Backcountry Ski and Splitboard Touring Course

Equipment

Equipment for ski and splitboard touring has improved very quickly in recent years. This has made it much more affordable, comfortable, and fun to get out touring. There is a lot of equipment choices to make and it is a big investment so it pays to know exactly what to look for.

Ski and Splitboard Touring Boots

Good ski boots are perhaps the most important item of equipment for ski touring. Ill-fitting, uncomfortable, or heavy boots are the most common trip spoiler we see. The boot is also the direct interface with your skis, without a good fit you will not get the optimum performance and enjoyment from them. Your regular downhill ski boots that are used on a ski field can be used for touring. However dedicated modern Alpine Touring boots are significantly lighter, with a great degree of movement for uphill travel, and nowadays offer similar ski performance to downhill boots.

Every foot is different so it is worthwhile visiting a professional boot fitter before buying any boots and different brands suit different sizes of feet. Similarly, the factory insole is unlikely to give you the best performance. If your feet are relatively normal, an off-the-shelf insole will improve comfort and for the more atypical shaped feet, a custom made insole is a very worthwhile investment.

Regular freestyle or free-ride snowboard boots are fine for touring with snowshoes or splitboards. For more technical mountaineering objectives, dedicated snowboard mountaineering boots are preferred. These offer a stiffer sole with heal welts for compatibility with boot crampons and better edging when boot packing in firm snow. Also a slight rear flex for more comfortable uphill travel and a rand for protecting the longevity of the boots. Check out brands like Fitwell®. More dedicated splitboarders also use lightweight ski boots combined with bespoke splitboard bindings.

Alpine Touring (AT) Skis and Bindings

Traditional frame bindings are generally cheaper but don't come close to matching 'Tech' or pin bindings for reliability, performance, and, most significantly, weight. Tech bindings might take a bit of getting used to but once mastered, they are simple to use. Hybrid bindings, such as the Salomon Shift, now offer a crossover option. These are DIN certified with the release reliability of standard downhill alpine bindings whilst offering the uphill performance of pin bindings.

There are compromises however in weight and ease of use but allow a one ski quiver for both ski field and backcountry.
With modern, lightweight, AT boots and bindings you can easily get away with a well-performing and potentially slightly heavier ski. The lightest touring-specific skis don't have the waist width or tip and tail stiffness to perform well in variable snow conditions and are best suited to 'skimo' racing. An all-mountain ski with an intermediate waist width (95-110 mm) works well in NZ.

Splitboards

Splitboard technology has developed rapidly over the last few years and is now a reasonable method of backcountry travel. Modern splitboards will perform similarly to normal snowboards downhill but can be split in two to go uphill similar to being on skis. The most popular splitboard bindings are Spark R&D or Karakoram. There are a few more parts to a splitboard binding so they can also be prone to icing. Having a tool handy for getting rid of ice buildup helps. At first, reconfiguring between downhill and uphill mode can be time consuming so some practice is useful before heading out on longer trips.

Snowshoes

Although snowshoes are a cheap and easy way to get into backcountry touring, they are much less efficient than using splitboard or AT ski gear. Snowshoes are best suited to flatter terrain, so not the typical terrain that skiers and snowboarders aspire to travel to. Snowshoe travel in very soft or firmer snow conditions or steeper slopes will be much more tiring and uncomfortable.

Ski and Splitboard Crampons

Snowboard boots do not offer much lateral ankle support and splitboards do not have the stiffness, length, or edging ability of skis. This limits splitboarders' edging in firm or icy conditions, possible at any point in NZ during winter. Splitboard crampons are therefore essential equipment for all trips. If hiring snowboard equipment, make sure that you have splitboard crampons as these are highly specific to the binding so difficult to source last minute.

Ski crampons improve the security of AT skis in firm conditions and are highly recommended throughout winter. They are also essential for glacier or spring (late August onwards) touring trips. Ski crampons are similarly specific to bindings types and models, may not be available locally, and need to be sourced in advance.

An ice axe and boot crampons can also be useful additions to the touring kit. Particularly after there has been rain on the snowpack followed by cold temperatures during winter, or in spring

when solar-facing slopes have received a number of melt-freeze cycles and become firm and icy in the morning.

