

# SNOW KITING AND BIKING IN AVALANCHE TERRAIN

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**ABSTRACT:** In recent years the summer sports of kite surfing and dirt biking have developed winter equivalents: the new sports of snow kiting and snow biking are introducing more recreationalists to avalanche terrain. When snow safety skills lag behind a riders' ability to access steep, snow covered terrain, accidents may occur. Backcountry users, educators, and forecasters can explore the possibilities and potential problems that arise with the advent and growth of each sport.

**KEYWORDS:** snow kite, snow bike, winter mountain travel, avalanche terrain, avalanche safety

## 1. INTRODUCTION

Snow kiting and snow biking have developed as winter equivalents of their respective summer sports, kite surfing and motor biking. We decided to discuss these growing mountain sports, one non-motorized and one motorized, as an opportunity to work with recreational communities in preventing avalanche accidents.

By way of media coverage, email survey, anecdotal information, and interviews with athletes, we are able to describe a marked increase in the use of snow kites and snow bikes. With significant growth in user ship and advancing technology, the sports of snow kiting and snow biking have potential to expose many more recreationalists to avalanche hazard.

Entering avalanche terrain on a snow kite or snow bike raises potential tool-specific concerns as well as showcasing the benefits of each tool's ability to navigate steep snow covered terrain. This paper encourages backcountry users, educators, and forecasters to discuss and prepare for the future of these sports.

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### 1.1 *Snow Kiting*

Snow kiting is an outdoor winter sport that harnesses wind, enabling a person to glide on snow. The sport is similar to kite surfing or boarding, but uses snowboard or skis instead of surfboard or kiteboard. Historical use of skiers pulled across snow by kites dates back to the 1800s (Fig. 1), possibly earlier. During the late 1990s, snow kiting, as it is known today, developed.



Fig. 1: Bering Sea skier Nome, Alaska 1896

### 1.2 *Snow Biking*

Snow biking has been a dream of many since the early days of motorcycles. Contraptions like the Chrysler Snow Runner, once sold in the Sears catalog, did not last long because the motorcycle was ill equipped to compete with a snowmobile. With the 1998 release of the Yamaha 450cc high performance four stroke, a new era dawned in motorcycle technology that

opened the door, bringing the snow bike to the masses. According to Bret Blaser, who now helps design and market Timbersled snow bike kits, there were a few companies that designed versions of a snow bike, but it wasn't until 2009 when the Timbersled Mountain Horse kit truly enabled deep powder mountain riding. The kit transforms a 50 horsepower motorcycle into a snow bike capable of riding in areas that a 150 horsepower snowmachine cannot access.

A snow bike can mimic a snowboard in steep, deep powder - then turn around and climb right back up the same slope.

Changing over a motorbike takes a mechanically minded individual 2-3 hours and costs \$5300-6000. Since 2011, innovations have enabled the machines to handle in deep snow, spawning a new form of efficient backcountry riding.

## 2. GROWING MOUNTAIN SPORTS

Snow kiting and snow biking are growing mountain sports.

### 2.1 *Snow Kite*

Very little statistical information is available regarding different kite related practices on land or snow. We rely on anecdotal observation and kite media to confirm traditional skiing destinations have seen an increasing number of snow kites since 2000. In the last 4 or 5 years, big companies like Redbull have signed on to sponsor snow kite events. This exposure draws more people into the world of snow kiting.

It is growing in popularity in mountainous places often associated with skiing and snowboarding such as Russia, Canada, Iceland, France, Switzerland, Austria, Norway, Sweden and the United States. An example of a kiting location with easy access to avalanche terrain is Thompson Pass, Alaska. A windy spring day in April attracts 50 kites or more into or near avalanche terrain. Contrast that number with 5 years ago when kites in the area could be counted on one's fingers.

The sport is becoming more diverse as adventurers use kites to travel great distances over snow and sports enthusiasts push the boundaries of freestyle, big air, speed and backcountry exploration. According to a recent ISAF (International Sailing Federation) evaluation report for the inclusion of kite surfing in the Olympics, the total numbers of kite surfers worldwide is estimated at 1.5 million. The more relevant information included in the ISAF report is the total number of kites sold in 2011: 180,000 and the number of students taught in recognized schools: 60,000 in 2011. This allows us to estimate that the potential number of people who crossover to snow kiting could be in the thousands each year. Within hours a beginner kiter can be cruising on snow fairly effectively - especially if they already have previous kite experience on water (crossover participants).

