that climbing activity on demanding routes could result in a probable accident. (Source: Eric Martin, Mountaineering Ranger)

HACE, PARTY SEPARATED, FAILURE TO TURN BACK
Alaska, Mount McKinley, West Buttress

Throughout the day on June 17, several expeditions passed Hiroyaki Hoshino (36) and his companions, between 18,000 feet and 19,700 feet. Everyone who passed Hoshino and was later interviewed said that Hoshino looked exhausted and shaky. A ranger patrol descending from the summit stopped to talk to Hoshino and in no uncertain terms tried to convince Hoshino to go down, but were unsuccessful. It is unlikely, but the language barrier could have been a problem in getting the point across to Hoshino.

At the "football field" (19,500 feet) Hoshino was too exhausted to go to the summit. His friends elected to continue and left Hoshino. Hoshino's friends summitted and returned for him. Hoshino had become ataxic from altitude sickness and exhaustion and he needed assistance from his friends to hike down. The Japanese were able to make it down to Denali Pass, where they requested a rescue at 0130 on June 18.

At 0402 the LAMA helicopter and Hudson's Cessna 206 acting as cover plane were in the air to evacuate Hoshino. At approximately the same time, a ground rescue team comprised of volunteers from High Camp was climbing up to assist the Japanese at Denali Pass.

At 0459 the LAMA landed at 18,000 feet, and ranger Kevin Moore assisted the ataxic Hoshino to the helicopter. Hoshino was flown to Base camp where he was treated and stabilized.

Analysis

Hoshino overextended himself. His climbing partners failed to recognize the situation and react to it. Instead they elected to go to the summit. They were also improperly prepared to bivouac, which caused Hoshino to become hypothermic while waiting for a rescue. (Source: Kevin Moore, Mountaineering Ranger)

FALL ON SNOW—UNABLE TO SELF-ARREST, INADEQUATE PROTECTION, POOR POSITION, INEXPERIENCE
Alaska, Ptarmigan Peak, Chugach State Park

On June 29, two instructors and their twelve students in a University of Alaska, Anchorage, Alaska Wilderness Studies 105 Class—Beginning Mountaineering—fell 2,000 feet down the North Couloir of Ptarmigan Peak in the Chugach Mountains near Anchorage. Two of the climbers perished, and 11 of the remaining 12 were seriously injured.

The class hiked to the base of the route on Saturday, June 28. This was the second climbing trip for the twelve novice climbers led by AWS instructors Deb and Ben Greene. They left the tents between 7:00 and 7:30 AM. on June 29 to climb the 2000 foot couloir. All participants reported the ascent went efficiently, albeit slowly. The groups topped out of the couloir at some time between 2:00 and 3:00 PM. Some members of the group hiked to the peak's false summit while others rested. The roped teams reformed, made some adjustments with a few members changing groups and began to descend sometime between 4:00 and 5:00 PM.

On the descent there were again four roped teams with two teams of four and two teams of three. The teams of three had all student members and were placed second and fourth during the descent.

There was a lack of consensus regarding the influence of time pressures on the decision to descend via the couloir. It seems that it was generally understood in the morning that the group would try to be down and back at the parking lot by 5:00 PM, but the relative importance of that goal was interpreted differently by different members of the group. Some considered time to be a major influence on decision making and others, including the instructors, thought it had little to no influence.

Before the class began the descent, there was some informal discussion involving some of the group members regarding the relative merits of descending the couloir versus the walk-off route on the other side. It was decided the walk-off route would be longer and might confront the group with unforeseen challenges as compared to the more familiar couloir.

The first team to descend included instructor Ben Greene (34), with students Jerilyn Pomeroy-Peterson (16), Kirsten Staveland (16) and Jay Chamberlin (28). They were always beneath the other three teams on the mountain. The second roped team to descend included students Juanita Palmer (43), Andrew Murphy (20s) and Steven Brown (23 - deceased). The third roped team to descend consisted of Instructor Deb Greene (38), with students Mona Eben (43), Mary Ellen Fogarty (40 – deceased), and Bernadino Lagasca (33). The top roped team and the last to start the descent had three students, Jacob Franck (18), Eric Schlemme (30) and Joshua Thomas (20).