Touring Skins

For traction uphill whilst touring, skins are stuck to the bases of the skis or splitboard. These allow sliding movement in one direction but grip in the other. Traditionally made from seal skin, they are now made from nylon, mohair, or a mix. Nylon is cheaper and last longer but has a less efficient glide than mohair. This makes the mix a good compromise. Most skin brands either come pre-cut for a particular ski or come with a cutting tool that makes it easy to trim to your skis yourself.

Skins can either adhere to the base of the ski with skin glue or a self-adhesive system. Glue is very reliable but easy to get contaminated by dirt and debris. Over time, this can affect their stickiness so require periodic cleaning and even reapplying of glue. Self-adhesive skins are easier to handle and maintain. Without the sticky glue, they can be stored more easily rolled up in your rucksack or in a pocket of your jacket. However, they do need to be looked after whilst on the go as excessive moisture or cold dry snow on the self-adhesive face can stop them from sticking to the skin bases.

Skin maintenance

You should always dry your skins out after use and keep them in a cool dry place during warm summer weather (even the freezer). This stops the glue from gunking up. Experienced tourers often prefer to store them in jacket pockets when going uphill as it helps them to dry out a little and avoids getting the backpack off, saving time during transitions. The skin saver sheet that most skins come with is best left at home as it's just another thing to manage in cold or windy conditions. Good maintenance is essential for the long life of the skins. A great tip is to always have some skin or candle wax in your repair kit. Especially during spring, soft, warm snow can start sticking to the underside of your skins, halting progress. This usually happens near the end of the day when already energy levels are low.

Poles

For ski tourers, any ski pole will do but is nice not to be too heavy. For splitboard touring, poles need to be telescopic or collapsable so they will fit into your backpack when travelling downhill. Avoid stowing poles (or anything) on the outside of your pack where they can easily be lost. Telescopic poles can get iced up. 3 section collapsable poles tend to break down smaller for the best fit inside a pack. On traverses, splitboarders will often keep out a pole for assistance.

Helmet

There are now many lightweight helmets available for touring so are becoming a standard piece of equipment. Dedicated ‘alpine’ or downhill ski helmets are often too warm for wearing uphill so need to be carried in or on your pack. Many helmets now come with a ski touring rating or are dual-rated for ski touring, climbing, and mountaineering. Purely climbing rated helmets are designed to deflect falling ice and rocks from above. Although better than nothing, they do not provide the same level of side protection as skiing helmets.

Avalanche Safety Equipment

Avalanche safety equipment is essential for ski and splitboard touring. All modern digital 3-antenna transceivers operate on the same frequency. It is important to become familiar with and regularly practice with your own device. Marking functions are useful for complex rescue scenarios but a lot has gone wrong if you are having to use it for real.

You should wear your Transceiver in a chest harness under outer layers or a zipped pant pocket. They should also be separated at least 20cm for electronic devices as they can cause interference. Transmitting devices must be in flight mode.

A 2 to 3 metre probes are most commonly used for the depth of snowpack usually encountered in NZ. Practice taking it out of your pack (leaving any sleeve inside the pack or at home), deploying downhill AND locking. Many an avalanche rescue practice has been slowed down by a floppy probe.

Shovels must be strong and durable in order to be effective for digging. Telescopic handles offer significantly better performance digging in hard snow or avalanche debris. You will notice a big difference in digging with lightweight models or shorter handled models. Make sure your companions have a solid shovel. Digging can be the most time consuming part of an avalanche rescue and you want to give them the best chance of getting YOU out.

Backpack

Finally, you’ll need something to put all your equipment in. A dedicated touring pack with a separate avalanche tools pocket is worth the investment. This allows for good organisation and to keeps the main contents of the pack dry. Other useful features are ice axe attachments and helmet pouches.

Small day packs won't do. You'll need space for touring essentials including map, compass, first aid kit, emergency shelter, emergency communications device, goggles, sunglasses, suncream, head torch, food, and water. A Buff® style neck gaiter is a useful item for keeping warm, keeping out drafts, and sun protection on glaciers. Even in winter, the sun can be strong. A baseball-style cap is useful for uphill travel.

