CONTACT: Adrienne Saia Isaac
Director of Marketing & Communications
aisaac@nsaa.org
(720) 963-4217 office

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NSAA Ski Lift Safety Fact Sheet

- In the 2017/18 season, ski lifts and aerial tramways transported a total of 53.3 million skiers a total of 200 million miles.
- The last guest fatality resulting from a mechanical malfunction of a ski lift occurred in the 2016/17 season.
- Since 2004, there have been three fatalities resulting from falls from chairlifts unrelated to mechanical malfunctions.
- A passenger is five times more likely to suffer a fatality riding an elevator than a ski lift, and more than eight times more likely to suffer a fatality riding in a car than on a ski lift.
- Lift maintenance, safety and operation is governed by ANSI B77 and regulated in many states by a state agency.

Overview
Aerial ropeways (including lifts, trams, and gondolas) remain one of the safest methods of transportation. Ski areas across the United States are committed to lift safety and have an excellent safety record for uphill transportation as a result of this commitment. 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.

Methodology & Terms
NSAA compiles lift incident information and updates this Ski Lift Safety Fact Sheet annually to provide ski areas and the public with the most current information on the ski 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 chairlifts.

The fatality and accident statistics included in this fact sheet focus on incidents involving ski area guests as opposed to ski area employees. Most employee-involved incidents are not situations in which the public would find themselves (such as ascending a lift tower to perform maintenance). Additionally, fatal falls from chairlifts that are the result of a medical event (e.g. heart attack, stroke, seizure) are not included in fatality data, as the cause of death is often inconclusive.

Ski lift: equipment installed to facilitate uphill transportation at a ski area. The term "ski lift" can also include conveyor lifts and rope tows.

Aerial tramway: a chairlift, gondola, or tram that moves via vehicles attached to a cable suspended in the air.

Surface lift: refers to people movers that are situated on the snow surface or allow the skier/rider to maintain contact with the snow surface, including conveyor lifts, rope tows, T-bars and Poma lifts.

Chairlift safety in context

Riding a chairlift, gondola, or tram while skiing, snowboarding, mountain biking or sightseeing, is an exceptionally safe and secure mode of transportation. There have been 13 fatalities from lift malfunctions in the United States since 1973 (the year NSAA began aggregating industry statistics)[1], a 45-year span during which the industry provided more than 17.5 billion lift rides to skiers and snowboarders.[2]

In this 45-year span, the ski industry has transported guests more than *8.76 billion miles in lift rides* — that is more than 94 trips from the Earth to the Sun over more than four decades.[3] 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. As of the 2017/18 ski season, the annual fatality rate per 100 million miles traveled on ski lifts was 0.145—far more safe, in comparison, than annual fatality rates of riding an elevator or in automobiles.[4] (see table 1 below). A passenger is *five times* more likely to suffer a fatality riding an elevator than riding a ski lift, and *eight times* more likely to suffer a fatality in a car than on a ski lift.

[1] NSAA first began tracking annual skier visits during the 1978/79 season. For the five preceding seasons (1973/74 to 1977/78), NSAA uses a conservative estimate of 39.7 million skier visits annually (which was the lowest skier visit number from the 1980/81 season) for purposes of compiling these chairlift statistics in NSAA's annual Ski Lift Safety Fact Sheet.

[2] During this 45-season period, U.S. resorts averaged 51.9 million skier/snowboarder visits per season, or 2.34 billion skier visits since 1973. To derive the 17.5 billion lift rides during this four-decade period, we conservatively assumed that each skier visit resulted in 7.5 ski lift rides per visit, and then multiplied 7.5 lift rides by 2.34 billion.

[3] If one assumes each lift ride is one-half mile long in distance traveled, on average, U.S. ski areas have transported skiers/snowboarders 8.76 billion miles during the past 45 ski seasons (17.5 billion lift rides multiplied by 0.5 miles traveled = 8.76 billion miles traveled on lifts). The distance from the Earth to the Sun is 93 million miles.

[4] U.S. ski areas had 53.3 million skier visits in the 2017/18 season. This number is multiplied by 7.5 ski lift rides per visit, with an average ride distance of 0.5 miles, resulting in 200,000,000 passenger miles during the 2017/18 ski season. With a total of 13 fatalities resulting from chairlift malfunctions over 45 years, the annual average fatality rate in that span is 0.288, or 0.29 fatalities per year rounded up. The fatality rate per year, divided by passenger miles, equates to 0.145 fatalities per 100 million miles of passengers transported by ski lifts.