The members of each rope team were separated from one another by approximately 15-20 feet of rope. All climbers had an ice tool or ax in hand. The four teams had various distances between them and all teams were in sight of each other. The estimated distances between the roped teams varied from 15 to 30 feet at times, with up to 150 feet or more of distance between the bottom team and the top team. At the time of the accident, the teams had descended an estimated 300 to 500 feet down the couloir. Several students and instructors were carrying pickets and flukes but were not placing them for protection. Each rope team was aligned at an angle to the slope with most students using the plunge step as they were descending.

The number of people on each roped team moving simultaneously was directly correlated to the steepness of the couloir and the abilities of each roped team. The instructors modified the descent technique as the couloir steepened and narrowed. Soon after starting the descent, the instructors noticed that some students were having trouble plunge stepping and were falling and either failing to self-arrest or arresting with some difficulty. At the couloir's steepest point, just before the accident, one person on each rope team descended while the other members faced into the slope, bent over their buried ice ax, with their hands gripped around the top of the ice ax. The shaft of the ice ax was plunged into the snow at an appropriate angle to the slope and buried to the top of the shaft. The ice axes averaged 65 to 70 cm in length, although two students reportedly had ice tools that were 50 cm or shorter. The ice axes were attached with leashes to either wrists or harnesses. (Either option was permitted by the instructors.) Unlike the conditions experienced on the ascent, the snow conditions on the descent were described as soft, with each person's boot plunging six to ten inches or more into the snow on the descent. As one climber moved down, the other rope team members faced into the slope in their "anchoring" stance. When the climber in motion reached the end of their rope, he or she faced in, plunged the ice ax into the snow and anchored for the next person to move.

The roped teams descended oriented at an angle to the slope with different distances between each of the teams. There was some bunching of the top teams in the narrow portion of the couloir. Almost from the beginning of the descent until the actual accident occurred, there were several incidents of students slipping and arresting their own fall or someone else on their roped team stopping them.

The immediate mechanism that caused the accident was initiated when Jacob Franck, who was moving down along side teammate Schlemme, slipped and was unable to self-arrest. When Franck's rope went tight, Schlemme was pulled backwards, landing on his back with his ice ax in his hands. Franck and Schlemme attempted to self-arrest but were falling out of control and pulled Thomas backwards so that he also landed on his back with his ice ax in his hands. The secondary mechanism that caused the accident was that the protection/anchoring system failed.

There was an estimated 30 feet of distance between the top team and the next team with instructor Deb Greene. The top team of three climbers fell out of control hitting the next roped team member Mona Eben, who was standing closest to the center of the couloir. She was knocked onto her back with ice ax in hand. At that point Franck, Schlemme, Thomas, and Eben were falling out of control pulling Fogarty, Lagasca and Deb Greene out of their stances and onto their backs. The seven climbers attempted to self-arrest but failing to do so fell into the next team of Murphy, Brown and Palmer. This third team was not moving at the time and were all faced into the slope over their ice axes. When the group of seven entangled climbers struck Murphy, Brown, and Palmer they too were pulled off their stances. The entire group of ten continued out of control down the couloir heading for the bottom team.

The bottom team of Ben Greene, Staveland, Pomeroy, and Chamberlin were able to see and hear the falling teams and, with no time to move, braced themselves for the impact. All four members of the bottom team were pulled off their stances and dragged down the couloir with the other ten climbers in an entanglement of ropes, ice axes and people. (Source: Interviews with participants and instructors, various reports and photographs, and on-site inspection.)

The following information on the ensuing rescue operation was provided by Dr. Ken Zafren, who was the Alaska Mountain Rescue Group Leader.

The accident was observed by three skiers who were approaching the base of the couloir. They were able to reach the victims in about 15 minutes. There were also a number of mountain bikers on the Powerline Pass trail, which passes directly below the base of the couloir. This trail also serves as a utility access road which is closed except to emergency vehicles. The first 9-1-1 call reporting shouts for help came in at 5:10 PM from one of the mountain bikers. When the skiers reached the victims they found the fallen climbers in a ball, some having difficulty breathing because they were entangled in the ropes and others because they were under other climbers. They cut the ropes and moved the climbers off each other as carefully as possible. One of the skiers ran back down to the AWS camp to bring up sleeping bags and to recruit mountain bikers to help.

Although the picture of the accident was still sketchy, by about 5:30 PM, the Alaska Mountain Rescue Group (AMRG) was called along with the Alaska Air National Guard 210th Pararescue Squadron (PJs) to assist the Chugach State Park Rangers and Alaska State Troopers (AST). Anchorage Fire Department Paramedics responded and Anchorage Police closed the road to the trailhead (Glen Alps parking lot) to facilitate emergency access to the incident command area.

