AVALANCHE ACCIDENT – Aneroid Basin, Wallowa Mountains, Oregon

LOCATION: Lookout Mt, Eagle Cap Wilderness, Wallowa Mountains, OR; Accident ~10 Miles south of Joseph, OR

DATE: March 7, 2009, approximately 12:50 PM

SUMMARY: 3 skiers caught, 2 complete burials, 1 partial burial, 1 fatality

SLIDE LOCATION AND CLASSIFICATION: HS – ASu – D 2.5 – R 4 – O; 8400 ft elevation, E-NE aspect, 3-6 ft slab depth, 37-40 degree slope; slide approximately 250 ft wide with secondary 100 ft wide lobe, vertical fall distance ~600 ft (full path) with debris estimated at 12 ft deep

REPORT PREPARED AND SUBMITTED BY: Roger Averbeck, Backcountry Avalanche Safety, Inc.; 503-679-1447 / roger.averbeck@gmail.com

SYNOPSIS:

On March 7, 2009, a group of three backcountry skiers were skiing in a remote basin in the Eagle Cap Wilderness near the privately owned Aneroid Cabins. The cabins are at an elevation of 7500 feet, approximately 7 miles south of Wallowa Lake, OR. Two members of the group are a father, age 50, and his 15 year old son from Enterprise, OR. The third individual was a friend, age 53 from Vancouver, WA. They were skiing on an east-north-east facing slope that they had already skied earlier that day. The slope had also been skied that morning by another group of four skiers from Portland, OR. All three skiers were caught, two were completely buried, one of whom was killed, and the third was partly buried. The two survivors were not injured. The recovery mission described below involved 19 people in a two day operation that took place March 9 – 10th.

The Wallowa Mountains are not covered by any avalanche forecast center. The Payette Avalanche Center in McCall, ID, 50 miles to the east, rated steep northerly slopes in the high alpine as considerable avalanche hazard on the day of the accident.

The coordinates for the accident are: 45 11 49 06 N / 117 12 10 53 W

AVALANCHE:

The HS – ASu – D 2.5 – R 4 – O avalanche crown was 3 – 6 feet deep and the width of the slide was approximately 400 feet. The start zone was between 8300 - 8440 feet elevation with slope angles of 37 – 40 degrees. The slide ran 620 vertical feet / full path to the base of the slope at 7820 feet elevation. The main lobe of debris was estimated to be 250 feet wide, with a secondary 100 foot wide lobe to the north. The slope was a wide open face below a narrow ridgeline known locally as Lookout Mountain, elevation 8500 feet. The slope that released is a well defined avalanche path. Vegetation is primarily scattered small clumps of subalpine fir and white-bark pine, with grass and forbs ground cover. The avalanche path contains several minor gullies and intervening

rock outcrops with enough soil to support small groups of trees. The run out zone is an abrupt and concave transition to an alpine meadow which served as a terrain trap for avalanche debris deposition. The debris was estimated at 12 feet in depth. Although the fracture initiated just below the ridge top, in an area of thinner snow, it propagated diagonally down across the mid slope zone of greatest wind deposition.

WEATHER AND SNOWPACK:

Temperature and precipitation data is from the Aneroid Snotel # 2, located at an elevation of 7300 feet approximately 1.3 miles north of the accident site. Since the Snotel station lacks an anemometer, wind data is from the Harl Butte RAWS (HRL03) located at an elevation of 6071 feet approximately 12 miles east of the accident site. The Wallowa Mountains have experienced a below average snowpack this winter (SWE at Aneroid Snotel was 66% of average by March). January 2009 was marked by an extended dry spell with numerous days above freezing. This period included some light rain events and melt freeze cycles that solidified the base and formed a major crust, which eventually created the bed surface of the March 7th avalanche. Surface hoar was observed on top the crust in mid January in the southern Wallowa's.

Typical winter weather returned on January 24th. Infrequent small storms but cooler temperatures through mid February provided conditions were favorable for near surface faceting. Surface hoar was observed in the Jewett Basin (8300 feet, 0.5 mile west of accident site) the weekend of February 7 – 8th.

In mid to late February, several reports and observations from McCully Basin (2 – 3 miles northeast of Lookout Mountain) and Norway Basin in the southern Wallowa's confirm that on north aspects there was a thick layer of diurnal re-crystallized facets snow (thickness varied from 5 cm to 10 cm). Many pockets of surface hoar were preserved and buried on east aspects in McCully Basin. On steeper north aspects, instability on the facets was indistinctive due to low shear energy, but once a slope was loaded by new snow and wind, failures were initiated by intentional ski cutting.

During President's weekend (February 13 – 16), an active storm cycle provided 30 – 40 cm of new snow with very strong SW winds, forming slabs of 1 – 1.5 meters in depth. During this weekend in the Wing Ridge area (4 miles east of Aneroid Basin), in McCully Basin, and in Norway Basin the weekend of February 21 – 22, intentional ski cut triggered slides revealed the facets buried 40 – 60 cm down on the January crust. Stability tests at the crown fractures yielded Q 3 shears. Tests conducted on east aspects with buried surface hoar yield Q 1 shears, and whumping was noted in flat areas in McCully and Norway Basins over these two weekends.

On February 14, skiers triggered two small avalanches on Lookout Mountain on the adjacent slope just south of the March 7th accident site. The largest (SS – ASu – D2 – R2 – S) was remotely triggered while climbing to the ridge top, on an east aspect at 8400 feet at a convexity. The crown fracture was 2 feet deep, 150 feet wide, and it ran 400 feet. Surface hoar is the suspected weak layer.

Natural or human caused avalanche activity in the Wallowa's was not observed during the last week of February. February 27 – 28th was clear and cold with gusty south

winds in the 20's – 30's mph, with plenty of snow (an average of 35 cm fresh snow sitting on the crust) available for wind transport.

Early March brought unstable weather, with a warming trend, brief rain showers and graupel in the alpine on March 1st. 25 cm of new snow fell on March 2 – 3, with south winds in the teens (mph). Natural avalanches were observed in the Wing Ridge area on March 2nd on a southeast aspect at an elevation of 8500 feet; and on March 4th on a northeast aspect at 8400 feet. The storm cycle continued but grew colder with another 15 cm of new snow on March 4, ending by the 5th. Two ski triggered avalanches occurred in the Wing Ridge area on Friday March 6th, on northeast and east aspects above 8000 feet elevation. No one was caught in either slide.