Table 1: ANNUAL FATALITY RATE COMPARISON*

	Passenger Miles Transported Annually	Average # of Passenger Fatalities per Year	Fatalities per 100 Million Miles Transported
SKI LIFTS	206,000,000	0.3	0.145
ELEVATORS	1,360,000,000	10	0.74
AUTOMOBILES	3,131,000,000,000	37,800	1.21

* *NOTE*: Because of limitations in the availability of statistics from various organizations, it is difficult to compare year-to-year statistics for chairlifts, elevators, and automobile fatalities. As a result, we use data from the most current year available for each. For example, while there is chairlift transportation data from the 2016/17 season, the most currently available data for automobile fatalities is from 2015, according to the *National Safety Council Injury Facts*, 2017 edition.

According to the Bureau of Labor Statistics, there are on average 10 passenger fatalities per year from riding elevators.[5] With elevators transporting passengers 1.36 billion miles per year,[6] there is an average passenger fatality rate riding elevators of 0.74 per year (per 100 million miles traveled).

Driving an automobile is far more dangerous than riding a ski lift. In 2015, 37,800 people died in motor vehicle accidents in the United States, for a death rate of 1.21 for every 100 million-vehicle miles.[7] The fatality rate per automobiles is more than *eight times* the 0.146 fatality rate for transport on a ski lift.

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[5] According to the U.S. Bureau of Labor Statistics (BLS), Census of Fatal Occupational Injuries, 1992-2009 data, there were, on average, five fatalities among passengers while using elevators at work (for proper comparison, this statistic only includes *passenger* fatalities, and excludes fatalities involving employees working on or around elevators). In addition, there were, on average, another five elevator passenger fatalities per year in *non-work* related passenger incidents, according to 1997-2010 data from the Consumer Product Safety Commission—providing approximately 10 elevator passenger fatalities per year on average. Other sources indicate a much higher fatality rate for elevators (the *Los Angeles Times*, for example, reports on average 27 fatalities on elevators per year, but it is unclear whether that data includes both employee *and* repairmen injuries). Out of an abundance of caution, we are citing the lower statistic for comparison purposes with chairlifts.

[6] According to 2011 "Elevator and Escalator Fun Facts," compiled by the National Elevator Industry, Inc., at www.neii.org. **There are also stats available here: https://www.eesf.org/**

[7] According to 2015 statistics from the *National Safety Council Injury Facts*®, 2017 edition, page 104 (37,800 fatalities, and 3.131 billion miles driven).

The most recent death of a guest due a lift malfunction at a U.S. ski resort was in 2016, when a woman was thrown from a chairlift at Granby Ranch in Colorado as a result of the lift's electronic drive system, an event described by regulators as "unprecedented" in the industry. Prior to the 2016 incident at Granby Ranch, the industry went 23 years without a fatality related to a chairlift mechanical malfunction in the U.S. In 1993, a Sierra Ski Ranch detachable-grip lift malfunctioned, resulting in one fatality. In 1985, there were two deaths caused by a malfunction of a chairlift at Keystone Resort in Colorado. These were the only fatal chairlift malfunction incidents in the 1980s or 1990s at U.S. ski resorts.[8]

Fatalities from lift-related malfunctions in the U.S. are a fraction of the number of fatalities from European lift malfunctions. While there have been 13 lift-related fatalities at American ski areas since 1973, over that same timeframe, there have been at least 102 fatalities in Europe from lift malfunctions.[9]

Fatal chairlift malfunction incidents

Below is the history of ski lift-related malfunctions in the United States that resulted in fatalities, listed chronologically.

Fatalities from Chairlift Malfunctions

SKI AREA	DATE	CAUSE	FATALITIES
Granby Ranch, CO	12/29/2016	Chair hit tower during electronic operating system malfunction	1
Sierra Ski Ranch, CA	04/04/93	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

[8] There have been a number of fatalities involving chairlifts unrelated to mechanical malfunctions. Two deaths were attributed to chairlifts that occurred during non-operating hours—one fatality was an industrial accident at Copper Mountain, Colo., in August 1975 involving an employee conducting summer maintenance (for statistical comparison purposes, only fatalities for passengers—not employees—are counted for these statistics, similar to our comparative data with elevators). The other fatality was at the Seattle Mountaineering Club, Wash., in 1997, when a child was tangled in a surface rope tow during non-operating hours at a private ski club that was closed. Lastly, in 2009 at Heavenly Mountain, Calif., there was a fatality when a guest fell from a chairlift as a result of an entanglement from a broken zip line retrieval cord; this death was not attributable to a chairlift malfunction, but from the nearby zipline operation at the resort.

