PERSPECTIVES ON SKI CUTTING

John Stimberis[1]
1Washington State Department of Transportation, Snoqualmie Pass, WA, USA

ABSTRACT: Ski cuts are often used as a stability test to check for avalanche initiation by means of a skier's weight. Avalanche control personnel employ ski cutting as a method of intentionally triggering avalanches as part of their hazard reduction programs. Certain avalanche types such as loose snow, shallow slabs, and storm slabs, are more conducive to ski triggering. Avalanche problems such as persistent slabs, deep slabs, and wet slabs are more difficult to trigger and are generally avoided. Under certain conditions ski cutting is more effective than explosives, and the results offer valuable information about likelihood of avalanche initiation. The author has over 25 years avalanche control experience and will present an overview of ski cutting as a viable method for avalanche mitigation and how ski cutting is employed in ski area and highway programs.

KEYWORDS: Avalanche Control, Ski Cutting, Hazard Reduction, Mitigation

1. INTRODUCTION

Ski tests are often used to determine the likelihood of initiating an avalanche on a particular test slope. Ski cutting, the act of intentionally triggering avalanches, is used for avalanche hazard reduction or what has traditionally been called avalanche control. Ski cutting has been an important component of avalanche hazard reduction for ski areas and highways. There are advantage and limitations to the use of ski cutting and these aspects will be explored further. Much of the information in this paper is drawn from my 25 years' experience in avalanche hazard forecasting and reduction.

Ski cutting is used to initiate both loose and slab avalanches, as well as cornices. Certain avalanche types favor ski cutting more than others, and a few should be avoided. Loose snow avalanches, both wet and dry, can be especially receptive to ski triggering (cite Miners, Stimberis). Slab avalanches can be equally receptive to ski triggering especially storm, wind, and shallow persistent slabs. Newly formed cornices are also ideal candidates for ski triggering, particularly in and around ski areas. Ski cuts can often affect a larger area of the start zone than a single explosive, and are often more effective with loose snow conditions. In addition, a slope where slab conditions are expected and do not produce any results with an explosive may be tested across the entire start zone with a ski cut. The ski cut provides more opportunities to affect a shallower point in the slab and increase the possibility of affecting the weak layer.

* *Corresponding author address:*
John Stimberis, WA State Department of Transportation, Snoqualmie Pass, WA 98068; tel: +1 509-929-1647;email: stimbej@wsdot.wa.gov

Ski cutting has been referred to as one of the most dangerous methods to observe and test the snowpack, but ski cutting continues to be widely used by practitioners throughout the world. It is a highly developed skill and when applied in a safe and methodical manner ski cutting provides favorable avalanche hazard reduction results.

2. METHODS

For the practitioner ski cutting is much more an art than science. Experience, familiarity with local terrain, and intuition play a big role in the positive outcome. Proper training and coaching are critical to the development of a competent ski cutter as it is primarily an apprentice style learning environment. The beginning ski cutter must be paired with experienced individuals. The learning environment should be as free from distractions as possible. Additional stress inducers such as time constraints and difficult snow conditions should be avoided. Once the initial concepts are in place the trainer takes on the role of coach. Fundamentals are still at the forefront of the experience but additional concepts are introduced. These concepts could include choosing additional escape routes and hypothetical scenarios based on a given piece of terrain or snow conditions. Adding these additional thoughts helps expand the thinking of the learner.

The ski cut itself is very dependent on the terrain and current snow conditions. Those involved with reducing slope scale hazard by intentionally releasing avalanches rarely enter the given situation without a strong working model of the current avalanche problem. Theses practitioners not only understand the avalanche type, but also the nuance of where it exists within the terrain. This working knowledge comes from an ongoing understanding of the local snow and weather conditions, and also the history of avalanches within their local terrain. Once control teams are moving through their routes they will further refine the pertinent avalanche information. Most often these conditions are relayed as location relative to start zone than specific slope angles. A team