Clear and cold weather set in for the weekend of March 6 – 8th. On Friday March 6th, and Friday night, moderate N – NW winds were recorded by the Harl Butte RAWS, and noted by various groups in the mountains, including those staying at the Aneroid cabins. Early Saturday March 7th, the winds recorded on the RAWS shifted to the SW and increased into the upper teens and 20's all day. In McCully Basin, ski guides first reported the increasing winds at 9 am, and estimated ridge top wind speeds above 30 mph, with visible plumes. Several individuals in the group(s) skiing on Lookout Mountain on March 7th stated that winds on the slope were calm to light, and they did not report ridge top plumes.

TERRAIN AND WIND EFFECTS:

Lookout Mountain is a north – south trending ridgeline, the summit elevation is 8500 feet, and it lies in an alpine basin surrounded by three higher peaks: Aneroid Mountain (9702 feet); Dollar Ridge (8960 feet); and Pete's Point (9675 feet). Tenderfoot Pass (8500 feet) is approximately 0.5 miles southwest of the accident site. North of Lookout Mountain, the East Fork Wallowa River drainage is 1.5 – 2 miles wide, bordered by north / south trending ridgelines above 8000 feet. This open valley descends approximately 7.5 miles to Wallowa Lake (4500 feet.). During active storm cycles, prevailing winds in the northern Wallowa's are from the southwest. High pressure often provides northerly winds. As a result of these wind patterns and the adjacent topography the east face of Lookout Mountain is subject to cross-loading from both directions: south and north, making for complex layering on the slope. Please see Figure 1 (photo of the slope taken March 6th, the day before the accident, note wind transport above ridgelines and buried avalanche debris to the north of accident site).

The accident slope had a snowpack that was extremely variable in depth and structure: The ridge top had fresh shallow snow barely covering rocks; it lacked any cornice development. Snow depths increased dramatically down slope due to cross loading effects on the steep rocky terrain. Snow "pillows" are visible in Figure 1. The slope shape may have contributed to the extent of propagation and the consequences for those involved. The start zone is slightly less steep than the central slide path, which has slope angles over 40 degrees, with two convexities in the upper half of the path, and a sharp concave terrain trap in the run out.

The following avalanche forecasts were not written for the Wallowa Mountains, although both areas are intermountain snow climate only 50 miles apart. None of the companion

rescue groups accessed the March 4th forecast in advance, nor did Skier 3. It is not known if Skiers 1 and 2 accessed the avalanche advisory.

Payette Avalanche Advisory, March 4, 2009:

“Yesterday strong southerly winds brought 8 inches or more of new snow to the West Central Mountains above 7000 feet. This snow came in quickly at rates of more than an inch an hour and laid in fresh 1 to 2 feet thick wind slabs along northerly facing ridgelines and mountaintops. These new slabs are covering a buried weak layer located approximately 2 to 3 feet down in the snowpack which has already been very active and caused numerous slides this past week. Today
and into the near future a Considerable / Very serious avalanche hazard
exists on slopes steeper than 35 degrees in high alpine areas, especially,
on north, northeast and northwest facing slopes near ridgelines where wind
pillows have formed and exacerbated the weak layer. This weak layer is
pocketed and you may not be able to trigger it at all times of the day,
tracks on the slope won't mean its safe.”

Payette Avalanche Advisory, March 7, 2009:

“Today on steep northerly slopes 35 degrees and above in the high alpine there is a considerable or serious avalanche hazard. Natural and human triggered avalanches continue to occur in these areas, especially near ridgelines where wind slabs are teetering on the edge of sliding. Your weight in these areas could be what pushes them over the brink.” “On steep north facing slopes in high alpine areas there remains a serious chance of triggering slides on a weak layer buried over 3 ft down in the snowpack.”

CROWN FRACTURE PROFILE:

Due to time constraints, three members of the recovery team were only able to do one profile at the top of the crown, at approximately 17:30 on March 9th. The total depth was 180 cm; the January crust layer was at 100 cm depth. A thin layer of fist hardness diurnal re-crystallized facets on top of the crust is suspected as the weak layer that failed when the avalanche released. However this layer did not respond to either a compression or extended column test conducted on Monday March 9th. The shear failure and energy release of the avalanche may have disturbed the weak layer in the remaining snow above crown. The slab above the January crust was 50 cm of 1F, under 20 cm 4 F with 30 cm of F / powder on the surface. Compression test scores were CT 13 / Q 2 at 30 cm down and CT 18 / Q2 at 50 cm down. An extended column test scored ECTN 12 / Q2 at 30 cm down. At least 4 “lemons” were present: The weak layer was 100 cm deep, possibly more than 1 step hardness difference between adjacent layers, composed of a persistent grain type (facets), and the layer was very thin, only a few cm. Grain sizes were not measured. See Figure 9 for the crown fracture profile.

Unfortunately the time of day did not allow for additional pits in the undisturbed snowpack above the crown, but depth hoar in the shallow snow near the ridgeline may have been a contributing factor. Once a fracture initiated in the upper snowpack layers,

i.e. at the 4F / 1F interface, the structure was weak enough even in thicker slab areas to propagate the slide for a long distance. Recent wind loading very likely added stress on the weak layers and increased the likelihood of propagating a fracture.

The local concern this winter has been: Presence of persistent weak structure; combined with a seemingly solid, strong, bridging slab / 1F layer; and a low to moderate energy snowpack. Even though the weak layers and crusts were observed, they did not fail easily when tested. Compression tests, extended compression tests, and shovel shear scores often yielded moderate to high strength scores and moderate to low energy (Q) scores; giving the impression of stability.

EVENTS LEADING UP TO THE AVALANCHE:

Skiers 1, 2, and 3 and a caretaker / employee of the private owned cabins had skinned the 7 miles and 2900 ft elevation gain to the cabins on Thursday March 5th, along with three of the six people from Portland that formed the eventual rescue group(s). Three more of the Portland group arrived at the cabins late in the day on Friday. Ten people stayed overnight in the Aneroid Cabins on Friday night.

On Friday, Skiers 1, 2, 3, and (eventual) Rescuers 1, 2, 3 set an up track up the well defined ridge south of "Shoulder Bowl" (see Figures 2, 3,4 for photos and maps of terrain and individual locations). They climbed to just below the south summit of Lookout Mountain. Skiers 1, 2, 3 dug a snow pit at 8400 feet on the E aspect in a wind deposition zone. The pit was approximately 5 feet deep. Results were not recorded, but Skier 3 remembered the following (approximate) layers, from the surface down: 6" fist / 6" 4F / 12" "2 fingers" / 24" 1F / then P on down. The Rutschblock score (conducted by Skier 2, who weighs approximately 152 lbs) was RB 6 (3 jumps) / Q3 at 12 inches down, and RB 6 (4th jump) / Q2 at 24 inches down. Skier 1's interpretation of the pit results was "moderate stability, low energy". The two groups of three people skied two runs on Friday in the vicinity of Shoulder Bowl and the scattered open tree lines below the snow pit location. With each run, the groups chose a new line further north for fresh tracks.

