The National Institute for Occupational Safety and Health (NIOSH)

Volunteer Ranger Dies from Fall on Denali

Alaska FACE Investigation 98AK012
June 1, 1999

SUMMARY

On May 24, 1998, a 33-year-old National Park volunteer ranger died when he fell from a ridge on Denali (Mt. McKinley). The victim and another volunteer ranger were descending from a 17,200-foot camp along the West Buttress. During their descent, the volunteer rangers witnessed another climber fall while descending an exposed section of the ridge route. After reporting the fall to the mountaineering park ranger in charge of their patrol, the victim requested and was given permission to down climb the 45-55° slope to attempt to make visual contact with the fallen climber. The rangers began down the slope, however they decided to travel unroped and relied on their ability to perform a self-arrest if they lost footing. Approximately 800 feet down the slope, the rangers encountered an extensive sheet of ice. The victim lost his footing and began to slide. He was unable to arrest his fall and continued down the slope toward a glacier. His body was not recovered.

Based on the findings of the investigation, to prevent similar occurrences, employers should:

- **Develop, implement, and enforce a comprehensive written safety program.**
- **Ensure that all regular and volunteer mountaineering park rangers carry two-way radios and that communication is maintained during all phases of search and rescue (SAR) procedures.**
- **Ensure that volunteer mountaineering park rangers carry a predetermined amount and type of equipment in order to render aid.**
- **Ensure that volunteer mountaineering park rangers are trained in park service search and rescue (SAR) procedures.**

Additionally, employers should:

- **Consider hiring seasonal full-time mountaineering staff to increase the ratio of full-time mountaineering rangers to volunteer rangers.**

INTRODUCTION

At 3:45 PM on May 24, 1998, a 33-year-old male volunteer mountaineering park ranger (the victim) died while participating in a search and rescue activity. An investigation involving an Injury Prevention Specialist for the Alaska Department of Health and Social Services, Section of Epidemiology ensued on June 1, 1998. The incident was reviewed with OSHA and park service officials, and their respective reports were requested.

The park service in this incident began using mountaineering (park) rangers in the late 1970's. As of May 1998, there were four full-time and two seasonal mountaineering rangers. Due to increased climbing activity on Denali and the surrounding peaks and the limited number of staff mountaineering rangers, mountaineering patrols were supplemented by volunteer mountaineering rangers. Patrols normally consisted of one staff ranger, four or five volunteer rangers, and one volunteer mountaineering physician. Each patrol period was 30 days of which 21 days were on the mountain. Volunteer rangers were selected by the individual patrol leaders based on 1) their mountaineering resume submitted to the park service prior to the climbing season, and 2) the ranger's knowledge of a volunteer's mountaineering expertise. Volunteers were well-experienced high-altitude climbers with at least one climb of Denali. Search and rescue (SAR) experience or training was not required. Patrols were usually divided into teams of two or more members. Patrol activities included promoting safe mountaineering technique, removing garbage, and providing aid and rescue assistance, as needed.

The victim was an experienced high-altitude mountaineer with an extensive climbing history that included several ascents in the Alaska Range. In addition, he had experience as a lead instructor in a wide variety of mountaineering and rock climbing courses. SAR experience, if any, could not be determined.

The park service did not have a written mountaineering safety plan. However, all volunteers completed 2 to 3 days of orientation and training at the beginning of their 30-day patrol. The training included: mountain safety and travel (roped vs. solo, speed, early day vs. late day, etc.), helicopter safety and "short haul" (hooking to the underside of a helicopter and being airlifted) training, communication, medical protocols, crevasse rescue techniques, and rescue policies and trends. Volunteers provided their own mountaineering equipment and clothing. A limited amount of used equipment was available to supplement personal equipment, however most volunteers rejected it because of inadequate or questionable quality.

