



Sluff Management: by Jim Conway and Mark Newcomb
as presented at the International Snow Science Workshop 1998

ABSTRACT: Since the first World Extreme Skiing Championships in Valdez in 1991, the Chugach Range around the Thompson Pass area has drawn thousands of skiers seeking steep powder and adventure skiing. The spring season often provides "windows" of stability which allows skiers and snowboarders to push into steep, technical, and exposed terrain. The steepest slopes now descended by heli ski operations in the area range from 40 to 60 degrees. While these "windows" of stability may have low hazard in terms of slab potential, sluffs and small point release avalanches remain a hazard. Over the last five years the staff at Valdez Heli Ski Guides have observed the interaction of skiers/boarders with sluffs in various terrain scenarios. The term "Sluff Management" was developed to describe the various techniques of avoiding and managing this hazard.

The presentation will describe the types of terrain and snowpack where sluffs become a significant hazard that needs to be managed. It will also review the recent evolution of powder specific skis and snowboards and how this relates to managing sluff hazards. Real life examples will be used to represent various scenarios depicting a number of Sluff Management techniques. Many of the techniques to be reviewed have proven significant in reducing the risk of an incident negotiating the steep terrain in the Central Chugach area.

1. Introduction:

Due to advances in equipment, hype from the media, and changes in attitude, the demand for the steep skiing experience has increased over the last ten years. While not a mainstream activity, steep skiing has certainly risen above the "fringe sport" category within the skiing community. Concurrent with this development was the rediscovery of Alaska's Chugach range as a premier steep skiing center. The first World "Extreme" Skiing Championships in 1991 exposed many avid backcountry and hard core skiers to the areas potential. Within three years the first commercial guiding operation was established. Now, there are four commercial heli ski operators in the Valdez area, three of which specialize in the steep skiing experience.

At Valdez Heli Ski Guides, this evolution has resulted in an economically viable guide operation that caters to clients who desire an adventure experience. The ability of the client varies from the well conditioned expert to world class skiers and boarders. Even the least experienced clients possess the athletic ability and competence to negotiate some very challenging terrain, but they may not have the necessary mountain or snow skills required. A great deal of effort, beginning with a thorough safety briefing, is devoted to education on avalanche hazard, glacial travel, and respect for the mountain environment. For the clients, guide direction and coaching is critical for reducing the risks. Terrain is selected for each client based on their skills, experience, desire, and ability to follow the guides recommendations. Clients start off on easily manageable slopes and gradually progress into more challenging terrain ("Terrain Progression").

Once stability has been established, and suitable terrain has been selected, the hazard most commonly encountered on steep slopes is sluffs. The guide staff, through the use of basic backcountry protocols (i.e. skiing one at a time), observation, and some hard learned lessons, has developed a method labeled "Sluff Management". The goal is to reduce one of the many risks involved in traveling in a winter alpine environment.

2. Defining a Sluff:

For the purpose of this discussion, a "sluff" will be considered a small loose snow avalanche. Often the sluff will be the result of a series of point releases in the starting zone. The depth of the layer, for manageable sluffs to which this paper refers, can range from 3 to 15 cm. Skiable slopes likely to sluff range from 40 to 60 degrees. Observed speeds, estimated in the field, range from 5 to 25 meters/second. The density of the snow involved is typically 5 to 15%. The snow is new snow, decomposing precipitation particles, or near surface faceted crystals. The highest potential involves near surface faceted

snow. Sluffs have been observed up to two weeks after the last storm event on the steeper slopes. The farther out from a storm event, the more likely the sluff layer is composed of facets. Most of these events do not result in significant deposition in the runout (0.0 to 0.4 meters).

3. The Need for Management:

Although burial is a possibility, basic terrain selection usually removes this risk (i.e.: avoiding terrain traps). The hazard comes from the sluff causing a high speed fall down steep, and in some cases, exposed terrain. Injury due to trauma may result. This may be caused by impact with other objects or simply over stressing the body in a violent tumble. The slopes descended vary from 500' to 2000', and range from 40 to 60 degrees. Exposure may consist of cliffs, seracs, bergschrunds, or crevasses. Bergschrunds lying below many steep faces are the most common hazard, especially when the gap is wide, or the downhill edge of the gap is higher than the uphill ("Innies"). The ultimate goal of sluff management is to avoid interaction with a sluff event.

4. Sluff Management Techniques:

Avoidance by Speed - This can be described simply in two ways. Go slow enough to stay above the sluff in the starting zone. Or, go fast enough to beat it through the runout zone. Obviously the technique used depends upon the skier's ability and snow quality.