While AMRG member Scott Horacek drove up the road, I waited at the Glen Alps

parking lot. As Medical Director for AMRG, I would be responsible for initial assessment of the injuries. AMRG member Chris Flowers and I were flown by AST pilot Bob Larsen to a small rock bench, about 150 meters east of the victims. Only a toe-in landing was possible for the Jet Ranger. Chris went ahead while I changed into double boots. It was so warm that I was still wearing just shorts and a t-shirt. I downclimbed the rock bands and sloping ledges which led to the couloir and crossed the hard snow between the landing zone and the victims. We arrived at the site just after 6:00 PM.

The scene that greeted me was surreal. Twelve victims were under sleeping bags and space blankets. There were several skiers and mountain bikers, most dressed very lightly, doing what they could for the victims. Scott arrived from below about the time I reached the site. We did the best we could to start triaging our patients. Loose rock at a steep angle made every movement more difficult. It was hazardous to move above any of the victims, but also unavoidable.

A short time later, the first of two Pavehawk helicopters carrying the PJ's arrived and hovered below the scene. In all, nine PJs were lowered from these helicopters and walked up a short distance to the scene. The PJs carried medical supplies. Two Anchorage Fire Department paramedics arrived by AST helicopter and were assisted by AMRG members to the scene. Eventually, 11 AMRG members were on scene for a total of 33 rescuers, including the bystanders. We required eleven litters and the same number of backboards or vacuum mattresses. All twelve survivors were airlifted by Pavehawk. Eleven were transported directly or via Life-Guard Helicopter to hospital and were admitted. The police Chaplain and The American Red Cross Disaster Unit responded to the command area to provide moral support and food for families and rescuers. A total of 93 persons, including helicopter personnel, were involved in the pre-hospital phase.

There were too many patients for one person to triage, so Master Sgt. Brent Woodiness assisted me as well as handling communications with the helicopters. The helicopters were staged from a flat moraine top near the AWS camp and were able to operate continuously for many hours by use of in-flight refueling from an Air National Guard C-130 which circled overhead to provide air cover. In addition, the trooper helicopter and a contract private helicopter provided continuing air support. The first victim left the scene by 8:30 PM and in four hours, all of the rest were evacuated.

The rescuers picked up debris at and below the scene (much of it blown away and down by rotor wash) and also dismantled the AWS camp. Although the pilots were willing to extract us from the field the way we had arrived, all of us elected to walk to the bottom of the couloir and take off from level ground.

One patient was admitted to the ICU where she stayed for several days. Several underwent emergency surgery for extremity injuries including an open femur fracture and a knee fracture dislocation. There were no internal injuries necessitating surgery nor were there any serious head or spinal injuries.

Analysis

1. Technique. The instructors' decision to use an untested descending technique with no back-up system contributed to the cause of this accident. At first glance it appears that having two or three climbers "anchoring" the rope team while one member descends is a secure method. Had the slope been less steep and snow conditions more favorable (that is firmer), their improvised system might have been sufficient to hold a fall.

It would have had an even greater chance for success if this system had been en-

hanced by having each climber tie a two-inch diameter loop in the climbing rope two to three feet from the harness. The ice ax shaft would then go through this loop. In this manner, when climbers were in the anchoring stance, the force of a fall would be transmitted to the ax/anchor instead of to the climber's harness.

The mechanism of failure was probably due to the following: When Jacob Franck fell, the next climber on the roped team, Eric Schlemme, was pulled by the rope from behind and below. Schlemme had his toes kicked into the snow, with his upper body pressing downward on the ice ax while gripping the top of the ice ax with both hands. It appears the toes of his boots served as a fulcrum as the downward force of Jacob Franck pulling at Schlemme's waist caused Schlemme to be jerked backward and away from the slope while he instinctively held on to the ax, pulling it from the soft snow. The third member of the roped team, Joshua Thomas described a nearly identical mechanism of failure when Schlemme and Franck pulled him off his stance. When the topmost team slid into the next roped team, it initiated the same sequence of failure that continued until all the teams were in an uncontrolled fall down the couloir. It is significant that nearly everyone interviewed said that they found themselves on their backs with their ax in their hands immediately after they were pulled or knocked from their stance.