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

Vail, CO	03/26/76	Cable wires entangled gondola	4
Mount Peter, NY	02/18/73	Deropement	1

Non-fatal chairlift malfunction incidents

There have been a number of other lift malfunctions at U.S. ski areas resulting in multiple passenger injuries.[10] NSAA has included the 1972 incident at the Glen Ellen ski area in Vermont given the large number of resulting injuries from that incident, despite only keeping chairlift malfunction data since 1973. These multiple-injury incidents are listed chronologically.

Non-Fatal Injuries from Chairlift Malfunctions

SKI AREA	DATE	CAUSE	# INJURED
Timberline, WV	02/20/16	Cross-arm weld Failure	9
Sugarloaf, ME	03/21/15	Rollback	7
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	08/10/00	Grip failure	6
Sierra Ski Ranch, CA	04/04/93	Sheave Failure	2
Loveland, CO	01/27/92	Deropement	2
Mount Snow, VT	01/31/87	2 Gondola cabins fell due to grip failure	3

[10] The injuries reported include both those that were treated at local clinics and hospitals, as well as minor injuries treated at the scene of the incident by ski patrol and other first responders.

Heavenly, CA	04/01/81	Deropement	6
Hunter Mountain, NY	02/01/78	Rollback	4
Jiminy Peak, MA	01/30/77	Rollback	10
Pomerelle, ID	01/1/73	Rollback	10
Glen Ellen, VT	03/11/72	Rollback	35

Falls from chairlifts

Since 2004, there have been three fatalities resulting from falls from chairlifts that were unrelated to mechanical malfunctions. On February 25, 2004, a skier died when he fell from a chairlift at Snow Trails ski area in Ohio; it was unclear whether he died from a medical condition, or as the result of the fall. On December 18, 2011, a seven-year-old boy died after falling from a chairlift at Sugarbowl, Calif., the only known fatality of a minor that has occurred as a result of falling from a chairlift in the U.S. An investigation of the incident conducted by the Placer County Sheriff's Department found the cause of the incident to be inconclusive, but the cause was not attributed to mechanical or technical error. In 2014, there was a fatality at Hunter Mountain, New York, when a woman riding a chairlift fell from the chair; the fall was not attributed to any mechanical malfunction of the lift.

On a rare occasion, an individual may fall from a chairlift as a result of a pre-existing medical condition. For example, an individual may suffer a heart attack, stroke, seizure, or other medical event while riding a chairlift, which causes the person to fall. When a fall of this nature results in a fatality, the actual cause of the death is often undetermined (whether it be the medical condition itself, the fall, or some combination of the two). Because these fatalities from medical conditions do not reflect the overall safety of riding chairlifts for the public, these rare incidents are not included in industry fatality data.

Most state regulatory agencies do not record all instances of passengers falling out of chairlifts. The best statistical information regarding the causes of falls from chairlifts comes from Colorado, which accounts for more than one-fifth of all skier visits in the country. The state is home to 27 ski areas ranging in acreage, terrain, vertical steepness, lift capacity, and variety of chairlifts, and can serve as a representative sample for the broader ski industry. Colorado law requires ski areas to report any falls from chairlifts resulting in injury, along with the cause of the fall, to the Colorado Passenger Tramway Board, a state regulatory agency that oversees chairlift safety and operation.

NSAA obtained data from the Colorado Passenger Tramway Board in order to analyze and interpret the frequency and causes of falls from chairlifts to better understand the safety considerations for the chairlift operation. NSAA analyzed data from Colorado ski seasons starting in 2001/02 through 2011/12. In that 11-season period, ski areas reported 227 falls with injury from chairlifts to the

Colorado Tramway Board and the causes reported for the falls, which included human error, medical condition, operator/mechanical error, or unknown cause.

