May, 1992

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TO: **CDR Louis Smith, NIOSH, Division of Safety Research**

FROM: **Gary Bledsoe, AKFACE**
Occupational Injury Prevention Program

SUBJECT: **Mountain Expedition Guide Dies in Fall into Crevasse on Mt. McKinley -- Alaska**

SUMMARY:

On May 21, 1992, a 41-year-old mountain expedition guide disappeared into a crevasse on Mt. McKinley, and is presumed dead. The lip of the large crevasse collapsed while he was inspecting the edge to determine a safe bypass route for a party of 2 other climbers. The surviving expedition members attempted to locate the victim, but were unsuccessful. The National Park Service decided that an attempt to recover the victim's body was too hazardous. Because the victim's body was not recovered, the exact cause of death could not be determined. However, it is presumed that the victim was either crushed under tons of compressed ice, or fell an estimated 85 feet to the bottom of the crevasse. The victim was guiding an expedition down from a summit attempt of Mt. McKinley. The fatality occurred at approximately 2:00 P.M. on the South Buttress of the mountain. Another member of the expedition suffered frostbite injuries while near Mt. McKinley's summit, and was hospitalized. He was released and returned to his home in another state.

The "AKFACE" investigator concluded that, in order to prevent future similar occurrences, employers should:

ensure that standard safety practices used in mountaineering are strictly followed

ensure that other expedition members are aware of mountain escape routes in the event that the expedition leader is incapacitated

ensure that expeditions have a back-up radio communications system in the event that the expedition leader and/or their critical equipment is lost.

INTRODUCTION

On May 21, 1992, a 41-year-old mountain expedition guide was presumed dead after falling an unknown distance into a collapsing crevasse. The Alaska Division of Public Health, Section of Epidemiology became aware of this incident through monitoring the television and news media. A full-scale investigation involving an Injury Prevention Specialist from the Alaska Department of Health and Social Services, Division of Public Health, Section of Epidemiology ensued on May 24, 1992. A fatality site investigation was not feasible because of the constantly-changing mountain and snow conditions, inaccessibility of the site, and extremely hazardous physical environment. Therefore, site photographs and physical measurements are not available. The incident was reviewed with the federal OSHA Compliance Officer, appropriate documents collected from the National Park Service (NPS) and OSHA, and the only available witness (a member of the victim's climbing party) was interviewed.

The collection of NPS documents was delayed due to the unusually high number of adverse events occurring on Mt. McKinley during this climbing season. A total of 24 climbers were injured (11 fatal, 13 non-fatal injuries) in one three-week period -- the highest number of deaths recorded since statistics were first collected in 1932. The current fatality rate for the season is 10.8 per 1000 (11 fatalities among 1023 climbers). This includes one occupational and ten nonoccupational deaths.

The employer is a private company specializing in guiding expeditions on Mt. McKinley since 1973. The company promoted safe mountaineering techniques as described in standard reference publications for mountain climbing enthusiasts. The company had never experienced an employee fatality prior to this incident. The victim was a world- renowned climber who was experienced in major ascents on four continents, and was known nationally and internationally as a very safe climber. The National Park Service licenses companies providing guide services on Mt. McKinley. These companies must submit standard operating procedures for safety and training. Also guide resumes are sent to the NPS's Chief of the Mountaineering Division for further evaluation. This company had been "grandfathered in" for a license some years previously. The NPS noted no previous infractions of safety rules or documentation of safety problems. Currently, there are no NPS rules or regulations requiring the use of belaying or other specialized fall protection techniques when approaching a crevasse.

On May 4th, the day prior to establishment of a base camp, The expedition party practiced safety techniques. The expedition guide checked the condition of all equipment, and loaned expedition members additional equipment he believed was required (ski's, overboots, pulleys, carabiners or snap-links). They then practiced practical crevasse rescue using a Z pulley system (device that provides a 3: 1 mechanical advantage).

INVESTIGATION

On May 5 1992, an expedition of four climbers began an ascent of Mt. McKinley. An advanced base camp was established on the east fork of the Kahiltna Glacier at the 11,000 foot level on May 7, 1992. On May 9th Camp 1 was established at the 12,500 foot level; one expedition member experienced breathing problems, and retreated from the mountain. On May 10th the remaining expedition members moved up to Camp 1, and it began snowing. This was the beginning of a massive storm system that brought high winds and a heavy snowfall to the mountain. On May 12th Camp 2 was established at the 14,500 foot level. The expedition remained at this camp until May 15th. Because of radio storm warnings, they returned to Camp 1, and remained there until May 17th. During this time a party descended to the Base Camp to bring more food to Camp 1. On May 18th they returned to Camp 2, and then established Camp 3 at the 16,000 foot level on May 19th.

A summit attempt was conducted on May 20th; one member (climber 1) remained at Camp 3 because he believed he would hold the remaining 2 climbers back during this attempt. The mountain guide and climber 2 got within 100 yards before aborting their summit attempt. This decision was made due to hazardous weather conditions (60 MPH winds), and the fact that both climbers had reached the summit in previous expeditions (they did not feel as driven to reach the summit on this attempt). In addition, climber 2 was suffering from frostbite, and there was concern about getting him off the mountain. The two climbers descended from their position near the summit, and returned to Camp 3 on the same day.