On the day of the accident (March 7th), the cabin caretaker departed early that morning for the Wallowa Lake trailhead. Skiers 1, 2, and 3 left the cabins earlier than the other group of six and returned to Lookout Mountain. Using the same up track, they chose a new line just north of the prior day's tracks. The other group of six people left the cabins 0.5 hours later, and followed the same up track to Lookout Mountain. Four members of the second group climbed to the top of Lookout Mountain and made one run to the north of all previous tracks, on the same slope that released that afternoon. They did not encounter skiers 1, 2, and 3. The remaining two people did not climb to the top of Lookout, instead they skied a run in Shoulder Bowl.

Both groups (of four and two) met near the base of the slope, and prepared to climb up for a second run. The group of four (Rescue Group 1) was approximately one fourth of the way back up when the avalanche released, and Rescue Group 2 was still at the base of Shoulder Bowl. Please see Figures 2, 3, 4 for approximate locations of individuals before and after the avalanche. Please note that the exact locations of

individuals when the avalanche released are uncertain, and disagreement exists among several witnesses.

The avalanche released at approximately 12:48 pm. According to Skier 3, Skier 1 had begun his descent, and was in the middle of the run when the avalanche released. According to Skier 3, Skier 2 had started down a new line to skier's left or just north of skier 1's line. Skier 3 entered the slope and fell due to thin snow / rocks. Skier 3 got back up and cut left to a location directly above Skier 1 when the avalanche released.

According to Skier 2, all three members of the group were within 50 feet of each other at the top of the slope when the avalanche released. Skier 2 remembers that Skier 1 had fallen, but got back up and they were both standing on the slope. Skier 3 was upslope and skiing toward Skier 1 and 2 when the avalanche released.

Skier 3 described the initial snow movement as a slab that was approximately 12 inches deep. Almost immediately he was hit from behind, knocked to a sitting position and began to accelerate down slope. This lasted about 15 seconds before the slide began slowing and filling in around him, eventually completely burying Skier 3 in a sitting position with his head approximately 12 inches below the surface. As the slide slowed down, Skier 3 was able to wave his hands in front of his face creating an air pocket. Skier 3 does not remember hearing the avalanche release. When the avalanche released, Skier 3 reported that Skier 2 was approximately 70 - 100 yards below and to his left, and Skier 1 was approximately 120 - 170 yards directly down slope of Skier 3 when the avalanche released. Please see the attached maps and photos for approximate locations of Skiers 1, 2, 3 when the slide released, and their eventual burial locations.

Skier 2 reported seeing powder "shoot up" off to his left when the avalanche released, then the fracture propagated diagonally down the slope to his left. Skier 2 remembers being carried past a large dead snag (visible in Figure 2 and 5). Skier 2 fought to stay on the surface by "swimming", but his head went under at one point during the ride. Skier 2 was partly buried up to his neck and shoulder with his right arm partly free.

COMPANION RESCUE:

Several members of both rescue groups noticed the avalanche immediately, but none remembered hearing the slide. Some reported seeing a powder cloud near the ridge top, with a person involved, others saw the debris at the valley floor. Most of the path was obscured from view by trees and an intervening spur ridge.
Both groups quickly contoured across to the debris in the run out zone, reaching the site within 3 – 5 minutes. All skiers and rescuers had transceivers, probes, and shovels. Rescuer 1 reached Skier 2 (partly buried), verbally determined that he was not injured and asked for the locations of Skier 1 and 3. Their location was unknown. Rescuer 1 initiated a transceiver search, was joined by Rescuer 2 and located a pinpoint for Skier 3 within 2 – 4 minutes. Rescuer 1 could hear Skier 3 under the snow, and was able to quickly clear snow from his head and mouth.

Rescuer 3 began digging out Skier 2, while the remaining three (Rescuers 4, 5, and 6) initiated a transceiver search for Skier 1. It took at least 10 minutes to extricate Skier 3,

but once freed, he and Rescuers 1 and 2 joined the search for Skier 1. At one point in the effort, Rescuer 3 was asked to leave Skier 2 to finish digging himself out, and Rescuer 3 began to assist searching for Skier 1.

After Skier 2 had been helped and while skier 3 was being dug out, a false strike (transceiver pinpoint) occurred during the search efforts, and approximately 10 minutes were spent digging in this location. Rescuer 2 reported that one or more of the rescuer's transceivers were on transmit, because of the automatic setting that reverts from receive mode to transmit. Rescuer 2 stated that this occurred to their own transceiver twice, after eight minutes in receive search mode each time, while searching for and digging out Skier 3.

At one point, Rescuer 3 reported a transceiver reading of 0.7 meters at the false strike location, near Rescuer 4's boots. At this time, Rescuer 4 had possession of Skier 2's transceiver, in addition to his own. Rescuer 4 returned the transceiver to Skier 2 after Skier 2 finished digging himself out. Also at this time, Rescuer 2 was still upslope digging out Skier 3; Rescuer 2 was not close to the false pinpoint location.

After an estimated 23 – 25 minutes from the avalanche release, a transceiver pinpoint and probe strike confirmed the location of Skier 1. It reportedly took an additional 5 minutes to dig down to the head, and clear the area around the face. Skier 1 was found face down, with the head 5 feet deep, with no air pocket, arms wide spread, and the feet were at least two feet below the surface. One ski (non releasable telemark) was still attached, and the second ski was found nearby. Skier 1 was not breathing, had no pulse. Rescuer 5 gave Skier 1 rescue breaths, Skier 3 initiated CPR as soon as possible, while all others continued to excavate around the victim.

It took approximately an hour to completely free the victim and CPR was conducted for at least 90 minutes total. During this time Rescuers 1 and 4 skied back to the cabins to obtain a rescue sled, and returned to the accident site. CPR was stopped, the victim was placed in the sled, and the entire group with all equipment returned to the cabins by approximately 4 pm. Upon return to the cabins, due to the time of day, fatigue of rescuers and survivors, the length and difficulty of the access trail; it was decided to wait until the next morning to ski out to contact authorities. Emergency communications were not available at the cabins. After the recovery mission was completed, the Wallowa County Medical Examiner determined the cause of death to be asphyxiation.

