



Phoenix Approach™ Analysis of Ski Lift Strangulation

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by

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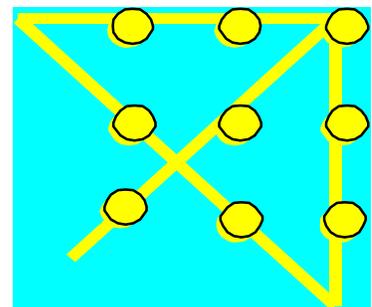
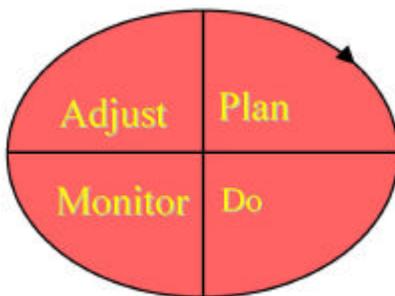


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Executive Summary

The bare facts are that a 14-year old girl was strangled to death by the chinstrap of her ski helmet after she unsuccessfully attempted to exit a ski lift chair as the chair was in transit. It would be tempting to focus on the dysfunctional behavior of the young girl in attempting to exit the chair at an unauthorized location, but there is more to it. This analysis illustrates how The Phoenix Approach™ to root cause analysis is capable of revealing cost-effectively amendable behaviors and conditions that are not compatible with good safety and business practices.

It is unclear whether the post-exit attempt behaviors of the girl's companion or of the ski area staff could have mitigated the consequences. What is clear is that the death resulted from a combination of factors that included safety devices operating in manners probably not intended by their designers.

These safety devices were the safety bar, which is intended to protect lift passengers from inadvertently exiting the front of the chair and the helmet, which is intended to cushion head impacts. The particular parts of the helmet that were involved were the helmet itself that wedged between the chair seat and the safety bar and the chinstrap that suspended the victim and asphyxiated her.

Helmet manufacturers and purchasers should consider the benefits of frangible links attaching helmets to chinstraps to break loose in the event of severe forces on the chinstrap. Ski area operators should emphasize to patrons the dangers associated with using a lift in other than the approved manner. They should also review their processes for responding to lift-related emergencies.

We do not know about the previous behavior of the victim or her friends, i.e., how they exited lift chairs. We also do not know about the response of the ski area operators to safety infractions, i.e., the confiscation of lift tickets or silent toleration.

In the early days of skiing lift chairs did not have safety bars and helmets were not worn. Safety bars were installed after falls from lifts. Helmets became popular after two celebrities died from ski accidents. The lesson to be learned here is that solutions cause problems, especially the unanticipated interactions of the solutions to different problems.

Narrative (from The Hartford Courant)

NEWS

Report: Ski Area Death An Accident

By COLIN POITRAS and CARA SOLOMON
The Hartford Courant

April 03, 2001

MIDDLEFIELD - The death of a 14-year-old Cromwell girl at the Powder Ridge Ski Area in January has been ruled an accident.

A three-month investigation by state police found "clear and convincing evidence" that Lauren A. Ramsay's death on Jan. 5 was accidental and that no criminal charges are warranted, according to an inch-thick investigative report released Monday.

Lauren died of asphyxiation when she and a friend tried to jump off a ski lift about 100 feet before the drop-off point at the top of the mountain. Her friend made it to the ground. But police said Lauren's helmet became wedged between the safety bar and the seat bottom, leaving her dangling from her chinstrap for several minutes.

While the report says the lift was safe and operating properly, the investigator notes there were some delays in the initial rescue attempt.

The report says some ski patrol personnel had trouble locating Lauren's chair on the lift. It also shows that as many as five to eight minutes may have passed from the time Lauren was first seen dangling from her chair and the lift was stopped, to the time emergency personnel brought Lauren's chair to the top of the mountain so she could be freed.

Powder Ridge officials could not be reached for comment Monday.

Lauren's parents, Sharon and Frank Ramsay, contacted at home Monday, said they were aware the report was completed, but had not seen it.

"Based on the information, it can only set us back," said Sharon Ramsay, still struggling to cope with the loss of her daughter. "Maybe someday we will read it, but not now."