moving in the ski cut a series of avalanches paths is far more interested in where slab initiation is most likely to occur (i.e. High in the start zone, or at the apex of convexities), than a numeric value of slope angle.
The safest way to approach a given slope is to place the first ski cut in a more conservative location and allows the best opportunity to reach the primary safe zone. Additional ski cuts may take a more aggressive approach, but always one that includes the best chance to abort and reach a safe area. Ski cuts that force one to fully commit to the terrain must be avoided as they offer little if any opportunity to move out of the terrain.
The experienced ski cutter absorbs vast amounts of information as they move across a slope and actions are often performed in an intuitive manner. This intuition is also known as Unconscious Competence, a place where the individual has so much practice with a skill that it becomes "second nature" and can be performed easily. Even though, the approach is always one which emphasizes safety. The approach to a given slope will always begin with a more conservative approach.
Loose snow avalanches are often very responsive to ski cutting. Traversing with a slight side-slipping action can initiate relatively small amounts of snow. These smaller initiations have the potential to entrain quite a bit of snow, especially in wet loose avalanche conditions. The ski cutter can also cover larger areas in a quick and efficient manner and reduce the avalanche hazard more completely than conventional hand thrown explosives.
Storm slabs and newly formed cornices are often reactive to both explosives and ski cutting. The use of ski cuts with these conditions is usually slope dependent. Avalanche mitigation programs have specific techniques in place to reduce the avalanche hazard and will include both explosives and ski cuts to accomplish their goals.
Slab avalanches that become harder to initiate, either because of slab thickness or density (i.e. persistent slabs, wind slabs) are often avoided due to the inconsistency of triggering. Deep persistent slabs and glide avalanches are avoided altogether as they may be extremely difficult, or impossible to initiate with skis. In all cases consistent, predictable conditions are favored by the ski cutter. Hard to trigger conditions, and those involving remote triggering and initiation onto low angle slopes must be avoided as the conditions are far too dangerous for ski triggering

3. DISCUSSION

The proper approach for the intentional triggering of avalanches is highly dependent on the avalanche problem and ease of initiation. No one method will always be the best choice. Conditions change spatially and temporally, necessitating constant evaluation and reassessment. The type of avalanche expected on a particular day often determines the terrain choices for sate travel, and consequently determines the proper terrain choice and approach for avalanche initiation. Consistency is key to safe and effective ski cutting. Inconsistent conditions increase the risk to the avalanche worker, though these conditions should not be confused with isolated pockets of instability. The experienced ski cutter can recognize the difference.

Several of the 10 common missteps of practitioners (Guyn, 2016) can lead to failure in ski cutting. Specifically the misapplication of terrain, being impatient with conditions, and not being vigilant to changes in the environment have the biggest potential to catch the avalanche worker off guard. It is important to be familiar with the terrain and behavior of avalanches paths within a program. Familiarity with local conditions and constant evaluation of the feedback provided by the snow come with experience and experience comes with time and proper coaching. Ski cutting is more art than science and development of the necessary skills follows an apprenticeship style format that can't easily be confined to a classroom.

Avalanche hazard reduction in an operational setting will most likely consist of some amount of ski cutting, especially in ski related environments. Transportation programs and those tasked with protecting infrastructure may still find some use for ski cutting. Loose snow conditions appear to have the most success from ski cutting and are beneficial to hazard reduction efforts at both ski operations and highway operations (Meiners, 2012 Stimberis, 2008)

A survey was sent to avalanche workers and the results will be covered in the corresponding poster. The survey touches on certain aspects of ski cutting, but does not go into specifics regarding snow climate or demographics. Initial results do show a slight bias towards winter snow conditions versus spring snow conditions. Most respondents tend to use ski cutting for loose snow and recent snow problems, including cornices. Very few, if any respondents indicated the use of ski cutting for deeper snowpack problems. A more complete dissemination of the narrative responses will be included with the poster, particularly those responses related to training and near-miss situations. Near-misses were

defined as encountering unexpected avalanche conditions for the given day.

The survey should be expanded upon for future investigation into the subject of ski cutting. A properly designed survey including additional questions related to snow climate, general demographics, and industry specific application would be a great starting point

ACKNOWLEDGMENT

I would like to thank the many experienced colleagues who have provided me with guidance and training over the years. I also wish to thank everyone who took time to answer the ski cutting survey

REFERENCES

Guyn, T., 2016: 10 common missteps of avalanche practitioners. Proceedings of the International Snow Science Workshop, Breckenridge, CO, 241-245.

Meiners, T. et al, 2012: Practitioners view on quick study of snowpack: How to explain the vocabulary for probe pole test and ski cutting. Proceedings of the International Snow Science Workshop, Anchorage, AK, 23-27.

Stimberis, J., 2008: Chinook Pass: 25 Years on. Proceedings of the International Snow Science Workshop, Whistler, BC, 262-267