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NSAA Lift Safety Fact Sheet

Ski areas across the country are committed to chairlift safety and have an excellent safety record for uphill transportation as a result of this commitment. In fact, there is no other transportation system that is as safely operated, with so few injuries and fatalities, as the uphill transportation provided by chairlifts at ski resorts in the United States. The National Ski Areas Association compiles and updates this Lift Safety Fact Sheet annually to provide ski areas and the public with the most current information on the ski resort industry's commitment to overall lift safety, financial investment in lifts and lift maintenance, industry education and training on lifts, and frequently asked questions about ski lifts.

Ski Lift Safety in Context

Riding a chair lift or gondola while skiing, snowboarding, mountain biking, or even just sightseeing, is an exceptionally safe and secure mode of transportation. Deaths from malfunctions of ski lift operations in the United States have occurred rarely over the past several decades. Since 1973 (when NSAA began tracking skier visits and retaining related statistics), there have been 13 deaths attributed to ski lift malfunctions and falls,[1] a 38-year span during which the industry provided more than 14.68 billion lift rides to skiers and snowboarders.[2] Notably, the ski resort industry in the United States has not experienced a fatality resulting from a chairlift malfunction since 1993, an 19-

[1] NSAA first began tracking skier visits during the 1978/79 season. Therefore, for the five seasons prior (1973/74 to 1977/78) NSAA uses 39.7 million skier visits as a very conservative estimate of visits for each of these five seasons. The 39.7 million visits were recorded in 1980/81, the industry's lowest recorded season.

[2] During this 38 season time period, U.S. resorts averaged 51.53 million skier/snowboarder visits per season. To derive the 14.68 billion number lift rides in this span, we multiplied the average number of skier visits (51.53 million) during the 38-year span, resulting in a total of 1.958 billion skier visits. We conservatively assumed that each skier visit resulted in 7.5 ski lift rides per visit – we multiplied 7.5 lift rides by 1.958 billion, resulting in 14,685,255,000 ski lift rides (14.68 billion).

year period.[3] To put this into context, in this 38-year span, the ski industry has transported guests more than *7.342 billion miles in lift rides* – that's more than 75 trips from the Earth to the Sun.[4]

Given the exceedingly rare number of fatalities involved due to ski lift malfunctions, and the billions of miles transporting guests, the industry's fatality rate is extremely low. For the 2010/11 ski season, which is the most current data available, the annual fatality rate per 100 million miles traveled on ski lifts was 0.149 – far safer, in comparison, than annual fatality rates of riding an elevator or in automobiles.[5] (See Table 1). In short, a passenger is *three times* more likely to suffer a fatality riding an elevator than riding a ski lift, and *nine times* more likely to suffer a fatality in a car than a ski lift.

Table 1: FATALITY RATE COMPARISON

	Passenger Miles Transported per Year	Average # of Passenger Fatalities per Year	Fatalities per 100 Million Miles Transported
SKI LIFTS	227,025,000	0.34	0.149
ELEVATORS	1,360,000,000	6	0.441
AUTOMOBILES	2,925,000,000,000	39,000	1.330

[3] On December 18, 2011, a fatality occurred when a child fell out of a chairlift at Sugar Bowl Resort in California. The investigation of that incident is currently on-going, and the investigation is being conducted by the Placer County Sheriff's Department. Pending the completion of this investigation, this fatality is not being calculated as a fatality involving a chairlift malfunction.

[4] If one assumes each lift ride is one half mile long in distance traveled, U.S. ski areas have transported skiers/snowboarders 7.34 billion miles during the past 38 ski seasons (14.68 billion total lift rides multiplied by 0.5 miles traveled = 7.34 billion miles traveled on lifts. The distance from the Earth to the Sun is 93 million miles.

