were short-hauled from the rescue site at 1020 and were received by the rescuers on the glacier at 1023. The patient and partner were then loaded inside the aircraft and flown to Lupine Meadows. Medic 1 then transported the patient to St. John's Hospital.

Given the continued rockfall in the descent path of the rescuers, the decision was made to extract Byerly and Holm via short-haul. Byerly and Holm were extracted at 1110 and were down on the Glacier at 1112. All members of the rescue party were then flown from the glacier in two flights and returned to Lupine Meadows. All personnel were back at Lupine Meadows at 1132. A rescue debriefing was concluded at 1300.

(Editor's Note: The lengthy description of the rescue operations is presented so readers can get a sense of the factors that must be taken into consideration and the level of commitment required by the rescuers.

Following next are the narratives from 2003.)

RAPPEL FAILURE/ERROR–NO BACK-UP BELAY AND NO KNOTS ON ENDS OF ROPES

Wyoming, Devils Tower National Monument

On May 17, Jacqueline Weimer (27) sustained fatal injuries after falling approximately 100 meters while rappelling adjacent to the popular El Cracko Diablo climbing route on Devils Tower.

Weimer and her climbing partner had just completed the Soler (5.9) and rejoined three friends in the Meadows, a large ledge system high on the south face of Devils Tower. The group of five decided to rappel together and rigged a double-rope rappel through fixed anchors using 60 meter ropes. A newer, smaller-diameter rope was threaded through the anchors and tied to an older, larger-diameter rope using a Flemish bend. The first person to rappel descended 59 meters—past two sets of intermediate anchors—to a narrow ledge with anchors. Using a different rope, he rigged a single-rope rappel at these anchors and continued down the remaining ten meters to a large ledge. The group planned to descend singly down the double-rope rappel, switching rappels at the small ledge, and then continue down the single-rope rappel, ultimately regrouping at the large ledge. (Although still high-up, this ledge forms the base of Soler and other routes and it is accessed by third class terrain from below.)

While waiting turns to descend the double-rope rappel, each climber observed that the joining knot traveled slightly away from the anchors. Each readjusted the knot before descending. Weimer was the fifth and last person to rappel. At this time her partners were changing shoes and eating lunch at the large ledge below. Weimer reached the intermediate rappel anchors. However, instead of immediately clipping in, she remained in a rappel stance on the two ropes. She then leaned briefly to her right in order to look up and consider how the ropes would pull. At this point her partners watched her fall backward, hit the large ledge, tumble, and continue to fall out of sight. Weimer was found with approximately three meters of excess rope—of the

thicker, older rope—running through her rappel device. Presumably, she lost control of the other rope and it slipped through her rappel device.

Analysis

Several factors contributed to this accident, including the extreme length of the rappel, the absence of blocking knots tied at free rope ends, and uneven rope lengths on the double-rope rappel. The compound effect of these factors resulted in a tragic accident.

Choosing to skip two sets of intermediate anchors forced the climbers to rappel dangerously close to the ends of their ropes. Only one to two meters of excess rope are generally available when this same narrow ledge is reached on a double-rope rappel using two standard 60 meter ropes. Nevertheless, many climbers prefer to avoid the hanging stances found at the intermediate sets of anchors and choose to rappel to this same narrow ledge. Although recognizing the length of the rappel, Weimer and her partners still made the conscious decision not to tie blocking knots at the free ends of their ropes because they were concerned that these knots might hang up when the ropes were tossed. Tying, or tossing and then retying, blocking knots can effectively eliminate the risk of rappelling off of rope-ends.

The group intentionally threaded a newer, smaller-diameter (10.2 mm) rope through the anchors and then tied in an older, larger-diameter (10.5 mm) rope, because they felt that doing so would allow for easier rope retrieval. However, this rigging allows the joining knot to travel through—instead of jamming against—the anchors if, on a double-rope rappel, the thinner rope passes through a rappel device slightly faster than the thicker rope. Indeed, while waiting turns to descend the double-rope rappel, each climber observed the joining knot traveling (about 1/2 meter) away from the anchors. Thinner, less worn ropes tend to travel through rappel devices slightly faster than thicker, more worn ropes because slightly less friction is applied to them by the rappel device. This effect can be eliminated if the rappel is rigged in reverse. Larger diameter (or more worn) ropes should be threaded through the anchors and then tied to smaller diameter (or less worn) ropes. In this scenario, instead of traveling, the joining knot will simply jam against the anchor, thereby maintaining even rope lengths.

It is significant that the rope diameters involved in this accident were fairly similar (10.2 vs. 10.5 mm). In this instance it is possible that the differences in sheath wear between the older rope and the brand new rope exaggerated the slight difference in diameter between the two ropes. It is unclear whether the JAWS descending device used by Weimer further exaggerated the situation because of the greater stopping power/friction that this device provides in comparison to other rappel devices. (Source: Chuck Lindsay, Climbing Ranger)

(Editor's Note: Things have changed since 1959, when my partners Carl and Jean Love and I were the 68th–70th to ascend the tower by the only known route. Now there are 6,000–8,000 climbers a year attempting one of the 220 named routes. On this day, there were 82 people on the various routes. Considering that more

than 80,000 climbers have visited the monument, the accident rate is low and there have been very few fatalities, most of them due to rappel errors.)

LIGHTNING, POOR POSITION–LATE START

Wyoming, Grand Teton National Park, Grand Teton

On July 26 at 1535, lightning struck and fatally injured Erica Summers (27) while climbing the Exum Ridge of the Grand Teton. This single lightning strike traveled down the Exum Ridge injuring seven climbers, five seriously. The initial 911 cell phone call at 1546 reported that CPR was in progress, one climber was hanging unresponsive from a rope, multiple people were injured and at least three climbers were unaccounted for.

The response to this incident included two Type-3 interagency contract helicopters with two full helitack crews, one air ambulance, three ground ambulances, and almost all members of the Jenny Lake Sub-District staff. Rangers flown into the Lower Saddle climbed or were short-hauled to two accident scenes. Rangers worked diligently in steep technical terrain to evacuate all the seriously injured patients and the fatality before nightfall.

Analysis

Several members of this group commented about the weather cell that produced the lightning for this incident. What many said was, "It didn't look that bad," or "We've been in way-worse weather." The group had little warning lightning was about to strike. The fatal strike was reportedly the first lightning produced from the storm cell, with no audible thunder as the cell approached. Witnesses reported only one other lightning strike produced from the storm cell, hitting a nearby peak. The characteristic warnings of hair standing up on the back of one's neck or buzzing metal were almost instantaneous with the initial strike. Given the group's position on the mountain, the time of day, and the skill level of those in the group, it is doubtful that had the storm cell approached with thunder 20-40 minutes before hitting the Grand Teton, the group would have been able to move off the mountain fast enough to get to a safer location.

Forecasts and recent weather observations should have indicated to this group that thunderstorms were likely to develop on the afternoon of the 26th. During the two days prior to this incident, afternoon thunderstorms developed and moved over the Tetons. When the initial incident report was broadcast, I looked up into the mountains at a significant storm cell. I wondered if we were going to be able to fly a helicopter at all, and I wondered why these people were on the Exum Ridge at 1546 in the afternoon.

The Exum Ridge is undoubtedly the most popular route on the Grand Teton and thus on a Saturday during the middle of summer, one is bound to encounter other climbers. It is very difficult for a group of 13 people to climb quickly. Getting to the base of Wall Street around 1100 with 13 climbers, many with no climbing experience, would surely have put at least some members of the group near the summit very late in the afternoon, even if other climbing parties had not been encountered.