The report says that when the first emergency calls came in, some ski resort employees and members of the ski patrol were unsure whether the incident was happening at the bottom or the top of the ski lift. Resort Director Chad Johnson later told police that lift accidents most often occur in the loading areas at the bottom of the lifts, which is where some ski patrol members initially responded, the report says.

A 19-year-old boy operating the lift at the top of the mountain said he immediately stopped the lift and radioed for help once he saw Lauren dangling from a chair about 30-feet from the discharge point.

The lift operator told police he then ran down the mountain and tried to yell up to Lauren, who by then had stopped moving. Some of Lauren's friends riding the lift behind her said they initially thought Lauren was kidding around but then they started screaming and crying when they realized Lauren was dangling by her neck strap and unable to free herself.

The lift operator, realizing Lauren was unconscious, told police he ran back to his station at the top of

the mountain and notified the ski patrol the situation was serious. When the lift stopped, Lauren's chair was still about 20 to 30 feet away from the drop-off point and too high up to attempt a rescue from the ground, witnesses said.

The investigator ruled that the operator's stopping the lift was necessary because Lauren was dangling too low to clear the drop-off point safely and might have gotten pinned against the unloading platform at the top of the mountain and further injured.

Eventually, emergency crews decided to restart the lift just long enough to get Lauren's chair above a safety net in front of the unloading platform where rescuers were waiting. One resort worker quickly grabbed Lauren's legs as her chair came toward him while another lifted the safety bar and freed Lauren's helmet, the report said. By then, Lauren was not breathing and had no pulse, the report says.

Rescue workers said they performed cardiac compressions for several minutes inside the netting, before transferring Lauren to the lift platform for more advanced first aid. Lauren was later brought down the mountain and transferred to a waiting ambulance.

The incident happened about 10 p.m. as Lauren and some of her friends from Middletown's Mercy High School were going on one last run down the mountain before ending their trip for the night. Lauren was pronounced dead at the hospital about 6 a.m. the following day.

Letter to Editor

Sent by Bill Corcoran shortly after the newspaper report.

April 4, 2001

Letter to Editor

This refers to the terrible tragedy reported in the April 3 "Courant" involving the death of a fourteen-year-old girl at a ski area. Unfortunately the death, as reported, was caused by the unintended interaction of two safety devices, a helmet and a safety bar. This previously latent set of causes was activated, according to the story, by the victim's using the chair lift in a manner not intended by the designer.

As we use technology to improve our lives we need to understand the limits of design and the potential dangers of safety devices. It would be helpful for parents to emphasize to children that, by and large, well-tested technology, such as ski lifts are safe only if used as the designers intended. Otherwise all of the designers' attention to safety is ineffective.

One might also hope that this incident will be reported to helmet manufactures so that they might learn from it. The frangible link is a common device for limiting the effects of excessive force on safety devices.

Sincerely yours,

Bill Corcoran
Windsor, CT

Phoenix Analysis (The Eight Questions for Insight)

Eight Question Analysis of Ski Strangulation	
Impact	
1. Consequences	<ul style="list-style-type: none"> ○ Actual: 1) Death of child , 2) Business interruption at ski area , 3) Costs of investigations , 4) other (not specified) ○ Expected: Increase gov't inspection of ski areas ○ Potential Consequences: More of the above.
2. Significance	<ul style="list-style-type: none"> ○ Precursor to: Another similar event ○ Extent: Almost all ski chair lifts have safety bars and many skiers wear helmets. Many ski areas do not enforce their own rules against dysfunctional patron behaviors on lifts. ○ Barriers that did not succeed: Warning signs at ski area to exit only at top of lift, ski area operator emergency response. ○ Remaining barriers: None ○ Campaign issue: It is a chronic problem to discourage hazardous behavior of young people at ski areas. Well-intentioned safety devices are often involved in accidents when the devices are used in ways not envisioned by their designers.
Influences on Consequences	
3. Vulnerability	<ul style="list-style-type: none"> ○ Chair travels high enough to strangle a victim and low enough to tempt early exiting. ○ Safety bar drops easily. ○ Helmet can wedge between chair and safety bar. ○ Chinstrap has no breakaway feature. ○ Children tend to break rules. ○ Ski area operators are not conscientious in enforcing rules.
4. Trigger	Victim attempted to exit chair at unauthorized location. (We don't know why.)
5. Exacerbation	Timing of descent of safety bar
6. Mitigation	Victim's companion escaped injury. (Luck?)