[5] Ski lift data uses 2010/11 industry statistics, when the industry had 60.54 million skier visits. This number is multiplied by 7.5 ski lift rides per visit (a conservative average number of lift rides per skier visit), transported, on average, a distance of 0.5 miles each chair lift ride, resulting in 227,025,000 passenger miles per year. With a total of 13 fatalities over 38 years, the fatality rate in that span is 0.316 fatalities per year. The fatality rate per year, divided by passenger miles, results in 0.149 fatalities per 100 million miles of passengers transported by ski lifts.

According to the Bureau of Labor Statistics, there are on average six passenger fatalities per year from riding elevators.[6] With elevators transporting passengers 1.36 billion miles per year,[7] there is an average fatality rate riding elevators of 0.441 per year (per 100 million miles traveled).

"In short, a person is *3 times* more likely to suffer a fatality riding an elevator than a ski lift, and *9 times* more likely to suffer a fatality in a car than on a ski lift."

In fact, driving an automobile is far more dangerous than riding chair lifts. In 2008, 39,000 people died in motor vehicle accidents in the United States, for a death rate of 1.33 for every 100 million-vehicle miles.[8] The fatality rate per automobiles is nine times the 0.149 fatality rate for transport on a ski lift.

The most recent death of a guest due a lift malfunction at a U.S. ski resort was in 1993, when a Sierra Ski Ranch detachable-grip lift failed. In 1985, there were two deaths caused by a malfunction of a lift at Keystone. There have been no other deaths related to lift malfunctions in the 1980s or 1990s at U.S. ski resorts.[9]

Fatalities from lift-related malfunctions in the U.S. are a fraction of the number of fatalities at European ski resorts due to lift malfunctions. While there have been 12 lift-related fatalities at American ski areas since 1973, over that same time frame, there have been at least 102 fatalities at European resorts from lift malfunctions – nine times the fatality rate of American ski areas.[10]

To be sure, ski areas are not immune from lift-related malfunctions which cause injuries and fatalities, but they are quite rare. Below is the history of ski lift-related malfunctions in the United States that resulted in fatalities, listed below chronologically:

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[6] According to the U.S. Bureau of Labor Statistics, Census of Fatal Occupational Injuries, 1992-2001 data (for proper comparison, this statistic only includes passenger fatalities, andexcludes fatalities involving employees working on or around elevators).

[7] According to "Elevator and Escalator Fast Facts," compiled by the National Elevator Industry, Inc., at www.neii.org.

[8] According to statistics (from 2008) from the National Safety Council Injury Facts®, 2010 edition, page 90.

[9] Two other deaths were attributed to chairlifts that occurred during non-operating hours, and one fatality that was not attributed to any lift malfunction. One fatality was an industrial accident at Copper Mountain, Colo., in August 1975 that involved an employee conducting summer maintenance. The other was at the Seattle Mountaineering Club, Wash., in 1997 when a child was tangled in a rope tow during non-operating hours at a private ski club that was not open to the public. Lastly, in 2009 at Heavenly Mountain Resort, CA, there was a fatality when a guest fell from a chairlift as a result of an entanglement from a nearby amusement facility.

[10] See Reuters, Sept. 6, 2005, "Chronology—Major Accidents in Ski Resorts"

SKI AREA	DATE	CAUSE	FATALITIES
Snow Trails, OH	2/25/04	Fall from chair	1
Sierra Ski Ranch, CA	4/4/93	Sheave battery failure	1
Keystone Resort, CO	12/14/85	Welding failure on bullwheel	2
Squaw Valley, CA	04/15/78	High winds deroped cables	4
Vail, CO	03/26/76	Cable wires entangled gondola	4
Warwick, NY (Ski area no longer in operation)	02/18/73	Deropement	1

Beyond the fatalities noted above from lift malfunctions and falls, there have been a number of other lift malfunctions at U.S. ski areas resulting in multiple passenger injuries, which are listed below chronologically:

AREA	DATE	CAUSE	# INJURED
Red Lodge, MT	12/28/11	Chair Detachment	2
Sugarloaf, ME	12/28/10	Deropement	8
Devils Head, WI	12/17/09	Rollback	13
Mt. Sunapee, NH	12/15/07	Deropement / Bullwheel	1

Lutsen, MN	8/10/00	Grip failure	6
Loveland, CO	1/27/92	Deropement	2
Heavenly, CA	4/1/81	Cable slipped on bullwheel	6
Hunter Mountain, NY	2/1/78	Rollback	4
Jiminy Peak, MA	1/30/77	Deropement	10
Pomerelle, ID	1/1/73	Rollback	10

Falls From Chairlifts

It is extraordinarily rare for a fatality to occur as the result of a fall from a chairlift which is not attributed to a mechanical malfunction or operation of the chairlift.