Since 2008, kites have improved to become high performance pulling machines with full de-power and safety features, allowing them to be used in gusty mountain wind 5-40 knots. Foil kites are still common, while some kite surfers use inflatable kites for water as well as snow. Snow kites can reach speeds over 60 mph and cover more than 50 miles in a session. Learning on the flats, and then quickly aspiring to gain elevation, people around the world now use kites as a personal ski lift to take them up mountains. "Climb a 1000 meters in 15 minutes," tout snow kite makers.

Profiling a snow kiter is difficult due to limited statistics available; a survey of kite media shows a new snow kiter could be anyone who enjoys snow skiing or snowboarding and are willing to try something new. Motivations inherent with other mountain riders using skis, snowboards, ski touring gear, snowmobiles or snow bikes are similar: the need to get outside in winter, the need to enjoy nature, the need to have new outdoor experiences. They are most likely to be 30-60 years old and male. The sport is currently about 80% male, 15% female, and 5% children under age 18. A small percentage are backcountry skiers, but for many who have come from kite boarding, their snow kiting

experimentation could well be the first time they ride snow outside of a ski resort.

The snow kite demographic seems to be medium-high income earners with time to travel. An entry-level snow kite kit costs around \$500-2000 and includes kite, bar, lines, and harness. With little set-up time, one is ready to snow kite just by adding skis or a snowboard.

## 2.2 *Snow Bike*

Timbersled users are doubling every year, with approximately 4000 Timbersleds in use. There is a mix of people who opt to try snow biking. Long time snowmobile riders are trying it for something different - a new way to play in the backcountry. A few choose to own both a snowmobile and a snow bike. Some have sold their snowmobile and now ride only a snow bike. The more interesting demographic from a safety perspective might be the dirt bikers who have not ridden on snow, but buy the kit, and enter into the mountains in winter for the first time.

A new snow biker could be anyone who enjoys motorized travel, ages 11 to 70ish. They are most likely to be male aged 18-40. The number of women who ride both snowmobiles and dirt bikes has grown steadily in the last 10 years, so presumably as snow biking catches on, more women will be giving it a try. The snow bike demographic also seems to be medium-high income earners with time to travel.

Through a limited survey of avalanche forecasting centers and backcountry users, increased snow bike use in the last 2-3 years has been observed. In some areas, it may represent nearly 10% of the motorized use. In areas where snowmobile mountain riding is popular, snow bikes are gaining popularity, examples include: northern Idaho, Montana, Utah, Alaska, Washington, Alberta, and British Columbia.

Motorcycle riders who are not previously snow riders may well be the largest percentage of snow bikers in the near future. Estimating the percentage of dirt bikers that will try snow biking is difficult, but predicting

an increase similar to the trend of flatland and trail snowmobilers changing to mountain riding in the 1990s, we can guess that 1000 or more new snow bikers a year could be introduced to North American avalanche terrain. Ownership of motorcycles went up in the United States 51% from 2000-2005. Probably an underestimate, but near 1 million dirt bikers live in mountainous regions of North America. Snow bikes attract people who already own a motorcycle. All they need is the track and ski kit to use their machine year round.

## 3. EXPOSURE AND ACCESS TO AVALANCHE TERRAIN

Snow kiting and biking enable increased access to avalanche terrain.

### 3.1 *Snow Kiting in avalanche terrain*

What can be accomplished with a kite on snow is yet to be explored; avalanche terrain is one of the next proving grounds. Some locations for snow kites are not in the mountains, but a growing number of kite destinations do have avalanche danger. To list a few: Thompson Pass Alaska, Skyline Utah, Vail Colorado, areas near Jackson Hole and the Big Horn Range of Wyoming, parts of Idaho, and locations in the Beartooth, Absaroka, Madison and Centennial Ranges of Montana.

Kites can cover a lot of ground in relatively short periods of time. Jennie Milton, one of the authors, has logged 30,000 vertical feet in less than 4 hours. Tacking back and forth very similarly to how a sailboat tacks – kites cross multiple aspects, both up and down the mountain.