Skiers 2 and 3 departed the cabins very early Sunday morning March 8th to ski the 7 miles out the trailhead to call 911 from the State Park at Wallowa Lake. The remainder of the group followed as soon as possible. It was necessary to leave the victim and his equipment secured in the sled inside one of the historic cabins.

RECOVERY OPERATIONS:

A well managed recovery operation in difficult conditions was implemented promptly. The recovery mission took two days: Monday – Tuesday March 9 and 10th. It involved the efforts and cooperation of many different groups including Wallowa County Sheriff and Search and Rescue, Wallowa Whitman National Forest, Ferguson Ridge Ski Patrol, Ski Guides from Wallowa Alpine Huts and Wing Ridge Ski Tours, LLC, and University of

Idaho Outdoor Program Trip Leaders. The Recovery Team consisted of 13 expert skiers from the above groups, with an additional 5 member support team that included the victim's wife of 20 years.

The remote location of the accident site, within a designated wilderness area, and the steep narrow access trail precluded mechanized support or transport, except for the lowest 1.5 miles near the trailhead. Helicopter transport of the victim was ruled out. The wilderness access trail crosses the lower portion of seven large slide paths and run outs on east aspects. The remoteness of the accident site required an overnight stay at the cabins for both teams. The access trail has many steep narrow segments that required great care and skill on the descent on Tuesday March 10th.

The mission was completed safely and successfully due to excellent cooperation among all team members, and the support team was able to provide the valuable opportunity for closure to the victim's wife. All individuals and groups involved in the recovery mission deserve recognition and thanks for their skills, expertise and professionalism.

IN CLOSING:

This report was written as part of an extensive volunteer effort to research the accident, to provide accurate information and to assist others who may find themselves in similar winter backcountry situations in the future. Much credit and thanks is due to the seventeen people who contributed to the research and report.

MAP AND PHOTO LIST:

Figure 1: Photo of Lookout Mountain taken on March 6, the day before the accident. Note cross loading and buried debris from recent natural slides.
Figure 2: Photo showing location of avalanche on the east northeast aspect of Lookout Mountain, with skier and victim locations. This image was taken on March 13th.
Figure 3: GIS Topo Map of avalanche accident site showing approximate locations of avalanche crown, snow pits, skiers position at release, and burial positions of the victims and two survivors.
Figure 4: Google Earth Image of Lookout Mountain and adjacent terrain with avalanche details.
Figure 5: View of crown and location of crown fracture profile, taken March 13th. Visible tracks are from recovery team members that conducted the profile on March 9th.
Figure 6: View of debris in run out zone with burial locations, taken March 13th.
Figure 7: View of slide from debris, taken on March 7th by Rescuer 2.
Figure 8: View of slide from meadow below debris, taken on March 9th by a recovery team member.
Figure 9: Crown fracture profile (March 9th)
Figure 10: Aneroid Basin Vicinity Topographical Map
Figure 11. Larger scale Google map picture of avalanche accident location.

PHOTOS:

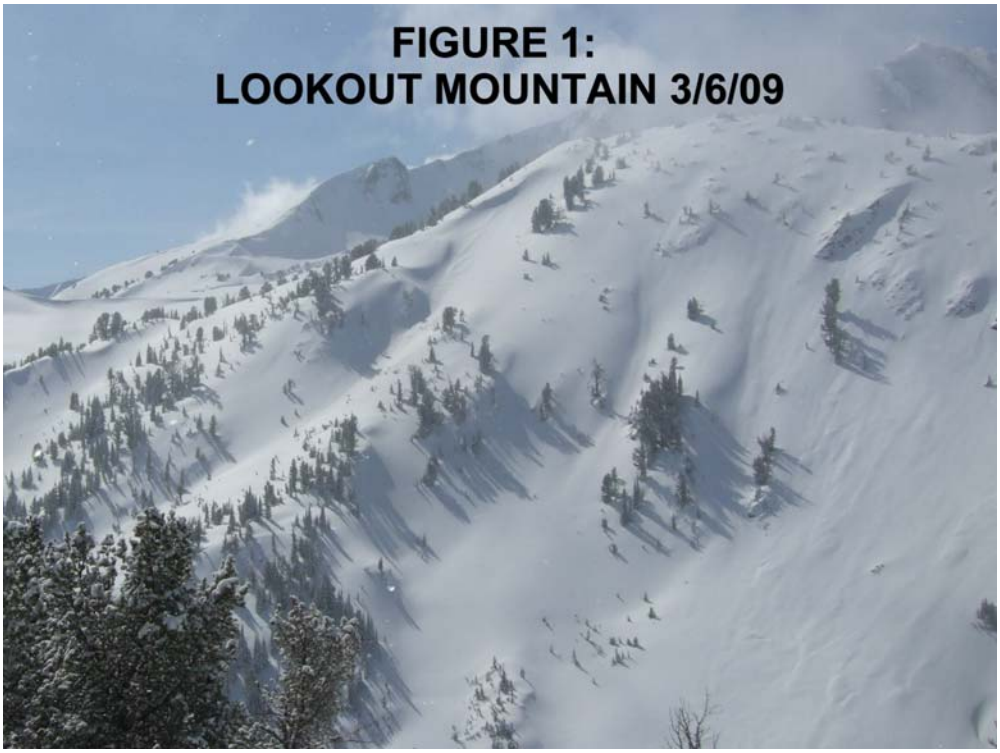

Figure 1. Photo of Lookout Mountain taken on March 6, the day before the accident. Note cross loading and buried debris from recent natural slides.