They rejoined the third climber at Camp 3, and spent the night in the tent warming the frostbitten climber's feet. On May 21st the expedition began to descend to the Camp 2 level at 10:00 A.M. The weather was cloudy which caused "flat" lighting conditions (lighting in which depth perception is adversely affected). However, visibility was not a problem. They tried to follow their previous footsteps down the mountain, but these had been covered by subsequent snows. The victim did not like to use "wands" (flags used for marking trails) because he believed "they trash the mountain". They had been descending for about 2 hours in a fairly flat area of the mountain on the West Buttress called "the Ramp." At approximately 14,700 feet the lead climber (climber 1) encountered a large crevasse (estimated to be 8 feet wide). He stopped and consulted with the victim concerning the best path around the crevasse. At this time the three climbers were roped together as follows: Climber 1 attached by 60 feet of rope to climber 2; climber 2 attached by 90 feet of rope to the victim. The climbers were oriented in a straight line with climber 1 leading. After consulting with climber 1, the victim moved directly forward towards the crevasse, reversing the order of roped climbers (victim, 90 feet of rope, climber 2, 60 feet of rope, climber 1).

The interviewed survivor reported hearing a "soft snow falling" sound, and was pulled off his feet as the victim fell into the crevasse. This survivor (climber 2) was pulled about 15 feet along the snow as the victim fell. This occurred at approximately 2:00 P.M. Climber 2 belayed to the edge of the crevasse, and saw the victim's rope protruding from compressed ice. He cut the rope and attached it to a ski pole jammed into the snow (used to mark the victim's position). He then walked around the crevasse and jumped over the lower narrow end. He repelled down into this end of the crevasse, and stood on a large block of compressed snow and ice (irregularly shaped, about 5 feet X 5 feet X 10 feet in volume). He estimated he had descended a distance of about 25 feet. He observed the victim's rope jammed between the large block of compressed snow and other smaller blocks. He attempted to dig into the compressed snow, but could see he was not making sufficient progress. He then repelled beneath the large block, but could not see the victim's rope exiting the snow and ice mass. He assumed that the victim was either buried in the large block or his rope had been severed, and he had fallen to the bottom of the crevasse (an estimated distance of another 60 feet).

At this point the surviving members of the expedition abandoned their rescue efforts, and decided to attempt to descend the mountain to get help. They were unable to call for help on the expedition's portable radio transceiver because it had been lost with the victim (a back-up radio is generally not used because of excess weight considerations). They walked for approximately two hours before they were forced to camp for the night. It is important to note that climber 2 reported significant concern about the survivors' ability to successfully descend from the mountain. Both climbers had become dependent on the expedition mountain guide; they had not devoted sufficient attention to the route because the guide was "in charge." Fortunately, they were both experienced mountaineers and were able to find their way off the mountain. They continued their descent the following day, and were met by two climbers ascending the West Buttress. Climber 2 was evacuated to a major hospital in Anchorage where he was treated for frostbite, and released the following week.

Other relevant information is summarized below. The interviewed survivor described the victim as "coherent" before walking to the lip of the crevasse; he did not seem to exhibit any symptoms of altitude sickness. He also did not appear to be tired (he was a world-class climber) or to be under any undue stress. He was aware of Climber 2's frostbite, but did not appear to be in a hurry. His next clients were far enough in advance that he did not need to worry about time. They were also within easy striking distance of their food cache, so there was "no unusual need for speed". He normally liked to move quickly; it was his style of

mountaineering. Apparently, approaching a crevasse in mountain climbing is a very common activity. However, the standard method of maintaining taut lines between climbers was not used. The victim normally used a "tight belay" (a belay in addition to the rope between team members) when jumping or ice climbing on small crevasses, and was "very safety conscious." He had accomplished many difficult and dangerous climbs, and "he felt he could assess the risks.

CAUSE OF DEATH

The cause of death is unknown because the body could not be recovered. He is believed to have died from either a fall into the crevasse, or crushing from compressed snow and ice as a result of the crevasse lip collapse.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers should ensure that standard safety practices used in mountaineering are strictly followed.

Discussion: The mountain guide approached the crevasse in a way which allowed excess slack in the ropes between the climbers. A standard method of moving to new positions involves all climbers maintaining taut lines between each other. If this had been done in this case, the victim may not have fallen as far into the crevasse and might have been rescued. After their investigation of this incident, the National Park Service recommended that a "tight belay" be used in these situations. The NPS believes that such a belay "would have provided a more secure rope system for stopping the fall." The NPS also pointed out that "the size of crevasses on Alaska Range glaciers can be deceiving because of large overhanging lips." Although the incident described above is difficult to evaluate (could the victim have been prevented from falling far enough to avoid engulfment in compressed snow?) due to the large size of the ice bridge that collapsed and the fact that world-class mountaineering is an inherently dangerous activity, added precautions such as adherence to standard safety methods is strongly recommended.

Recommendation #2: Employers should ensure that other expedition members be aware of mountain escape routes in the event that the expedition leader is incapacitated.

Discussion: After the expedition leader was lost, the remaining climbers were not clear on how to continue their descent. They had become over-dependent on the leader. A less experienced group of climbers may have suffered further injury or death due to significant delays in descending the mountain. In addition, if the guide had been rescued from the crevasse, but still required medical attention, the survivors would have been delayed in getting additional medical assistance for the guide due to this lack of knowledge of expeditious descent routes. All expedition climbers should consider alternative plans for potential adverse situations. In addition, all team members should have maps, compasses and the ability to use them, and a clear understanding of the descent route.

Recommendation #3: Employers should ensure that expeditions have a back-up radio communications system in the event that the expedition leader and/or their critical equipment is lost.

Discussion: When the expedition leader was lost in the crevasse, the portable radio transceiver he was carrying was also lost to the expedition. Although these radios are line-of-sight only (they can be used only for point-to-point distances within sight), there is sufficient air traffic on this mountain to allow reliable emergency radio transmissions. Either a back-up radio should be carried by another expedition member, or (if excess weight considerations are over-riding) any critical equipment (especially essential, sole items) should be handed off to another climber before the leader approaches hazardous areas.

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