Fig. 2: Kiter in an avalanche run out zone.

Even though a kiter might not be planning to kite in steeper terrain, gaining access to snow kiting venues may require traveling through or under avalanche paths (Fig. 2). Several of the kiting destinations require skiing or hiking from a trailhead or ski area boundary.

### 3.2 Snow Biking in avalanche terrain

Snow bikes are able to travel into new terrain previously not accessed by motorized tools. Navigation through tight trees has previously limited where motorized vehicles could go. Snow bikes are changing that. Skilled snow bikers can select routes through thick forest into areas similar to what ski touring permits, opening vast amounts of new upper terrain for exploration. “From boondocking through the tightest trees, to side hilling and climbing the steepest mountains. Riding a Mountain Horse is easy to learn and will give you confidence to go places and do things that you never do on any other snow machine,” says Timbersled’s website.

If one can already ride a dirt bike, it does not take much time on the machine to put a novice rider into steep terrain. The temptation for new snow bikers to start climbing and side hilling could quickly outpace their understanding of avalanche safety. Reagan Sieg, a pro motocross rider took up snow biking four years ago. His advice to new riders: “Make sure you go into the backcountry prepared! Snow conditions are always changing. Make sure you have

gone through the right steps to help make each ride a safe one so everyone can talk about how fun the day was down in the parking lot.”

## 4. SPORT SPECIFIC AVALANCHE CONCERNS

Each sport has unique ways of traveling on snow, as well as avoiding and managing the avalanche hazard.

### 4.1 Snow Kites and avalanche concerns

Snow kiting requires rather large, open spaces with snow cover. For this reason, the avalanche concern associated with snow kiting will be limited to mostly glaciated and alpine terrain. An interview with a Thompson Pass skier new to kiting revealed a fairly common experience: he had a ‘panic attack’ when he found himself kiting up a mountain he knew well - it suddenly donned on him that this time was different because he was “way the heck up there in avalanche terrain with no guide, no gear, no one knew where I was or what I was doing.” He had no backpack, no beacon, no probe, no shovel, and no plan – other than riding the wind higher and further than he had before. The exhilaration of riding uphill had far surpassed his situational awareness. He exposed himself to avalanche hazard without taking his customary precautions.

Most kitters on water and snow adhere to the rule, ‘kite with a friend for safety’. For mountain riding this can be expanded by adding ‘and carry avalanche rescue gear.’ At this time, very few snow kitters are in the habit of wearing beacons or carrying rescue gear. Wearing a beacon and carrying a pack with probe and shovel in side can be added to the ‘gear list’ for kiting in the mountains- because, “you never know where the wind might blow.”

Kiting is different from traditional ski touring in the following ways:

- Kitters seek the wind, thus making it more likely to encounter freshly wind loaded slopes that could be unstable.

- Kite surfers crisscross open slopes to gain elevation.
- Kite surfers might try to travel up ridges, but updrafts can pull a kite off, into dangerous terrain.
- Kite surfers prefer open slopes due to the consistent wind, but those very slopes (large, planar, and 35 degrees) have the capacity to avalanche quite large.
- Kite surfers often play on cornices and wind lips, using these features like waves - popping off, catching air, and landing.
- The stress of 'catching' the wind can distract riders from looking for objective hazards.
- Crossover kite surfers from kiteboarding have the kite skills to enter avalanche terrain very quickly, but their ability to use their tool may surpass their avalanche skills.

The good news is many experienced kite surfers are adept at using weather forecasts to interpret the wind potential for their sport. Combine this habit with avalanche awareness, and they will be comfortable accessing their local avalanche forecast. Trained kite surfers know to look for subtle surface clues that interpret the current and recent wind transport of snow. They do test cuts on multiple aspects and dig quick hand pits to provide more information. This skill set is primed to incorporate further knowledge and experience into their decision making about where to go and why.