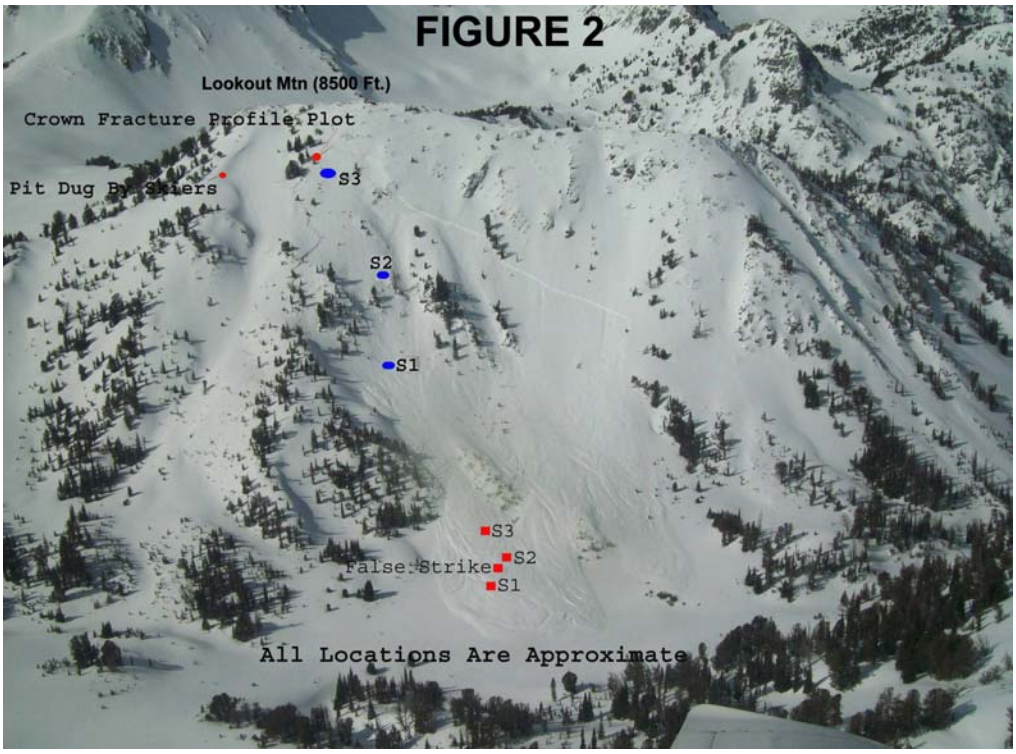

Figure 2. Photo showing location of avalanche on the east northeast aspect of Lookout Mountain, with skier and victim locations. This image was taken on March 13th.

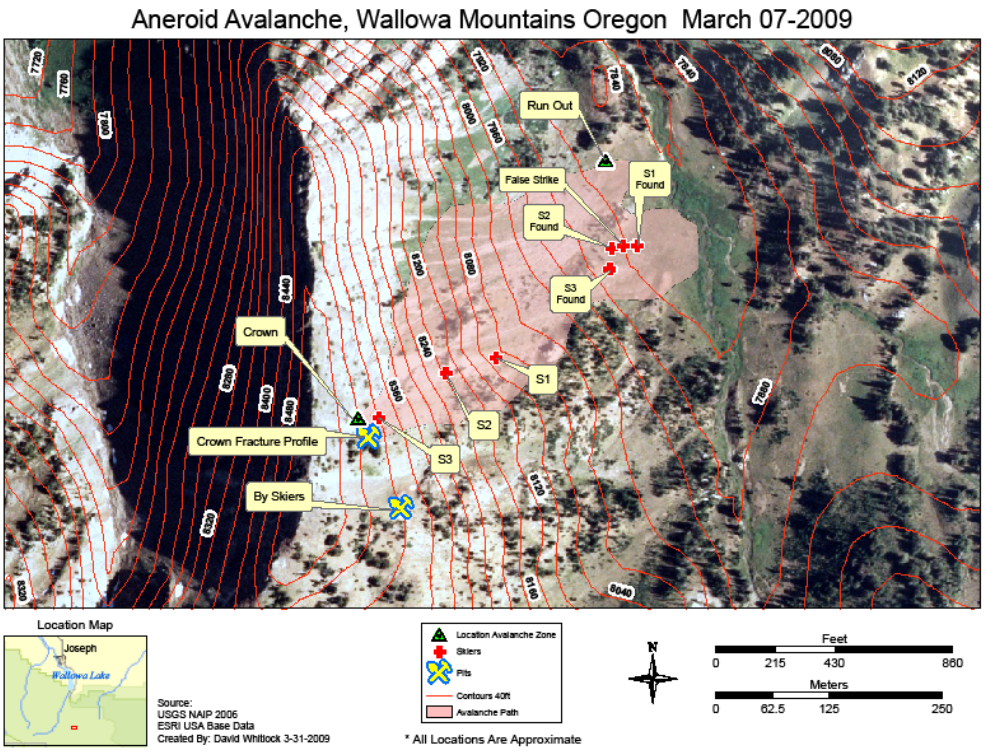

Figure 3. GIS Topo Map of avalanche accident site showing approximate locations of avalanche crown, snow pits, skiers position at release, and burial positions of the victims and two survivors.