INVESTIGATION

The incident occurred on an icy slope along the West Buttress of Denali. The West Buttress is a popular approach to the summit of Denali and is used frequently by both private and guided expeditions. The route is classified as Grade 2 based on the Alaska Grading System. *

The Alaska Grading System is unique to Alaska because of the extreme environment and weather conditions. Each climbing route within the Denali National Park and Preserve is given a rating from Grade 2 (moderate route with minimal technical difficulties) to Grade 6 (severe with the highest standards of sustained technical climbing for several thousand feet). There are no Grade 1 routes on Denali, which denote an "easy glacier route." The West Buttress route starts from a 7,200-foot base camp located at Kahiltna Glacier and consists of 17 climbing miles, with a vertical gain of 13,100 feet (Figure 1a). The most often encountered difficulties and dangers along the West Buttress route are steep slopes (40° to 50°), avalanches, and crevasses. However, cold and high altitude are primary factors that contribute to many mountaineering incidents including falls.

Figure 1a. West Buttress of Denali (Mt. McKinley)

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The victim and his partner were at a 17,200-foot camp for 3 days prior to the incident, waiting to climb to the summit. (The remaining members of the patrol were either at a 14,200-foot camp or completing other assigned duties on the mountain.) Due to poor weather conditions (high winds and poor visibility), they cancelled their summit attempt. During their time at the high altitude camp, they reported only slight headaches and no other symptoms of high altitude-related illnesses to patrol members at the 14,200-foot camp.

On the day of the incident, the victim and his partner were descending the West Buttress route. The route between 17,000 and 16,000 feet followed the ridgeline, winding between granite rocks (Figure 1b). Several sections along the route were steep, exposed, and slightly technical. Winds were 30 to 40 MPH with gusts of 45 MPH or greater. Visibility varied from a

few feet to 2,000 feet due to blowing snow and clouds. The victim and his partner each were wearing full summit attire including a pack, a body harness, crampons, and overboots. Each carried one ice ax, one ice screw, and one snow picket. Only one two-way radio was issued to the team, which was carried by the victim (on his chest). These radios were "line-of-sight" meaning the transmission could be blocked by terrain or other obstacles. While "line-of-sight" radio communication is imperfect, the park service felt that there was sufficient air traffic to allow reliable emergency radio transmissions.

Figure 1b. Detail of the West Buttress Route, 16,200 to 17,200 feet

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As they proceeded down the route, the victim and his partner passed another two-man team that was descending at a slower pace. They continued down the ridge, staying slightly to the lee side (the side sheltered from the wind). The teams were approximately 100 feet apart when the victim's partner witnessed one of the two men from the other team lose his footing and tumble down the slope toward a glacier. The volunteers climbed back to the fall site. After traversing the fall line, the victim climbed back up the ridge to inform the patrol leader who was still at the 14,200-foot camp. According to records, the victim radioed at 2:14 PM and stated that they had witnessed a fall and that he thought he could see something on the glacier. ** The West Buttress route starts from a 7,200-foot base camp located at Kahiltna Glacier and consists of 17 climbing miles, with a vertical gain of 13,100 feet (Figure 1a). The most often encountered difficulties and dangers along the West Buttress route are steep slopes (40° to 50°), avalanches, and crevasses. However, cold and high altitude are primary factors that contribute to many mountaineering incidents including falls.

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Figure 1b. Detail of the West Buttress Route, 16,200 to 17,200 feet

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As they proceeded down the route, the victim and his partner passed another two-man team that was descending at a slower pace. They continued down the ridge, staying slightly to the lee side (the side sheltered from the wind). The teams were approximately 100 feet apart when the victim's partner witnessed one of the two men from the other team lose his footing and tumble down the slope toward a glacier. The volunteers climbed back to the fall site. After traversing the fall line, the victim climbed back up the ridge to inform the patrol leader who was still at the 14,200-foot camp. According to records, the victim radioed at 2:14 PM and stated that they had witnessed a fall and that he thought he could see something on the glacier. **

At this time, the victim requested permission from the patrol leader to descend the slope (Figure 2) to "take a look." During the radio communication, there was discussion of loss of (line-of-sight) radio communication. According to the park service radio log, the victim wanted to descend a reasonable distance before returning to the ridge to report any additional information. He was given permission to descend and told that assistance was being sent from the 14,200-foot camp (ascent time — approximately 2 hours). He was not told to wait for assistance or to set-up a radio relay before descending the fall line. The patrol leader later stated that his understanding of the conversation was that the two volunteers would descend only a short distance below the ridge to attempt a better view not to attempt to contact the fallen climber.