The following questions and discussions came up multiple times in our conversations with snow kite surfers in regards to a kite surfer getting caught in an avalanche and how rescuers can prepare for these incidents:

- What does the kite surfer do if they trigger an avalanche and begin to get pulled down with it? The most common consensus was to attempt to power up the kite and get pulled off slope or catch air and allow the

slide to pass below. Kite surfers use this technique to prevent from getting worked in the surf. What if powering up doesn't work? Several people said to pull the safety release and pray that you don't get caught and strangled by your lines while getting avalanched.

- What happens to the kite during the avalanche? If the kite is in the air at the bottom of slope, the powder blast could be a major concern - pulling the kite violently fast. If the kite is on slope when the slide is in progress, the rider could be pulled down mountain, which creates slack in the kite lines and could cause the entanglement issue.
- What should a rescuer do if a kite surfer has been caught and buried in an avalanche? If the kite is on the surface, safely secure the kite to avoid rescuers being hurt and try following the lines to the victim. For a beacon search, know that kite lines are 25m on average, search in a 50m radius around the kite.
- If the avalanche site is windy, a kite should be approached carefully. Rescuers should hold the kite in a manner that will not get them or other rescuers wrapped in lines. After a lifeguard was hurt during a rescue of an injured kitesurfer in California, lifeguards in many countries are now taught these skills. Mountain rescue teams in snow kite areas could learn from this.

#### 4.2 Snow Bikes and avalanche concerns

Initially, early adopters of the sport were snowmobilers. Now, a larger percentage is dirt bikers who have never or rarely ever been exposed to backcountry winter conditions. They have a machine capable of putting them in extremely dangerous terrain, and may not realize the risks, or have the proper training or equipment to cope with those risks (Blaser, 2014).

Similar to snowmobiling, snow biking's most obvious concern is having the power to travel into avalanche terrain very quickly. Riding longer distances, multiple drainages, aspects, and elevations in a short time period potentially increase the exposure and subsequent avalanche risk.

In contrast to snowmobiles, snow bikes do not highmark as well as they side hill. Side hilling allows snow bikers to access terrain that is not traditionally traveled by other machines. When snow bikers explore off the beaten paths, they might find lingering snow instability not found in heavily trafficked areas.

The introduction of a new tool in the backcountry brings the question of how that tool will travel on and stress the snow. How does the stress bulb of a snow bike compare with a snowmobile? Snow bikes weigh an average of 300 pounds (dry weight) with a typical track width of 12.5 inches and track length of 120-137 inches. Mountain snowmobiles often weigh more than 500 pounds with typical track width of 15-16 inches and 136-174 inches in length. Jeremy Hanke, one of the authors, has been involved in stress bulb and slope testing of snowmobiles and looks forward to experimenting with snow bikes more this winter.

As taught by snowmobile avalanche educators, speed and agility can be a motorized rider's friend. A rider can gain valuable information in minutes by targeting inconsequential terrain (small test slopes), checking for slab depth and sensitivity. Riders can leave an area with unstable conditions and relatively quickly, find another place with better, safer conditions.

For exiting an avalanching slope, a snow biker must have the same contingency plan as someone on skis, snowboard, or snowmobile - get off and out from under moving snow.



Fig. 3: Snow biker descending steep slope (Reagan Sieg photo).

As with other backcountry users, successful snow biking groups will take the time to:

- Agree on an objective for their ride, discuss the terrain they will be entering and why.
- Articulate exactly what terrain they will avoid and why.
- Agree and communicate re-group locations.
- Have the skills and gear to perform an effective companion rescue.

If riders recognize that one or all of their members are lacking skills and experience, their terrain options can be simplified or flattened.

## 5. AHEAD OF THE CURVE: OUTREACH AND EDUCATION OPPORTUNITIES

We know good decision making begins with acknowledging the risk. If the new sports of snow kiting and snow biking grow with avalanche safety information accessible and specific to their unique users, then perhaps preventable accidents can be avoided. In a perfect world, learning the basics of backcountry snow safety should be just as important as learning to fly a kite or ride a bike.

Awareness of the risk can help reduce the unknowing from entering avalanche terrain and dangerous situations. A logical step for educators and forecasters would be to encourage a message of safety from the top

of the sport's food chain to the bottom: snowmobile manufacturers have recently heightened awareness and are now actively encouraging a culture of safety through advertising and support for avalanche information. It makes sense that snow kite and snow bike manufacturers follow suit. Blaser says Timbersled is currently educating new riders at its' demo rides, online chat rooms, and have a web marketing and dealer training campaign coming December 2014 with avalanche safety as a priority.