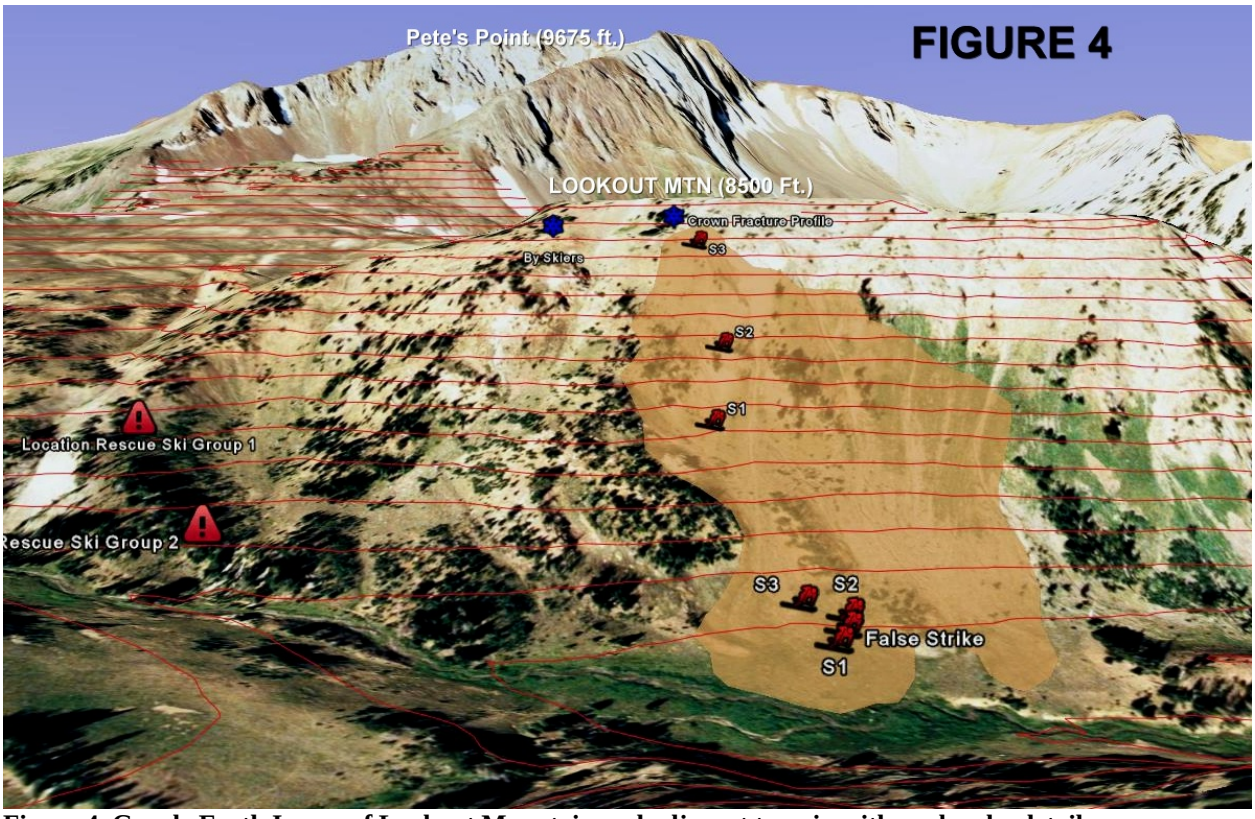

Figure 4. Google Earth Image of Lookout Mountain and adjacent terrain with avalanche details.

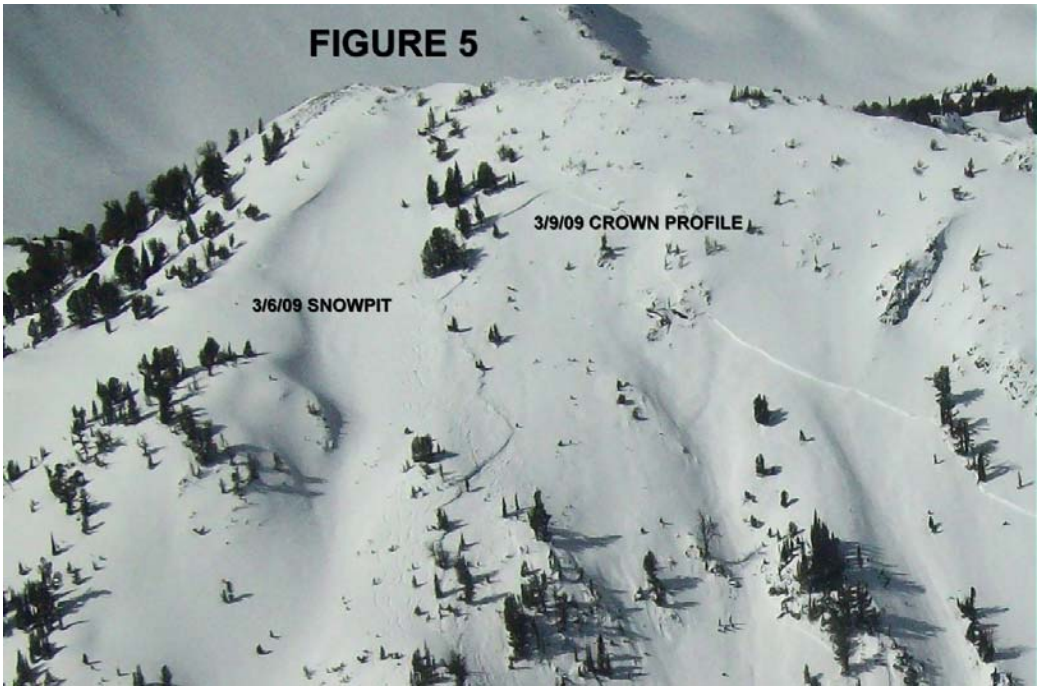

Figure 5. View of crown and location of crown fracture profile, taken March 13th. Visible tracks are from recovery team members that conducted the profile on March 9th.

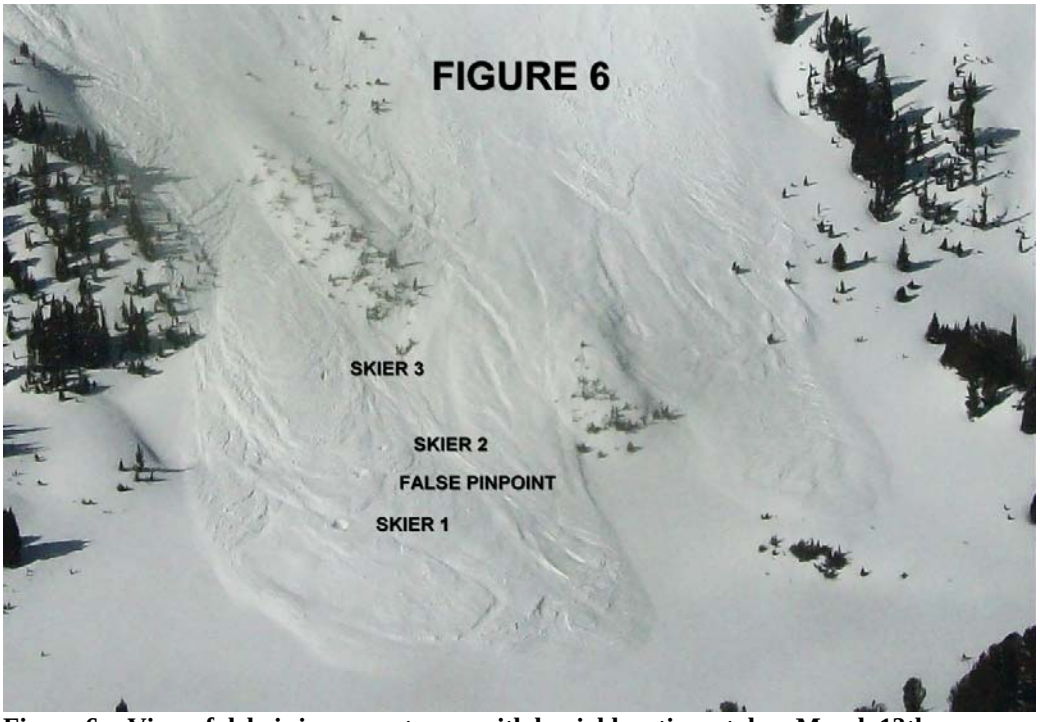

Figure 6. : View of debris in run out zone with burial locations, taken March 13th.