In hindsight, the instructors should have elected to use more traditional methods, such as setting their pickets and flukes as fixed protection, or lowering the students from a multi-anchored belay. The safest alternative would have been to descend via the walk off route.

2. Protection. Roped teams on steep snow with no fixed protection contributed to the magnitude of the accident. Roped travel without fixed protection is usually done on the relatively flat surface of a glacier as a precaution for crevasse falls or on uneven terrain where at least one climber can obtain a secure position. On rare occasions a guide may rope to a client without fixed protection when the guide is confident of holding a fall.

It has been observed that climbing teams roped together on steep terrain often have a false perception of security. A high percentage of mountaineering accidents that involve climbing falls share three common factors: (1) descending, (2) roped together and (3) no fixed protection. A rope without fixed anchors invariably becomes the primary mechanism of multiple injuries during a fall.

The descent system lacked redundant safety. (See, for example, previous comment on the ice ax/loop technique.) All mountaineers recognize the need for redundant safety systems while climbing, and in particular while teaching others to climb. Deb and Ben Greene mistakenly thought that the combination of the students being roped together, their newly learned ability to plunge step and self-arrest, and the "anchoring" technique described earlier represented a redundant system. In fact, with no fixed protection, each roped team was dependent upon every person to perform flawlessly. Thus any uncontrolled fall could have resulted in an uncontrolled descent of the entire roped team. Considering the minimal experience the students had, they should not have been relied upon as a critical component of a "safety system."

3. Instruction. Students reported that all instructions that were provided were clear and understood. They carried out the instructions, but were unable to perform the self arrest and belay under the conditions encountered. The next appropriate step in the instructional sequence would have been for the instructors to confine their activities to the lower third of the North Couloir.

4. Position. With only 15 feet between each student, the reaction times for self-arrest are very limited, making it harder to stop a fall before weighting the next climber in line on the rope team. Short roping students is often used in steep snow conditions. However, the more traditional technique involves short roping only the students, leaving a long section of rope between the students and instructor. The instructor then sets a belay and lowers the group of students.

The rope teams were inadvertently stacked above each other creating a "net" like effect and contributed to the magnitude of the accident. The North Couloir's narrow, funnel-like contour made it difficult for the tightly grouped rope teams to stay out of each other's "fall-line" and inevitable that a fall by the uppermost rope team would capture the rope teams positioned lower on the slope.

In situations where rope teams must descend a snow slope, it is imperative each rope team stay clear of the other's fall line. Maneuvering through a narrow chute presents special problems that usually involve groups descending one at a time and clearing the fall line before the next group descends. The lack of a safe run-out contributed to the severity and magnitude of the accident.

5. Supervision. When determining an appropriate ratio of students to instructors, several factors are taken into consideration. These include the terrain, the skills of the participants, and the overall profile of the participants. The relatively large student to instructor ratio of 6:1 seems inappropriately matched to the difficulty of the climb and experience level of the students and may have contributed to the accident. With only two instructors for four rope teams on a steep, narrow couloir, it seems almost inevitable that rope teams would be close together for the sake of communications, and therefore positioning—as indicated—is critical. Additionally, a large group of students in difficult terrain presents an instructor with a significant amount of information to process in a very short period of time. Keeping track of six students in two separate groups, some of whom are falling, scared, or practicing improper technique, would be extremely difficult under the best of circumstances.

It is also important to note that it is inappropriate to allow beginning students to lead and/or to be on a roped team independent of instructors under conditions where the safety of the students would be compromised should a fall occur. (Source: Jed Williamson, Daryl Miller, Jim Ratz—External Review Team)

(Editor's Note: Several recommendations were put forward by the review team in December of 1997, and the University of Alaska, Anchorage, is in the process of implementing these.

Obviously, this was a very high profile event. There was a considerable amount of media attention, some of it quite critical. Part of the concern was around the length of time between the incident and this reviewer's team engaging in an investigation and report. It should be understood that few educational institutions are prepared to respond to a multiple trauma event, so determining what actions are "appropriate and timely" requires significant focus and effort.

This was an extremely difficult situation for all, including the investigators. I was called upon in the fall, and solicited the expertise of Daryl Miller, Mountaineering Ranger from Denali, and Jim Ratz, former NOLS Executive Director. We appreciated the full cooperation of the participants and friends, the University and its Alaska Wilderness Studies program, officials, local guides, and community members.)