Eight Question Analysis of Ski Strangulation

Close Out (Lessons to be Learned)

7. Lessons to be Learned	<ul style="list-style-type: none"> ○ The safety of any engineered device is highly dependent on its being used in accordance with the design intent. ○ Solutions cause problems, especially the unanticipated interactions of solutions to different problems. ○ Parents and ski area operators can influence the behavior of young people by emphasizing exact safe behaviors at ski areas.
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Close Out (Corrective Actions)

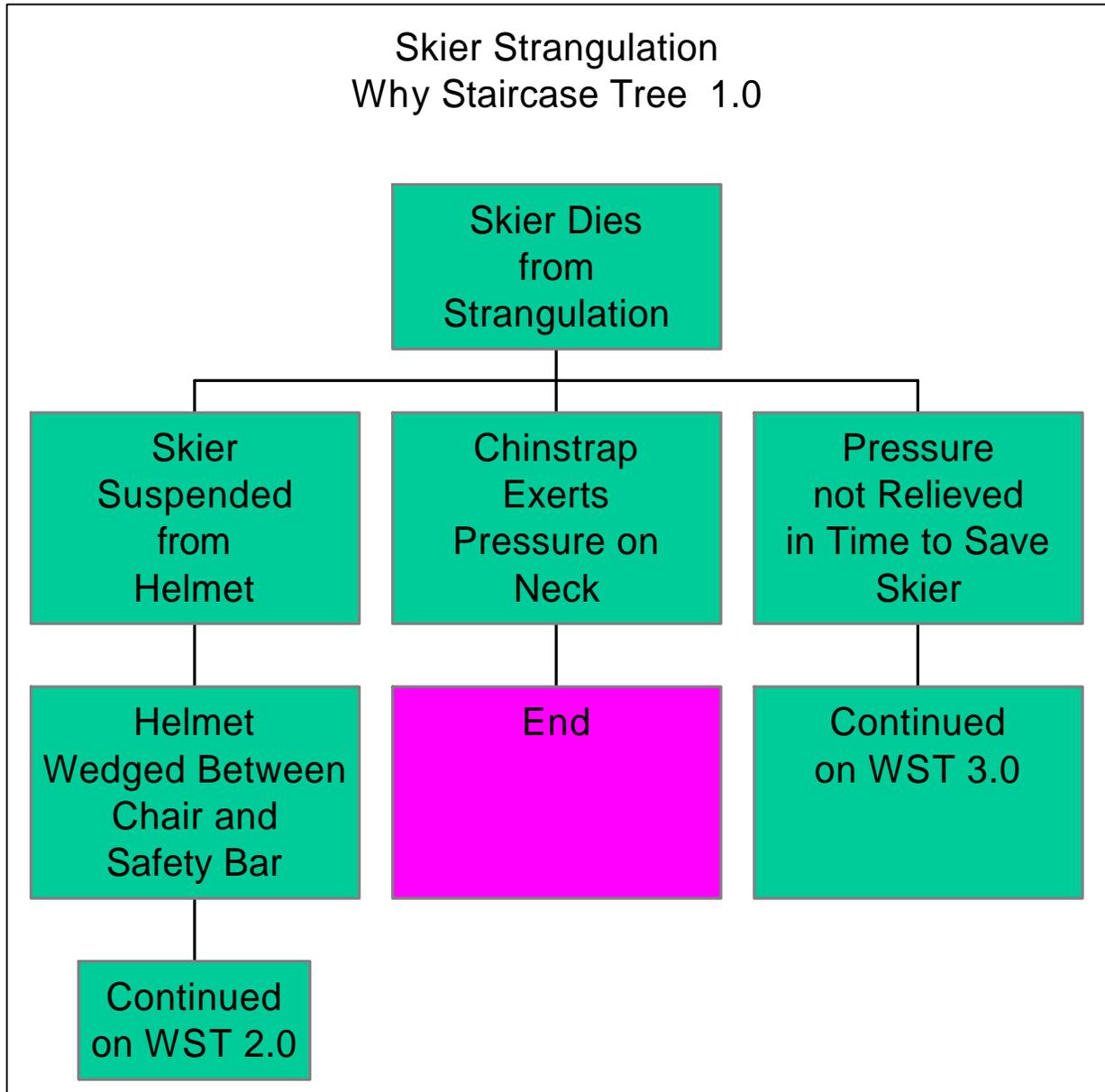
8. Corrective Actions	<ol style="list-style-type: none"> 1. Interim compensatory measures: 1) Have the lift ticket sales personnel brief purchasers on the necessity to use the lift as instructed. 