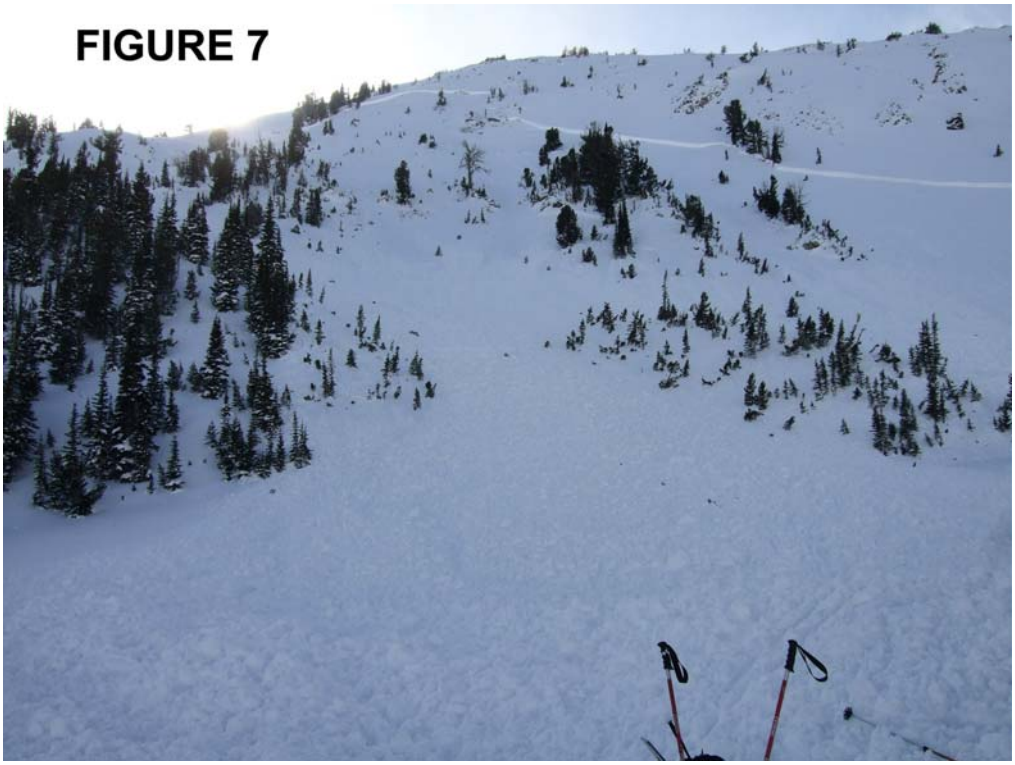

Figure 7. : View of slide from debris, taken on March 7th by Rescuer 2.

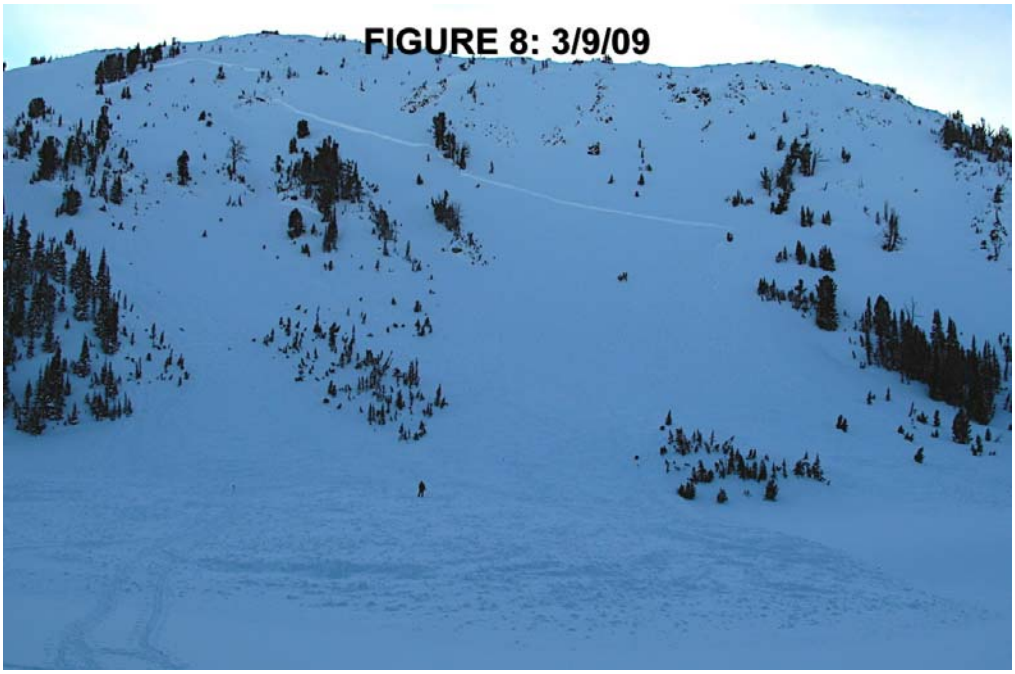

Figure 8.View of slide from meadow below debris, taken on March 9th by a recovery team member.

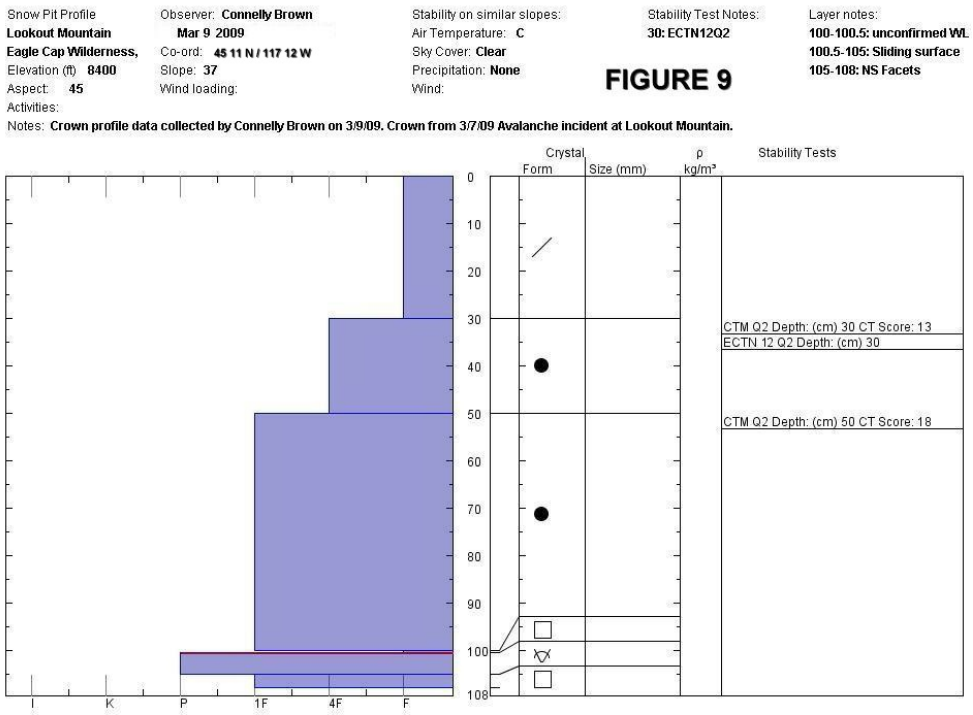

Figure 9. Crown fracture profile (March 9th)