Passengers falling out of chairlifts are typically not recorded or collected by most state regulatory agencies; only Colorado's state Tramway Safety Board requires ski areas to report any incidents where a guest falls from a chairlift for any reason. Most often these incidents occur because of missteps while loading or unloading the chairlift, or while passengers are adjusting ski or snowboard equipment while on a moving lift. Similarly, there have been reports of individuals falling from chair lifts related to a pre-existing medical condition, resulting in fatalities (such as a skier suffering a heart attack, stroke, or seizure while riding a chairlift). Because these rare fatalities are not the result of the operation of the chairlift, these are not included for purposes of chair lift fatality statistics.

On December 18, 2011, a seven-year old boy died after falling from a chairlift at Sugar Bowl, Calif., the only known fatality that has occurred in the industry as a result of falling from a chairlift (because this incident is pending investigation by the Placer County Sheriff's Department, it is not included in chair lift fatality statistical data).

The *Denver Post* in 2002 studied years of data collected by Colorado's Tramway Safety Board regarding falls from chairlifts in Colorado. According to the *Denver Post,* "[a]n analysis of state accident reports by the *Denver Post* shows that human error – rather than mechanical problems, unsafe operation or weather conditions – is the cause of most falls from ski lifts."[11] As the *Denver Post* explained in their review of the

[11] See "Falls from Lift a Skiing Risk, but Serious Accidents Rare," *Denver Post*, Dec. 8, 2002.

agency's data, "[m]ost falls happen because of mistakes getting on, when skiers sit down badly or shift their weight too fast, or getting off, when skiers move forward too soon and lose their balance on the seat." In addition to the safe operation of chairlifts by ski resorts, skiers and snowboarders have a corresponding obligation to ride and use chairlifts in safe and responsible manner. According to the Skier Responsibility Code – the seven-point ethics code adopted by the ski resort community and NSAA in 1966 which has been adopted in skier safety legislation in many states – skiers and snowboarders are personally responsible to "know how to use the lifts safely."

Lift Inspections and State and Federal Regulation

Ski areas adhere to rigorous and exacting inspections procedures for the lifts at their resorts, and the fact that ski areas have not had a fatality due to a lift-related malfunction in 18 years is attributed to their meticulous inspection and maintenance programs. Ski area employees conduct their own individual inspection of theirs lifts on a daily, weekly, monthly, and annual basis. This year-round maintenance regimen is conducted pursuant to state agencies, lift manufacturer requirements, federal requirements, national safety standards and other inspection entities.

The American National Standards Institute ("ANSI") – a national, non-profit umbrella accrediting organization which oversees standard-setting committees for nearly every industry in the United States – has a standards committee dedicated solely to ski lifts and passenger ropeway systems. Safety standards for ski lifts have been established by the ANSI Accredited Standards Committee B77 ("B77" for short), which was started back in 1956 to recommend safeguards, principles, specifications, and performance objectives that would reflect the current state of the art of passenger ropeway design, operations, and maintenance. This B77 Committee – which sets national consensus safety standards – is comprised of government officials, engineers, lift manufacturers, ski area owners and operators, academics, and other members of the public interested in ski lift design, operation, and maintenance.[12] Membership on the B77 Committee is open to the public. The B77 Committee meets several times each year to address concerns by Committee members, review new technology, analyze incidents involving lifts, and vote on updates and changes to these safety standards on a regular basis. The current standards regulating ski lifts were most recently approved in 2011.