2. Corrective actions for symptoms and effects: (complete) Disposition of remains, memorial services, etc. 3. Corrective actions for causes: 1) Inform helmet manufacturers of the role of the chinstrap. 2) Review ski area emergency procedures and training. 4. Corrective actions for generic implications: 1) Notify ski area operators' association, 2) Share this analysis with your children. 5. Corrective actions for self-assessment deficiencies: Ski areas should review the extent to which they are conscientious in noting poor enforcement practices of their employees. 6. Disposition of Extraneous Conditions Adverse to Quality: (none) 7. Follow-up plans: 1) Ski area operators schedule days to monitor behaviors of their employees and of ski lift patrons.
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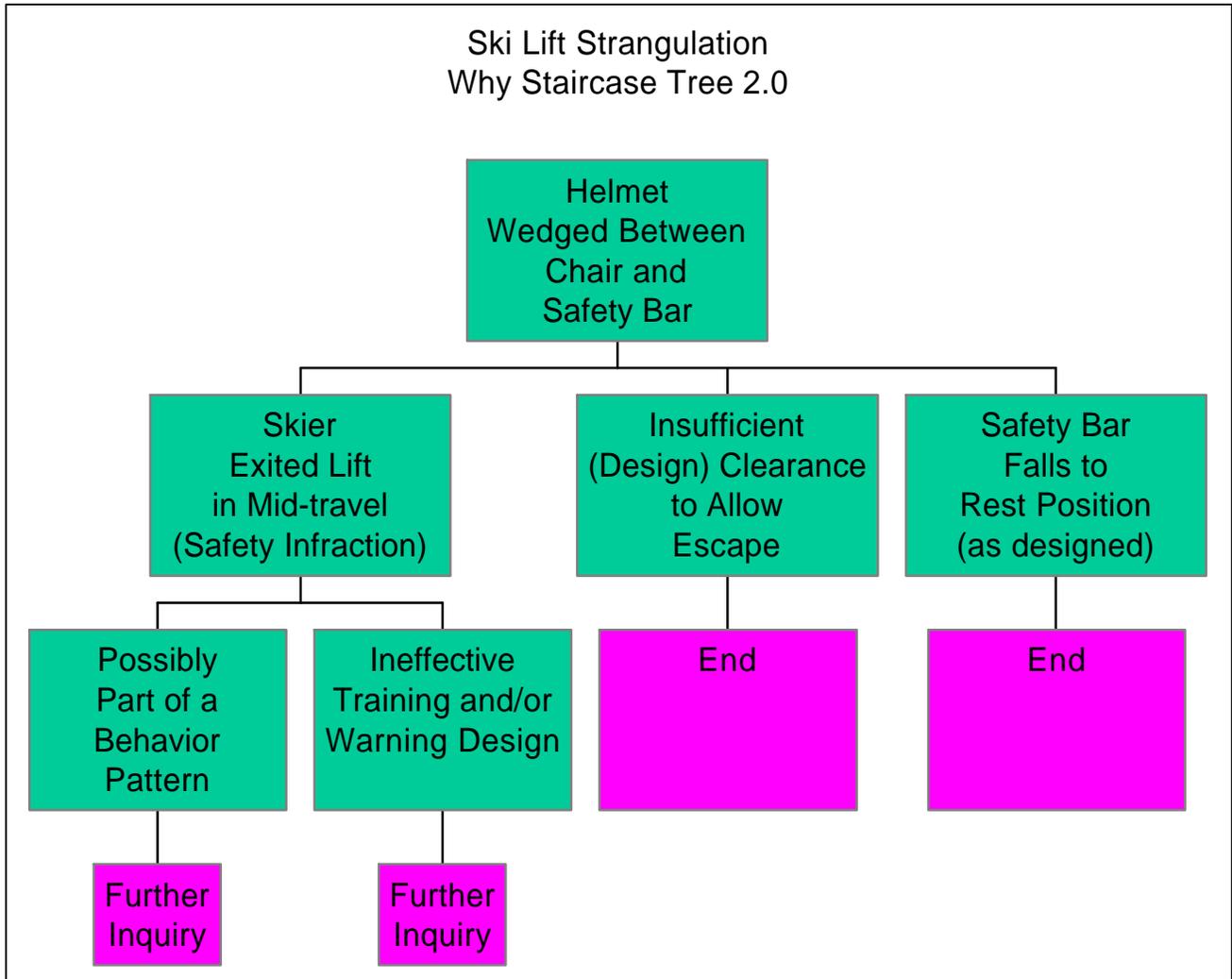
Barrier Analysis Matrix