The results of this analysis establish that 86 percent of all falls are attributed to skier error and 4 percent of falls are due to medical issues of the rider. Only 2 percent of all falls from chairlifts were the result of mechanical or operator error, reinforcing the overall safety of chairlift operations. Additionally, 71 percent of all falls from lifts in Colorado occurred on chairlifts that had a restraint bar.

In 2002, the *Denver Post* published a study based on 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 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."

Lift Inspections and State and Federal Regulation

Ski areas adhere to rigorous and exacting inspections procedures for the lifts at their resorts. Ski area employees conduct their own individual inspection of chairlifts on a daily, weekly, monthly, and annual basis. This year-round maintenance regimen is conducted pursuant to regulations by state agencies, lift manufacturer requirements, federal requirements, national safety standards, and insurance company compliance policies.

The American National Standards Institute ("ANSI"), a national, nonprofit umbrella accrediting organization that oversees standard-setting committees for nearly every industry in the U.S., 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 (ASC) B77, which was started back in 1956 to recommend safeguards, principles, specifications, and performance objectives that would reflect the current state of passenger ropeway design, operations, and maintenance. The B77 Committee is comprised of government regulators, 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 Committee meets several times each year to address concerns by Committee members, review new technology, analyze incidents involving lifts and ropeways, and vote on updates and changes to these safety standards on a regular basis. The current standards regulating ski lifts were most recently revised in May 2017 in the 2017 version of the B77 standard.

State regulatory agencies have adopted these B77 safety standards, and codified them into law, to govern ski lifts and passenger ropeway transportation. In addition to these B77 standards, many ski areas are subject to inspection by regulators from state agencies overseeing chairlifts. Furthermore, most states and other inspection entities require impartial, third-party engineers to conduct lift

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

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

inspections. Many states require surprise, unannounced chairlift inspections during the course of the ski season as part of the regulatory framework for lift safety.

Ski areas operating on U.S. Forest Service (USFS) land must adhere to lift-related requirements in their special use permits. The USFS requires certification and inspection of lifts in accordance with the ANSI B77 Committee standards. Moreover, the USFS has members on the ANSI B77 Committee, and the agency monitors ski lift construction and operation on public land, as well as requiring high levels of insurance coverage.

As part of ski areas' maintenance and inspection procedures, independent specialists are brought in to inspect the cable (the wire rope that carries the chairs) and perform chairlift grip testing. Ski 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. All ski lifts are required to have auxiliary engines as back-up power sources in the rare instance of a loss of electrical power. Lastly, ski areas routinely practice chairlift evacuation drills with their ski patrol in case of hazardous conditions or lift malfunctions.

Technical Training and Education

The ski industry has a comprehensive 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. RMLA has hosted an annual educational conference in the western United States since 1971, 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 operations. Ski areas located in the eastern U.S. attend the annual Lift Maintenance Seminar (LMS), which has been holding similar educational workshops annually since 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. The Midwest Ski Areas Association, California Ski Industries Association, the Pacific Northwest Ski Areas Association, the Ski Areas of New York/Pennsylvania Ski Areas Association, the Southeast Ski Areas Association, the Intermountain Ski Areas Association conduct annual lift maintenance education seminars and hands-on training. Furthermore, NSAA features lift operations seminars at its two annual Winter Conferences and at nine regional locations during the annual NSAA Fall Risk Management workshops. The two main lift manufacturers in the United States—Doppelmayr USA and Leitner-Poma—conduct their own training and educational seminars for ski areas that have installed their lifts.

Chairlifts and Your Responsibility Code

Skiers and snowboarders have an obligation to use chairlifts in a safe and responsible manner. According to the ski industry's "Your Responsibility Code," the seven-point ethics code adopted in 1965 by the ski industry and which has been codified in skier safety legislation in many states, skiers and snowboarders are personally responsible to "know how to use the lifts safely." Skiers and riders are encouraged to ask ski area personnel for assistance if they are unsure of how to load, ride, or unload a particular lift.

NSAA Lift Safety Programming

Ski areas across the country observe National Safety Month in January, which is dedicated to education for both guest and employee safety. Many ski areas have developed comprehensive guest safety education programs and actively promote the seven points of the Responsibility Code. One of the points of the Responsibility Code is that guests must know how to load, ride and unload the lift properly. Guests should let the lift attendant know if it is their first time on a lift, if they are unsure of how to load, ride, or unload the lift. Additionally, NSAA's Kids on Lifts program emphasizes safe lift loading, riding and unloading practices for children.

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