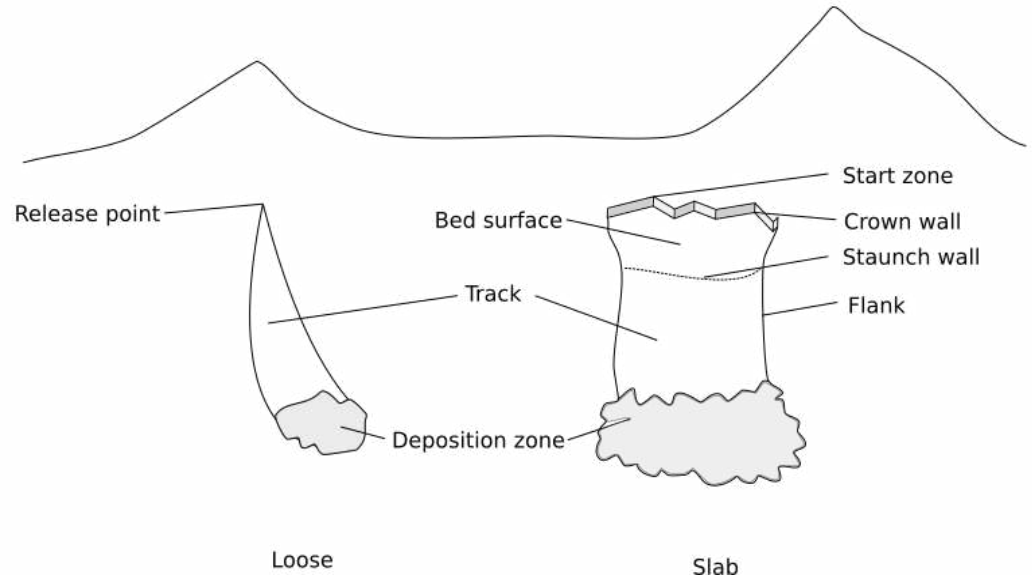
Avalanche Skills

Avalanches are a fascinating and complex science. Luckily learning how to avoid them is a whole lot simpler. You can avoid exposure to avalanche hazards by being confident in identifying and avoiding avalanche terrain and being able to assess the indicators of dangerous avalanche conditions. It is only when the decision is made to push into steeper or more complex terrain that a tacit agreement is made to accept a certain amount of risk. Having our eyes open to gather information, and being aware of our uncertainty and limitations allows us to make good decisions to manage this risk. Finally, being well practised in rescue techniques may help minimise the consequences should a member of your party get caught in an avalanche.

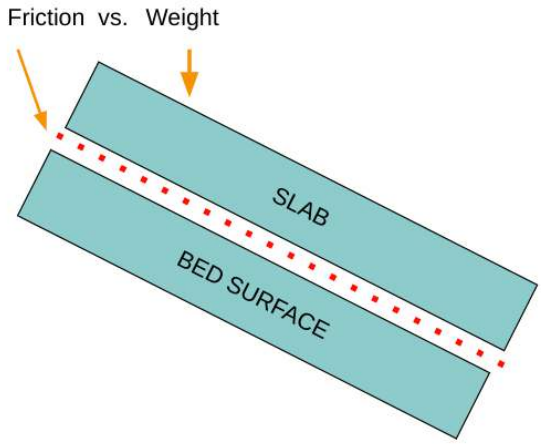
Basics

There are 2 main types of avalanches:

Loose avalanches are also known as point release avalanches as they initiate at a single point and fan out. They are often relatively small, involving either very wet or very dry snow in the upper layer of the snowpack, and can be easy to predict. Even a small one can be dangerous if they carry a person into a terrain trap such as rocks, gullies, or over cliffs. They are usually triggered naturally by new snowfall or rapid warming from the sun or rain and are distinctive in appearance by their teardrop shape.



Slab avalanches are generally bigger, posing a bigger danger to backcountry users and can be more difficult to predict. A typical winter snowpack is made up of many layers and an obvious indication of a slab avalanche danger being present is a snowpack structure that includes denser cohesive layers of snow above weaker, less dense layers. Slab avalanches can be triggered by additional load from new snow, rain or the weight of the person, overcoming the friction of the weak layer and resulting in the slab fracturing into chunks and travelling down the track or path to the deposition zone.



