



## Engineering Sciences Section - 2014

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### **C6 Forensic Engineering Investigation of a Skiing Loss of Control Fatality**

*A.K. Aleksander, PhD\*, Aleksander & Associates, PA, PO Box 140558, Boise, ID 83714*

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The goal of this presentation is to assist the attendee in understanding the investigative process and in becoming familiar with the terminology and critical factors that affect such an investigation.

This presentation will impact the forensic science community by increasing awareness of the fact that skiing fatalities, though relatively rare, are difficult to investigate, due to the inherent variability of the pertinent physical parameters of the winter terrain, as well as human cognitive behavior, dynamic performance, and the particular circumstances.

A 15-year-old girl befriended a 13-year-old girl at gymnastic classes and invited her for a weekend at the family's mountain resort residence. The older girl was a seasoned racer who had been coached for some years and competed in many races throughout the mountain west, particularly at ski areas in California.

She owned several pairs of skis, which were of a recent design.

The younger girl had had few opportunities to ski, but indeed owned an older pair of skis. The parents of the younger girl were hesitant to let her go, but after assurances from the parents of the 15-year-old that they would be with the girls at all times, agreed.

On a Saturday morning, the girls were dropped off at a major western ski resort while the parents went off to a real estate seminar. The girls got on the first chairlift at the base of the mountain, and proceeded to ski down an intermediate slope (marked as a family ski zone, and marked with slow speed banners), a distance of approximately 1,400 feet. At that point, the 13-year-old lost control, veered across the hill, and hit an island of trees. She was unresponsive with severe injuries, and although evacuated by the ski patrol and transferred by helicopter to a local hospital, she died of the injuries that evening.

The investigation focused on why this accident occurred, and identified the contributing factors.

Skiing as a sport has evolved through several significant generations of technical innovations. These include changes to basic concepts in ski design, most notably the length and side-cut profiles of the skis. These side-cut changes affect the turning characteristics of the ski. The skis the decedent was using were not her own, but lent to her by the elder girl. This fact, plus terrain and common skiing errors, will be examined in more detail. These differences between the older traditional "straight" skis, and the more recent "shaped," or "parabolic," or similar side-cut skis will be discussed, as they likely affected the outcome of this case.

Witness statements, photos, photogrammetric techniques, and site investigations helped in determining the sequence of events leading to the fatal crash. Also, ski testing and an evaluation of the ski design parameters further clarified the probability of a condition sometimes referred to as "railed edge" or "back seat," terms that describe the shifting of the center of gravity onto the rear half of the ski length. This condition tends to freeze a person in an awkward position, resulting in unintended acceleration and loss of directional control. The performance characteristics of specific skis must be learned and are not necessarily readily transferable to other types of skis. This is one of the key findings in this case.

The case was litigated, and the results will be discussed. Ultimately, the very nature of gravity sports predisposes one to an elevated level of hazards that must be mitigated by training, caution, and adherence to basic safety guidelines. Parental oversight is one of those cautions.

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#### **Skiing, Skis, Ski Patrol**