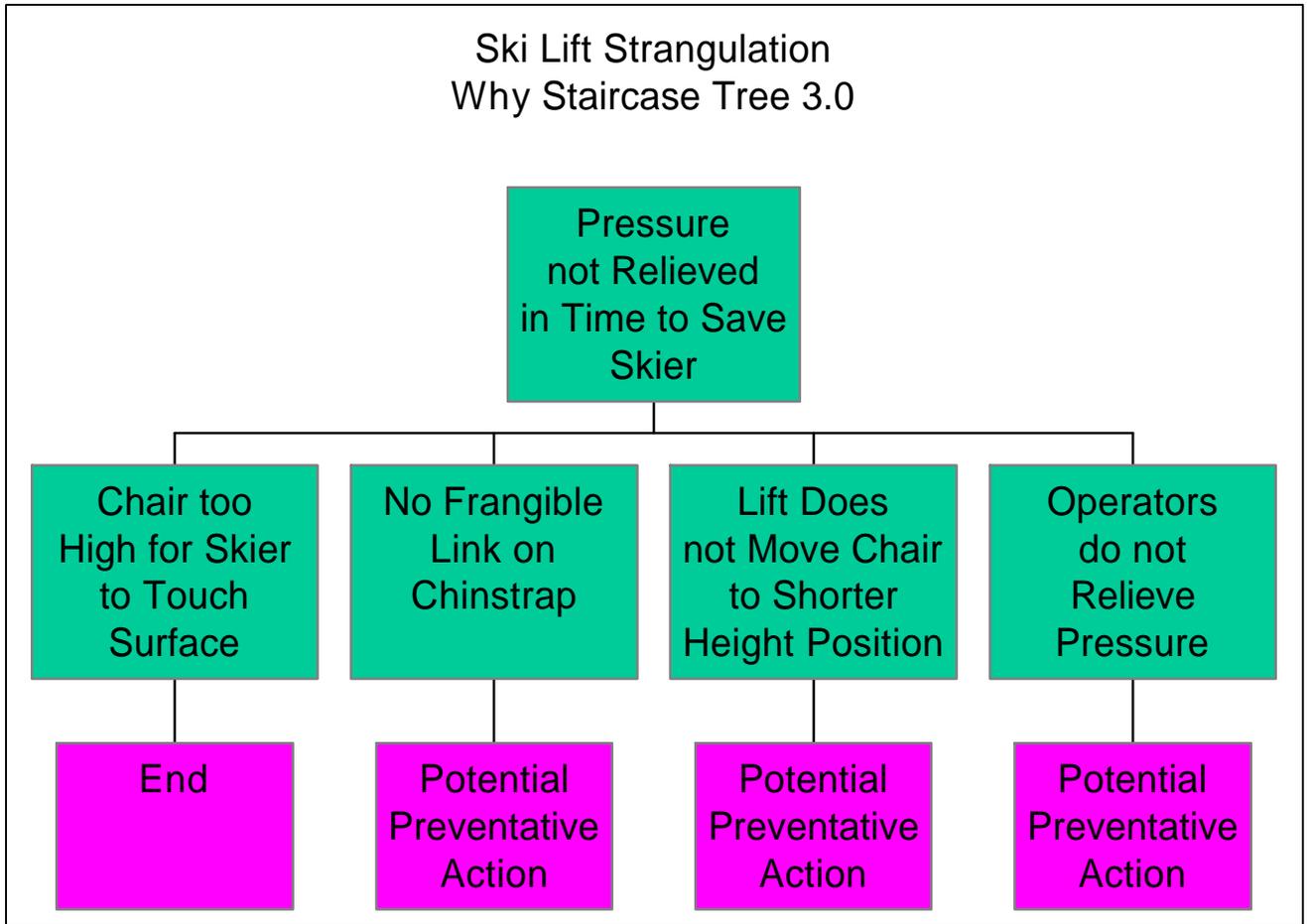
Barrier Analysis Matrix © for CT Ski Lift Fatality				
Barrier	Target Protected	Threat	Effectiveness in this case	Significance
Sign "Get off only at top"	Lift Patron	Accidents resulting from premature exit.	Patron exited near top.	Violating this sign triggered the accident.
Safety Bar	Lift Patron	Fall from Lift	Caught ski helmet	Set-up factor. (Speed of descent was an exacerbating factor.)
Helmet	Skier's Head	Impact injuries	Caught on Safety Bar	Set-up factor.
Helmet Strap	Helmet	Loss of Helmet	Strangled patron.	Final exacerbating factor.
Helmet Strap Breakaway Device	Helmet Wearer	Strangulation and "Snagging" effects.	Did not exist. Could not have worked.	Missing barrier.