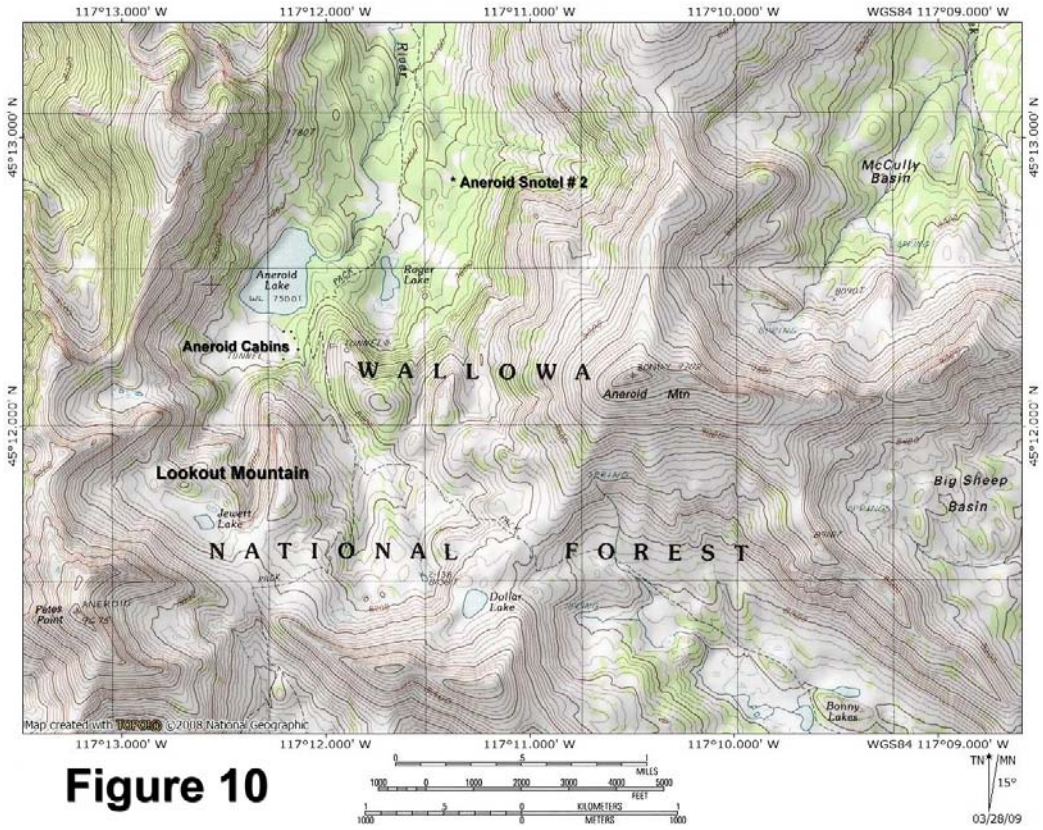

Figure 10

Figure 2. Aneroid Basin Vicinity Topographical Map

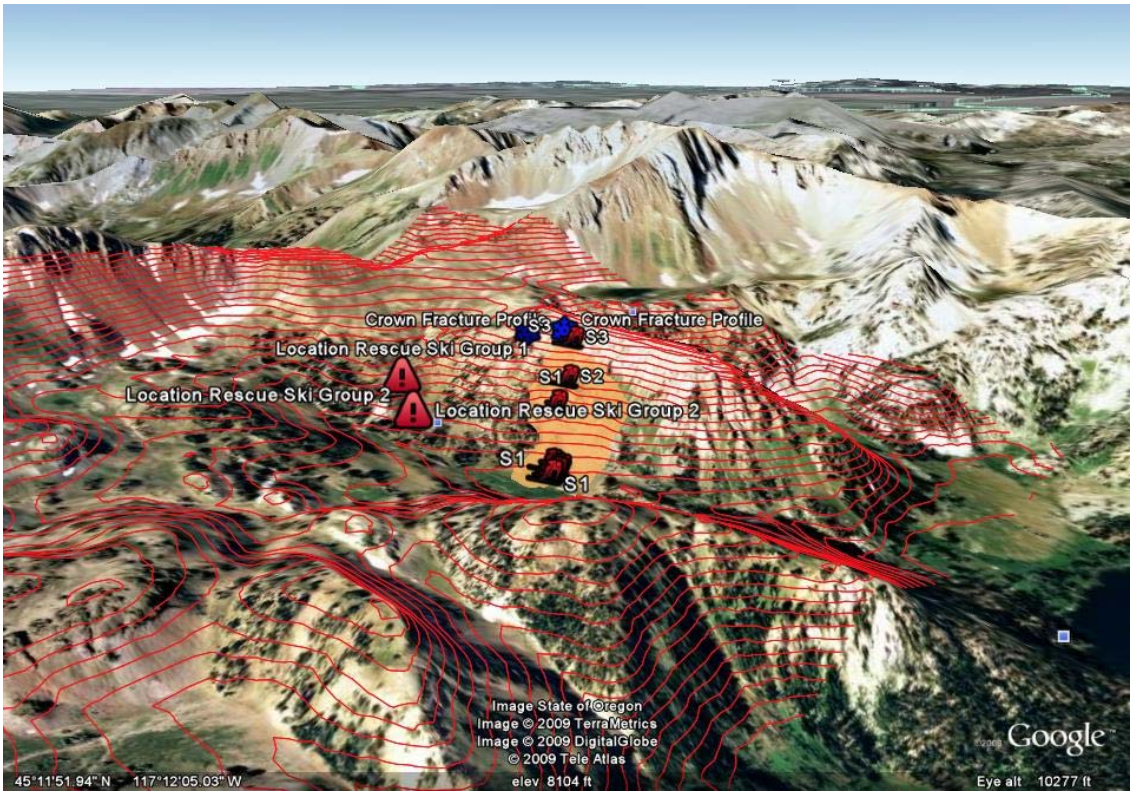

Figure 3. Larger scale Google maps picture of avalanche accident location. Aneroid Lake at lower right of map, Lookout Mt just above location of crown fracture profile marker.