In turn, state regulatory agencies have adopted these B77 safety standards (and codified them into law) to govern ski lifts and passenger ropeway transportation.[13] In addition to these B77 standards, ski areas are subject to inspection by regulators from state agencies governing ski lifts based on the B77 standards. Importantly, most ski

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[12] Canada has a parallel standards committee, known as the Z98 standards, which are similar to ANSI B77 standards in the United States.

areas go above and beyond the minimum standards required by ANSI B77 Committee and state regulatory agencies. Furthermore, many states and other inspection entities require impartial, third-party engineers to conduct lift inspections. In fact, most states require surprise, unannounced chair lift inspections during the course of the ski season as part of the regulatory framework for lift safety.

Additionally, ski areas operating on National Forest System lands must adhere to lift-related requirements in their special use permits. The U.S. Forest Service requires certification and inspection of lifts in accordance with the ANSI B77 Committee standards. The U.S. Forest Service is a member of the ANSI B77 Committee and monitors ski lift construction and operation on public land.

As part of ski areas' maintenance and inspection procedures, independent specialists are brought in to inspect the wire ropes (the wire that carries the chairs) and chair lift grip testing. Areas routinely inspect tower footings that support the lift equipment, the sheaves that support the haul rope on the towers, gear boxes, brakes, and the electric motors powering the lifts, as well as other components. In fact, all ski lifts are required to have auxiliary engines as back-up power sources, in case there is a loss of electrical power. Lastly, ski areas routinely practice chair lift evacuation drills with their ski patrols in case of hazardous conditions or lift malfunctions.

Ski Resorts Invest Heavily in New and Upgraded Lifts

Ski areas across the country invest heavily in new ski lifts, lift upgrades, and overall lift maintenance. During the 2010/11 fiscal year, total ski industry expenditures on lift operations and maintenance was approximately $285 million – and this financial commitment does *not* include capital expenditures on new and upgraded lifts, which are accounted for separately.[14] In fact, over the past 10 years, ski areas have increased their spending on lift operations and maintenance overall by 92 percent in the decade. This represents a growing – and ongoing – financial commitment to effective and safe lift operations at ski areas across the country.

Likewise, ski resorts pour significant resources into new and upgraded chair lifts. This season alone, resorts are projected to spend $59 million on new and upgraded lifts – which represents a four-fold increase in investment in lifts from the 2010/11 ski season.[15] The Northeast region lead the country in installing new and upgraded lifts last season, with 15 lifts installed. Indeed, capital expenditures on new and upgraded lifts is well over $1 billion going back to the 1996/97 ski season, with an average investment at more than $69 million on new and upgraded lifts at resorts each year.

[14] This data comes from the *2010/11 NSAA Economic Analysis of U.S. Ski Areas*, which surveys ski resorts across the country, and is published annually.

[15] This data comes from Table 8 in the *NSAA Kottke National End of Season Survey*, which is published annually by NSAA.

Lift Maintenance: Technical Training and Education

The ski industry has a long-standing and exhaustive training and educational regimen for ski lift operators across the United States. The Rocky Mountain Lift Association (RMLA) is a trade association for maintenance and operation personnel for ski lifts and ropeways. Going back to 1970, RMLA has hosted an annual educational conference since 1970 in the western United States, with more than 375 attendees from ski areas participating in more than 70 different educational presentations and seminars on issues relating to lift safety, maintenance, and lift operations. Similarly, for ski areas located in the eastern U.S., the annual Lift Maintenance Seminar (LMS for short) has been holding similar educational workshops each year, going back to 1976.

In addition to these two mainstays of lift training and maintenance, there are numerous other regional workshops on lift maintenance, lift safety, and lift operations. There are lift maintenance seminars conducted annually by the Midwest Ski Areas Association, the Pacific Northwest Ski Areas Association, the Ski Areas of New York, and the Intermountain Ski Areas Association, and the New England Ski and Sports Summit. Indeed, the National Ski Areas Associations features lift operations seminars at their two annual winter conferences, in addition to eight regional locations during the NSAA Fall Risk Management workshops conducted annually. Lastly, the two main lift manufacturers in the United States – Doppelmayr USA and Leitner-Poma – conduct their own training and educational seminars for ski areas which have installed their lifts.