Figure 2. Direction of descent and fall from the West Buttress route

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Note: This is an enlargement (3x) of a topographic map with an original scale of 1:50,000.

The victim returned to the fall site and told his partner that they had permission to descend the slope. A third two-man team descending the route volunteered to assist. Equipment was pooled from the members of the three teams; this included a 165-foot climbing rope and an assortment of carabiners (metal snap-links), runners, and prusik slings (loops of rope or webbing). The equipment was divided between the two volunteer rangers; the victim carried the rope and the radio. The team initiated their descent, each carrying one ice ax, one ice screw, and one snow picket; neither carried a second ice ax. The fallen climber's ice ax was found near the ridge along the fall line but was not used for the decent. They also agreed to descend the slope without using the rope and felt a self-arrest (a technique using an ice ax to stop a slide) could be performed. Rope work (a climbing safety technique using a rope to stop a fall) would make for a slower descent and would require the use of several more ice screws or snow pickets for protection. Climbing ropes to establish a fixed line down the slope were available at the 17,200-foot ranger cache, however they decided not to climb back to retrieve the cache supplies.

The victim and his partner began their descent along the fall line at approximately 2:30 PM. As the team descended, they constantly maintained voice contact to assess each other's fatigue and comfort levels. The slope was 45-55°, and the terrain along the descent was hard snow with occasional patches of ice, approximately 10 to 30 feet long. (Snow can be transformed into alpine ice from the effects of pressure, wind, sun, and time. There may be no clear distinction between alpine ice and hard snow. In contrast, ice formed from frozen water, water ice, is usually harder and more brittle than alpine ice and occurs in steeper areas; however, at high altitudes and low temperatures, water ice and alpine ice can be indistinguishable.) Approximately 600 to 800 feet down the slope, the team encountered a larger ice patch that was very brittle. The victim's partner's goggles were icing, restricting his vision to a few feet. It is unknown if the victim was experiencing any visibility problems. They continued down the slope over the ice until the victim's partner suggested that they head for some rocks further down the fall line and evaluate whether they should use a running belay. (A running belay is a technique used where climbers (usually 2 or 3) are roped together. The lead climber clips the rope to a carabiner (or series of carabiners) attached to a fixed object, such as a rock (natural protection) or a manufactured device (artificial protection, such as an ice screw or snow picket) secured to the terrain. If a climber falls, the weight of the other climber(s) should arrest the fall. However, if a fall occurs and the running belay fails, then all climbers secured on the rope could fall. A running belay is safer than climbing without a rope but less secure than a fixed belay where one climber in the roped team remains anchored and able to brake or arrest another climber's fall.) At approximately 3:45 PM, 2 to 3 minutes following their decision to move toward the rocks, the victim's partner heard something slide down the slope. He yelled to the victim but did not hear a response. After removing his goggles, he noticed that the slope surface was a 400 to 500 foot sheet of water ice. Unable to radio for assistance, he moved to the rocks, anchored himself with an ice screw, and waited for the second rescue team. At 7:15 PM, a second rescue team descended to his position.

The following day, the team descended the victims' fall line. The first fallen climber's body was recovered, however the volunteer ranger's body was not located. It was surmised that he came to rest in either a crevasse or the bergschrund (the giant crevasse found at the upper limit of glacier movement). The circumstances and location of the fall were such that it is unlikely he survived.

CAUSE OF DEATH

The presumptive death certificate listed the cause of death as accidental fall.

RECOMMENDATIONS/DISCUSSION

After their investigation, the park service developed many recommendations that have been implemented. It is the intent of this report to provide educational information to the mountaineering industry and associated professions in order to enhance prevention efforts and promote safe work behaviors.

Recommendation #1: Employers should develop, implement, and enforce a comprehensive written safety program.

Discussion: In this incident, safety protocols were disseminated and discussed verbally. Regardless of the frequency of these discussions, a comprehensive written safety program would provide guidelines that better safeguard employee safety and health. The more structured format of a written program should outline standard safety practices and optimize information for employees who must use judgement as to whether to initiate and conduct specific operations and activities. Employers should ensure that employees are aware of all standard practices and that these practices are to be strictly followed.