Avoidance by Terrain - Proper terrain selection can eliminate exposure to a sluff event. The simplest technique is to ski off fallline to one side in the starting zone. A variation of this is to ski down an appropriate number of turns (depends on the dynamics of the sluff) then traverse off to one side, out of the sluff path, and begin turning again. As long as there is enough room laterally, whole slopes can be descended using this technique. Another method is to ski slopes with a double fallline so the sluff is constantly moving downhill and away. Finally, spines (steep snow ridges) are another good terrain feature, as the snow falls to either side and away from the skier. The spine must be big enough that the skis are not near the right or left edge of the spine where it meets the sluff path. A skier must also be alert if a spine ends at a point where the sluff path on either side converges. In all cases, care must be taken to avoid terrain features which enhance the sluff, such as gully bottoms and narrows.

Avoidance by Combined Techniques - On complex terrain, combining the above techniques is the best way to mitigate the sluff hazard. There are countless variations of speed and terrain use that can be successfully executed. The most basic technique is to ski down to an Island of Safety, stop, wait for the sluff to pass, then continue. A necessary skill for effective use of the combined technique, is the ability to look up hill while skiing and track the progress of the sluff (also known as the "Chugach Look").

A common scenario is to aggressively descend in front of a sluff, then as the skier observes it catching up, he pulls off onto a slope with a new fallline and drainage. The original sluff continues down the first drainage while the skier has transferred to the new drainage. A skier might just as easily ski up onto a spine or a side slope with a double fallline, watching for the sluff to pass before reentering the original fallline. A number of these maneuvers may have to be incorporated into one run. Obviously, this is a more advanced technique requiring careful study of the terrain along with mental and athletic skill.

Ski Cutting - Ski cutting is probably the most traditional method of controlling sluff activity. In many cases it will serve to eliminate the chance of sluffing during a run. On the other hand, enough loose snow may remain to create a substantial hazard, especially on the steepest slopes. But the experienced steep skier may be reluctant to cut slopes for aesthetic reasons. This might be for the pure powder experience or a film shoot. Where the skier is confident in his ability to negotiate the terrain and sluff paths, he may prefer to deal with the sluff during the run, rather than control it ahead of time. The guide, through communication with the client, determines what is advisable in each situation.

6. The Sluff Management Plan:

From the straight forward run descended by a skilled but unpracticed client, to the complex lines of a world class skier or boarder, a sluff management plan is the key to reducing risk. A sluff management plan is the result of careful study of the terrain, snow conditions, skier's ability, and contingencies. It puts together all of the techniques described above into a comprehensive plan. It is key that the client is thoroughly briefed on his line and options before he begins the run. It can be as simple as pointing out a recommended line; or as complicated as developing a plan that incorporates all of the strategies above. The guide will point out the potential sluff hazard to the client and will develop and/or approve a plan. A guide must carefully consider the client's line and be confident that he can execute it. If there is any doubt, a more conservative line should be selected.

In situations where accomplished athletes drop big complicated lines, time must be taken to thoroughly study the terrain and snow. The group may land adjacent to the slope and study it, or make use of Polaroid snapshots. Most guides use this opportunity to educate clients about hazards and strategy. For each big descent it is prudent that the guide works with the pilot and other skiers to come up with contingency plans in case of an incident. It is important to note here the standard practice of pointing out the hazards and preferred line to an average client, versus the extensive preparation involved in setting up a major descent by a world class athlete. The more complex the descent, the more dynamic the plan needs to be

with options based on forecasted contingencies.

6. Conclusions

The techniques for sluff management have become more complicated due to two relatively recent events. One is the popularity of snowboarding and especially freeriding. And the other is development of wide high performance skis designed specifically for fast high performance powder descents. Snowboarders took the lead on establishing how fast steep terrain can be descended in powder conditions. But in the past two years high performance fat skis have allowed skiers to adopt the same aggressive 'out in front' sluff management tactics. Controlled ski descents with speeds from 40 to 60 miles per hour have been witnessed. In the past, the primary backcountry user was most likely on narrow waisted skis. The limitations imposed by this equipment usually forced the skier to descend slowly and deal with sluffs high in the starting zone, staying high enough where the forces are less powerful. Now with the higher speeds allowed by snowboards and fat skis, the rider has the potential to be affected by the sluff much lower in the track where the forces are much greater. The new technology, even in the hands of the average backcountry skier or heli ski client, has exposed even more users to this hazard.

The staff at Valdez Heli Ski Guides has had a strong measure of success using the techniques described above. Fortunately, to date there have been no serious incidents as the result of a skier or guide being involved with a sluff. The practice of the techniques described in this paper clearly reduce the risk of an incident.