The comprehensive and exhaustive extent on training and educational opportunities for lift maintenance and safety in the industry is a testament to the amazing level of guest safety at ski areas across the United States.

Frequently Asked Questions

Q: How many ski lifts are there in U.S.?

A: Approximately 3500 – the vast majority which are traditional double, triple, and quad chair lifts (both fixed and detachable), as well as gondolas, surface lifts, rope tows, and aerial tramways.

Q: What is the average age of lifts installed in the U.S.?

A: It is difficult to accurately establish the average age of chair lifts, particularly in light of the fact that the vast majority of lifts have received significant upgrades to their dynamic machinery and critical components since installation. However, a clear majority of lifts were installed after 1980, and survey data indicates that 83 percent of all fixed grip lifts have been installed since 1970. Less than 1

percent of fixed grip chairs lifts were installed prior to 1960. Regardless of the date of initial installation, lifts can operate safely with proper maintenance and inspection for several decades. Rapid growth and investment in the ski resort industry occurred in the 1970s, 80s, and 90s, and well into this first decade of the 21st century, when the vast majority of chair lifts, gondolas, and other uphill transports were installed.

Q: Do manufacturers or state regulators have a recommended lifespan for a ski lift?

A: There is no recognized or consensus recommended lifespan for a ski lift, either based on the manufacturers' perspective or state regulators. Moreover, the ANSI B77 Committee does not consider or evaluate the overall safety of a lift based on its date of installation. Lifts are continually maintained and inspected on a daily, weekly, monthly, and annual basis, and moving parts (such as haul rope, sheaves, controls, drive systems, motors, gear boxes, bearings, and other components) are frequently being replaced or upgraded during the life of the lift. In addition, some chair lifts are operated at varying degrees of capacities (some lifts operated at full capacity all the time, some lifts are frequently idled, some lifts are operated both winter and summer seasons, etc). *Simply put, the date of initial installation of a lift is not indicative of the lift's overall level of safety*. Indeed, the last two lift malfunctions which resulted in fatalities (one incident in 1993, the other in 1985) both occurred on lifts that were less than one year old. Well maintained ski lifts – with proper maintenance and equipment upgrades – can operate effectively for decades past their date of original installation.

In this sense, chair lifts are similar to elevators in buildings. With proper inspection, upgrades, and maintenance, elevators can operate safely for decades, and often outlive the utility of the actual building themselves. Like automobiles, a person would not replace a car simply because it needed new tires; a ski area would not replace an entire lift system (many which are a half-mile in length or longer) when upgrading components will allow the lift system to continue to operate safely and effectively.

Q: How do resorts determine when to discontinue lift operations due to weather conditions?

A: It's a case-by-case basis, and there is no one-size-fits all procedure or protocol used in the industry. Usually, the decision to shut down a lift is determined by a select group of ski area managers, which may include the general manager, ski patrol director, the risk manager, and/or the manager of the lifts department. Moreover, different considerations would be used for different lifts at the same resort; some lifts located at higher elevations may be more exposed to wind and other conditions than lifts closer to the base of the resort. It is not unusual for a ski area to close a lift due to weather conditions.

Additional Media Resources on Ski Lift Safety and Operation

Jim Fletcher, **P.E.,** Professional Engineer and senior consultant with Shea, Carr & Jewell professional engineering firm; member on the ANSI B77 Standards Committee; for the past several decades, Jim Fletcher has worked as an engineer on numerous transportation projects around the country, including projects in the ski industry, as an independent, outside consultant. He is not associated or employed with any ski areas.

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THE NATIONAL SKI AREAS ASSOCIATION, LOCATED IN LAKEWOOD, COLO., IS A TRADE ASSOCIATION FORMED IN 1962 FOR SKI AREA OWNERS AND OPERATORS NATIONWIDE.

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