Fernie Snow Valley is a medium sized ski resort located in the Front Ranges of the Rocky Mountains of southeastern British Columbia. The resort sits in a snowbelt that receives abundant and heavy snowfalls. Accumulations of 4 to 6 meters in the starting zones is average. The major portion of the ski areas lies within two sub alpine cirques, avalanches of class 4 have been observed in both bowls. A sharp ridge running north to south forms a headwall above the ski area, perpendicular to the prevailing westerly winds. Approximately 500 meters of large cornice form on this 2 km. ridgeline 300 meters above the ski area.

Historically cornice control is one of the more problematic aspects of the Fernie Snow Valley avalanche control program. Cornices can provide much larger triggers than the avalauncher used to test and control the starting zones above our ski area. In January of 1988 a cornice fall released a class 3 avalanche on a slope that had been tested by the avalanche team that morning. This larger than expected avalanche covered the upper section of two open ski runs. An area approximately 150 meters by 200 meters had to be searched. Probe lines were established and R.C.M.P. dog master Gordon Burns was called in. The dog was able to search the entire area in less than 1 hour. By luck no one was caught by this avalanche. A note of interest and caution, the following morning over half of the debris, where up to 40 rescuers had been working, was covered by another avalanche which also had been triggered by cornice. This points out the need for an avalanche guard, and an escape route that must be known by all rescuers.

In the early days of cornice control at Snow Valley, as access to the ridgecrest is not readily available, cornices were allowed to mature through early winter and an annual or bi-annual expedition was mounted. Conventional drilling and blasting on the worst sections with up to 65 kg placed ½ kg per 2 meters was capable of removing approximately 200 meters of cornice. This method was effective but time consuming and not without considerable risk to the control teams. The Avalanche Handbook states "Working on massive cornices a proper belay affords inadequate protection from the crushing forces of gigantic cornice blocks." A gigantic cornice block breaking off at toes of our borehole driller led us to look to safer methods.

To reduce the risk, surface blasting was employed using the same spacing and poundage as with drilling. A safe working line was set out using wands, charges were connected up with detonation cord, then a 3 meter collapsible probe was used to push the charges out onto the roof of the cornice. Results were similar to those for the drilling method. This method was a little faster, since charges could be pushed into place from behind the safe working line, a belay was not used. This is a dangerous practice. The safe working line can be difficult or impossible to establish. On one cornice control mission a massive cornice block broke off less than 1 meter from the safe working line while placing the wands. Using a belay is strongly recommended. Surface blasting has been used successfully for some years and still is when conditions require it. Flying up to the ridgeline early in the morning before the ski area opens and rigging a section of cornice for surface blasting was tried. This method was satisfactory in both results and limiting the length of time a large portion of the ski area had to be closed for cornice control. It is not however the most cost effective, successive trips to the ridge are required, the number of days for flying and working on the ridge are also limited.

In an effort to find a faster, easier method, blasting with bundles of 5 kg to 10 kg placed in the center of the cornice roof has been tried. This has proven to be a very successful technique for removing large cornices. It has the advantages of being able to deliver the charges by simply throwing them on the cornice roof or by dropping them from a helicopter. This eliminates the need to expose the control teams to the
risk of working on the cornice roof and it is very fast. It is possible for us to helibomb our entire 2 km ridgeline in less than 1 hour. This is less helicopter time than was previously required to lift 2 teams and their blasting supplies for surface or drilling operations. A 5 kg charge has become our standard payload to simplify the target selection and minimize confusion caused by using varying sized payloads.

One thing that has particularly surprised us is how unstable many of these large cornices are. Many times cornices have broken off as the charge lands on the roof. During one mission 3 out of 5 cornices released by the weight of the charge before detonation. This led to the suggestion that rocks should precede the charge. If the cornice holds the rock it should hold the charge. Cornices that have been previously controlled seem to be particularly unstable. The large vertical faces left by control are a breeding ground for new cornice, but the new cornice does not bond well to these faces. Therefore once cornice control is undertaken it must be continued almost continuously. Another problem we have encountered is a detonation dislodging an adjacent cornice that has a charge with a smoldering fuse sitting on it. For this reason we now stagger charges and try not to place charges too close together.

Helibombing of large cornices is a fast, safe and effective method of removing large cornices. It is possible to remove a lot of cornice in a short period of time. Helibombing does not clean the cornice back as well as drilling or surface blasting in every case, this can be overcome by following up with a hand bombing mission. Landing on the ridge after helibombing, it is possible to identify and safely remove any remaining bits. Craters left by the helibombs provide good reference points for working on the ridge. Helibombing may not be the answer in every situation, but for our particular problems it is the fastest, safest, and most economical method used to date.

We try to keep an open mind regarding cornices and new ways to control them. Cornice control methods are being evaluated in an ongoing program at Snow Valley. An attempt is being made to reduce the buildup of cornice on problem areas by use of permanent structures on the ridgecrest. A test program will be undertaken and combined with the current active control for the 1990-91 season. This will hopefully increase the safety margin in dealing with unpredictable cornices.