter skiing in Canada to date, I say "No," unless the experience of heli-skiing is reduced to a level where it is no longer interesting to the participants. As long as heli-skiing is carried out at the presently accepted (demanded?) level, I believe that nobody in good conscience can say today that they can take skiers into this type of terrain, under these conditions, and guarantee them absolute safety. Rather, I believe that it should be spelled out very clearly to the participants that heli-skiing is potentially very dangerous.

That the majority of participants regularly accept the risks involved with heli-skiing has been demonstrated many times and particularly vividly last spring after a fatal accident. When the rescue operation was finished at 2:15 p.m., the guides terminated skiing operations for that day. At least 20 of the 40 skiers present were quite upset at not being able to ski anymore.

## Discussion

MCCLUNG: How many total avalanche accidents have you had to date?

GMOSER: Up to the present (Nov. 1976), we have had about 15 accidents involving slides of varying sizes out of 60,000 skier days.

SAIDLAIR: Do you have any problems with skiers of low calibre in avalanche terrain?

GMOSER: Today, the calibre of our skiers is quite high, and in fact this is a problem since the skiers are always pressing our guides for runs with increased difficulty.

HAMRE: Is there an element of competition?

GMOSER: We try to subdue most of the competition up to a point, but we are not out to break a person's spirit.

WILLIAMS: Do you request guides and clients to ski without pole straps and ski straps?

GMOSER: Ski poles are generally not a problem since most of our clients have the new style of ski pole that comes without a strap. The question of whether or not to ski

without ski-straps is a difficult question to decide. If a skier loses his ski in the back-country, he may be in great danger, and we do not recommend skiing without straps.

CALVERT: Does your bombing enlarge avalanche slopes?

GMOSER: We are sensitive to this problem. Our bombing is mostly limited to small slopes which block access to safe routes. To date, we have not enlarged any avalanche path.

SISNEROS: How do you dispose of duds in blasting from helicopters?

GMOSER: We have had only one dud so far. We planted a second charge next to the first and detonated both.

BURR: Do you consider static electricity a problem in bombing from helicopters?

GMOSER: We are using the pre-assembled cap fuse assembly which contains a protective shunt to bypass static discharge.

TABLE 1

Comparison of Alpine Ski-Touring to Heli-Skiing

	Ski-Touring	Heli-Skiing
Frequency of exposure to avalanche hazard	1-2 runs a day.	7-15 runs a day.
Skiers expectations	Moderate.	Extremely high.
Group size on the runs	12-15 skiers.	Up to 44 skiers.
Communication with your group	Very good mountain awareness.	Little understanding for mountains problems.
Time for observation	2-5 hours each run. Contact with snow all the time.	3-5 minutes all visual.
Size of area	Usually 1 valley. 1-5 mile radius. Same conditions except for different exposures.	100 plus different runs. 20 mile radius. Drastically different weather & snow patterns within area.