Why Staircase Trees

WST= Why Staircase Tree







Conclusions

This tragic accident was the result of unanticipated interactions (coupling) between safety devices. It was triggered by the dysfunctional behavior of the victim.

Young people cannot be guaranteed not to engage in risk-taking behavior. Adults designing, operating, and supervising situations in which young people can put themselves or others at risk must be forever vigilant to discourage such behavior and to provide such features as will compensate for such behavior to the extent possible.

Analyst's Comments

This is a highly unusual event in that it had no mitigating factors, except possibly that the victim's companion, luckily, was not injured.

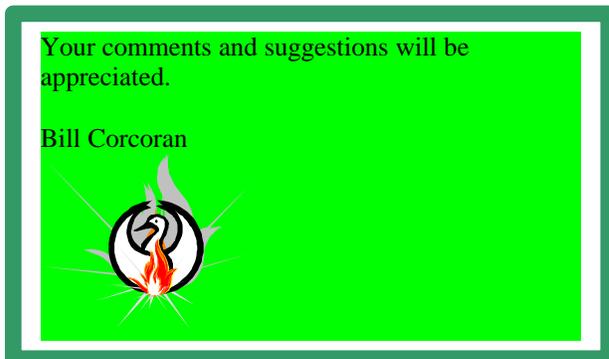
The analyst believes that the tools that were used were adequate to make the event and its analysis transparent. Other Phoenix Tools® that could have been used, but were not, included:

- The Comparative TimeLine ®
- The Missed Opportunity Matrix ©
- The Cause-consequences Matrix ©

If I were actually investigating this event I would look more into:

- The human factors design of the warning signs
- The human factors design of the lift chair itself.
- The exact behaviors of the lift area crew once they were aware of the event.
- The verbiage on the back of the lift ticket.
- The previous behavior of the victim and her friends, i.e., did they jump from lifts before.
- The response of the ski area operators to safety infractions by customers.
- The words that ski instructors use in training their students in the safety aspects of skiing.

Request and Offer



This article can be used as a template for a relatively quick and cheap Root Cause Analysis. A Microsoft Word™ (doc) file is available upon request to root cause analysts who would like to try out the template.

Contact Bill Corcoran at 860-285-8779 or by e-mail.