

leader. After an arduous probe search, Rainery was finally found the next day at 2 p.m. under 18 inches of snow not ten feet from where Sawada was. Evidence indicated that Rainery was killed on impact. (Sources: Leo J. Hannan, Howard J. Holloway, Kent Saxton, and U. S. Weather Service.)

Analysis: If the icy slab had released, the Flattop Mountain slide certainly would have taken an even larger toll. The party was inexperienced and totally unaware of avalanche danger. The Koyota Peak party should have taken warning from the slide observed the previous day and the warm temperature on the day of the accident, and either retreated or at least stayed completely on ridge routes. Neither party was equipped with hardhats or avalanche cords. Mark Rainery's life may well have been saved if he had been wearing a hardhat and had an avalanche cord or helium balloon attached to him. Both parties were fighting darkness, which is a major problem for winter mountaineering in the high latitudes.

Both rescue parties indicated the need for a common radio frequency for various agencies involved in rescues. The Federal Communications Commission has since authorized 4383.8 kilohertz upper side band for all stations in Alaska except airborne and citizen's band. Rescue groups in the United States and Canada should contact the American Radio Relay League, Newington, Connecticut 06111, for the name of the radio amateur Emergency Coordinator in their area. In urban areas like Anchorage, where mountains are so close by, mountaineering clubs and rescue groups might consider a public education program on avalanche dangers, and also arrange for warnings through public media when avalanche conditions are severe. (Source: James Prior.)

BOLT FAILURE—Arizona, Pinnacle Peak. The *Requiem* is a predominantly aid climb located just to the north of the standard route on Pinnacle Peak's east face. Originally, this route was one pitch, the climbers penduluming off the uppermost bolt into the standard route on the left. In 1970 the route was finished by the placement of two three-eighths of an inch belay bolts for a hanging belay at the previous high point and climbing the ridge to the right of this point.

Rolin Watson (19), Peter Noebels (17), and Dana Hollister (16) began their ascent of the *Requiem* after arriving at Pinnacle Peak approximately 8 a.m. and doing some preliminary climbing lower on the peak. None of the three had previously climbed the route, although Noebels had obtained some information concerning its whereabouts.

Watson led the first pitch of the *Requiem* belayed by Hollister. Watson nailed the first 25 feet up to the cliff hanger move, reached the horizontal crack, and then across to the first of a series of one-fourth of an inch aid bolts. Watson ended the pitch here, clipping into the second one-fourth of an inch bolt with a belay seat and securing the belay line to the same bolt. This bolt was then connected to the first bolt (three feet lower) by a one-inch nylon sling.

Hollister ascended the fixed belay line on jumars cleaning the pitch. Just before reaching the horizontal crack, one of the aid nuts pulled out, causing Hollister to take a short pendulum. Upon reaching Watson, Hollister stated that he did not feel like finishing the climb, and descended the fixed line on jumars.

After Hollister had retreated to the first belay ledge, Noebels began his ascent of the fixed line on jumars. When Noebels reached a point approximately ten feet below Watson, the belay anchors failed. Later investigation showed that both bolts sheared at their juncture with the rock.

Both Noebels and Watson fell free to a point below their first belay ledge where the rock starts to bulge outward. It is most probable that both climbers impacted the rock here, possibly at several points. Hollister later stated that he observed Noebels hit a medium sized Palo Verde tree just a few feet from where Noebels came to rest, breaking part of it off. Watson and Noebels stopped at a point level with the base of the vertical rock, among talus boulders and scree. The total distance of the fall from the belay to the final stopping point was estimated at over 120 feet. The approximate time was between 1400 and 1415.

Hollister had observed the fall while waiting on the first belay ledge. He quickly descended to the fallen climbers where he found both conscious, but Watson delirious with severe head injuries. After administering preliminary first aid for bleeding, Hollister descended to Pinnacle Peak Patio, a restaurant one-half mile west of the accident site.

Analysis: The immediate cause of the accident was the failure of the two one-quarter of an inch belay bolts (which had originally only been intended for aid). Both bolts were Rawl drive stud bolts of the center expander type. Both were discovered to have sheared clean at their juncture with the rock surface. These bolts were placed over seven years ago on the original ascent.

Several contributory factors existed, however, which indirectly led to the belay failure. First, and most serious, was the decision to place the belay at this point. Noebels stated that they assumed that these bolts were the belay bolts and since rope drag was becoming a factor, they decided to place the belay here. Actually, the normal hanging belay was still 40 feet higher, which utilized two three-eighths of an inch stud bolts.

A second factor was the apparent lack of background knowledge on relative bolt strengths possessed by these climbers. Watson's actions in placing the entire load on a single one-fourth of an inch bolt demonstrates this clearly. That Hollister did not question this arrangement after arriving at the belay position is further evidence to this fact. Noebels later stated that he knew very little about one-fourth of an inch bolts. All three climbers had nearly two years climbing experience each, mostly in clean climbing style.

Finally, the arrangement of the belay load was such that only the uppermost bolt held any load from Watson in the belay seat or the fixed line. The lower bolt was unloaded, attached to the one above via a one-inch nylon sling. When the upper bolt failed, this arrangement allowed three to four feet of drop before becoming effective, essentially cancelling any chance for it to halt the fall. The use of either a self-equalizing belay system or loading the lower bolt and backing up with the upper one *possibly* would have prevented the belay failure of both bolts simultaneously.

Although not a contributory factor to the belay failure, the fact that no member of the climbing party wore hard hats on this climb cannot be ignored here. It is safe to say that the skull fracture suffered by Watson probably would not have occurred had he worn his. That Noebels did not suffer grievous head injuries after falling over 100 feet without a hard hat can only be attributed to extraordinary good luck! (Source: Bob Box, Arizona Mountain Club.)

RAPPEL FAILURE—California, Sierra Nevada Palisades. A group of three teenagers climbed from a glacier camp via the U Notch and chimney to the summit of North Palisade by noon after a 0730 start. They began a class 3 traverse north on