Development of a sport specific information card that comes with purchased kites and bikes could provide the basic avalanche safety messaging like being aware of conditions, choosing terrain appropriate for the avalanche danger, knowing what to do if an avalanche occurs, and carrying beacon, probe, and shovel. Encouraging new riders to join groups that have avalanche skills and knowledge. With experience gained from the ski, snowboard, and snowmobile populations, support for this safety messaging could come directly from the manufacturers and/or the avalanche industry.

The next level of influence in any sport is with top athletes. These are the riders that people young and old look to for example. They play a key role in the growth and development of their sports. Riders promoting sports are role models through which others learn to be avalanche savvy and rescue ready. Top riders who exemplify safety consciousness can communicate this through advertising and the Internet. Reagan Sieg, a snow biker living and riding in British Columbia, has already embraced this role - increasing avalanche awareness in his backcountry community. Likewise, Jennie Milton, one of the authors, has done the same for her snow kiting circles in Alaska, Oregon, and Australia.

Awareness of the risk of riding in avalanche terrain could be introduced in interviews with 'professional' and top-name riders, pointed articles in sport magazines, online media, Facebook pages, weather sites, and forums specific to the sport. Utilizing a well-known

rider as the ambassador for this message immediately increases the effectiveness of the outreach. Media pieces can succinctly outline what riders do to ensure avalanche accident prevention:

- Trip preparation and planning
- Effective group communication
- Use alternatives if snow conditions seem unstable or group's ability does not match the terrain

A series of informative sport specific videos, like [Throttle Decisions](#) (created by the Canadian Avalanche Association), may be useful to spread these ideas.

Avalanche educators are the next step in providing opportunities for riders to hear the concepts again and practice them in the presence of an 'expert'. Developing avalanche educators who have a solid understanding of their sport is crucial for conveying the nuances of how their tool might be used to increase the margin of safety.

And finally, the information provided by an avalanche center is implemented into the rider's decision making. The more background education and experience the rider has, the more useful the forecast will be in locating appropriate locations to recreate and enjoy the mountains. If avalanche danger is on the rise in areas frequented by snow kiters or bikers, forecasting centers may choose to make note of this in their travel advisory. This could help the riders make better decisions - it also forges a relationship with the public and encourages observations and feedback to be shared with the forecasters.

There are many ways to connect avalanche safety with riders. While these sports are new and relatively small, educators, forecasters, and manufacturers who begin this effort now will most likely have a large impact on the future. Snow kiters and bikers might never remember a time when avalanche concerns weren't part of their riding plans.

## 6. DISCUSSION: SNOW BIKES AND 'NEW' SPORTS

We realized different people reference different sports using the same term 'snow bike'. To some, snow bike is synonymous with 'fat tire bike', especially if one works in or near a 'wilderness area'. Our survey that we emailed out asking avalanche forecasters and educators to comment on their impressions of the sports brought up discussion about fat tire bikes - mountain bicycles that have wide, soft tires. A few interesting thoughts were shared about fat tire bikes in avalanche terrain. Several people expressed concern that with the advent of fat tire bikes, people are riding summer trails year round, sometimes traversing or riding in the run out of avalanche paths. There was even a case of a highway avalanche closure being complicated by a group riding fat tire bikes on a summer trail that parallels that highway. It was also mentioned that in hard surface snow conditions, fat tire bikers are able to travel off-trail and could conceivably expose themselves to wind or hard slab avalanche concerns.

Another snow travel tool termed a 'snow bike' is a mountain bike-like frame mounted on skis. These have mostly been introduced at ski areas as downhill rides. They supposedly do not perform well off-piste, so their riders may not be able to get into or under much unmitigated avalanche terrain.

Many snow sports have been introduced over the years, including paraponting, base jumping, variations on snowboards (no-board), variations on skis (bigfoot, mono ski); some seem to be fads, some micro-niche cliques, but all deserve attention when it comes to the potential dangers of participation. We hope to help curb the avalanche accident rate through prevention and awareness.

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