Recommendation #2: Employers should ensure that all regular and volunteer mountaineering park rangers carry two-way radios and that communication is maintained during all phases of search and rescue (SAR) procedures.

Discussion: In this incident, two factors affected radio communication between patrol members 1) all communication between the volunteers and the patrol leader ceased when the team moved below the ridge and 2) the ranger carrying the radio fell, leaving his partner incapable of communicating with other patrol members. While the park service had a sufficient number of radios to outfit each team on the patrol, it did not have enough radios to outfit each ranger. It would be prudent for the park service to provide radios to all mountaineering patrol members in order to maximize communication capabilities between individual patrol members and other monitoring stations during critical operations. In addition, the additional radio(s) would allow patrol members greater flexibility to relay communications around blackout areas when terrain or other obstacles block “line-of-sight” communication.

Recommendation #3: Employers should ensure that volunteer mountaineering park rangers carry a predetermined amount and type of equipment.

Discussion: It is the policy of the park service to provide necessary and appropriate assistance to park visitors when the activity is within the skills and technical abilities of the rangers and a reasonable margin of safety can be maintained. While all climbers must be prepared to be self-sufficient, mountaineering rangers are expected to have a higher degree of knowledge, expertise, and commonsense in order to render aid to others in need. This entails having equipment and training to facilitate these activities. Following their investigation, the park service also recommended that a minimum equipment requirement should be instituted to ensure employee safety. In addition, the park service should also consider supplying basic equipment that is normally worn or damaged during work-related mountaineering activities.

Recommendation #4: Employers should ensure that both permanent and volunteer mountaineering rangers are trained in park service search and rescue (SAR) procedures.

Discussion: The park service recognizes that some climbers will become ill or injured each year and that SAR operations will be conducted on a discretionary basis (as determined by the rangers). However, in this incident, the mountaineering rangers initiated a search and rescue activity that placed the rescuers at risk. In addition, communication between the victim and the patrol leader was not precise in that the extent of the descent prior to the arrival of assistance was interpreted differently. It is important to provide training, not only in skills but also communication techniques, to all

rangers in order to maintain a reasonable margin of safety. SAR training should include incident assessment, information communication between rangers and base camp, and risk factors affecting an activity. While the volunteer ranger program attracts a higher caliber of high altitude mountaineers, their collective and individual knowledge should not obscure the need to plan and provide specific training for these activities. Difficulty switching from a climber to a rescuer modality can hamper or compound the hazards associated with a SAR activity.

Recommendation #5: Employers should consider hiring seasonal full-time mountaineering staff to increase the ratio of full-time mountaineering rangers to volunteer rangers.

Discussion: Since 1989, Denali has had over 1000 climbers on the mountain annually. Following their investigation, the park service recommended that an additional ranger should be hired during the climbing season. Although the volunteer program attracts an array of world-class climbers who provide essential acclimatized and skilled personnel on the mountain, their expertise and experience may not provide the leadership necessary to direct a crisis. A permanent ranger would have a higher degree of training necessary for critical decisions and other judgement calls, such as SAR (vs. recovery) operation. By using two permanent rangers on each patrol, one ranger could always be available to render assistance on the mountain during an emergency while the other would be able to provide continuous radio support to the remainder of the patrol.

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Fatality Assessment and Control Evaluation (FACE) Project

The Alaska Division of Public Health, Section of Epidemiology performs Fatality Assessment and Control Evaluation (FACE) investigations through a cooperative agreement with the National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR). The goal of these evaluations is to prevent fatal work injuries in the future by studying the working environment, the worker, the task the worker was performing, the tools the worker was using, the energy exchange resulting in fatal injury, and the role of management in controlling how these factors interact.

To contact Alaska State FACE program personnel regarding State-based FACE reports, please use information listed on the Contact Sheet on the NIOSH FACE web site Please contact In-house FACE program personnel regarding In-house FACE reports and to gain assistance when State-FACE program personnel cannot be reached.

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** Volunteers are converted to an administratively determined pay schedule when their assistance is necessary during an emergency. When the climbing incident was reported, both volunteers became government employees.

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