Slab avalanches that have released are easily spotted because the top of the avalanche will have a crown wall, an easily discernible horizontal line across the slope at the top of the slab. The crown wall can be anywhere from a couple of centimetres to several metres in depth depending on the depth of the weakness. Below the crown wall there will typically be a smooth slope, known as bed surface, bounded on each side by the flanks.

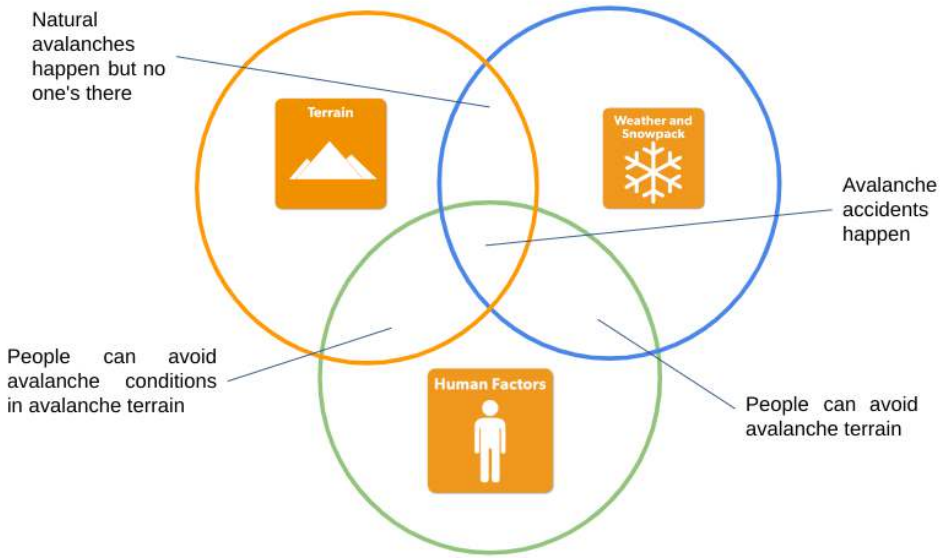
Avalanche character

Avalanches are further categorised by their character. Characters can be slab or loose, wet or dry and these are used within avalanche forecasts to provide more information on where the

danger is likely to exist, how to identify the problem, and how to manage the risks. Different characters will exhibit different parameters on the extent of the problem, what terrain to favour or avoid, which observations are most useful, the expected size of the avalanches, perceptibility to triggering, and how long the problem is likely to persist.

Risk management

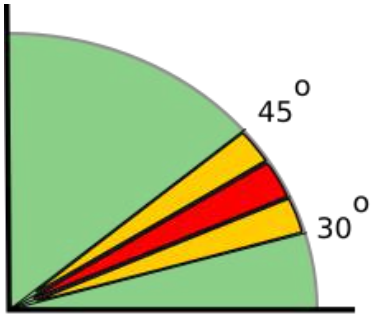
Avalanche may be encountered whenever the appropriate snowpack conditions exist in areas of avalanche terrain. As backcountry travelers, we only expose ourselves to danger by entering avalanche terrain.



Terrain

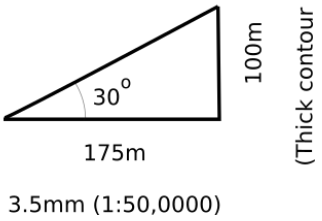
Being able to identify avalanche terrain is the most important skill in avoiding avalanche danger. Avalanche terrain is classified as areas that are either areas where avalanches can occur or areas that are exposed to avalanches from above. There are 5 main characteristics that can be used to identify avalanche terrain and the first line of defense from avalanche risk is avoiding avalanche terrain.

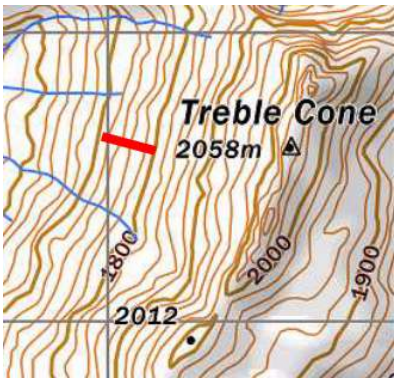
Angle

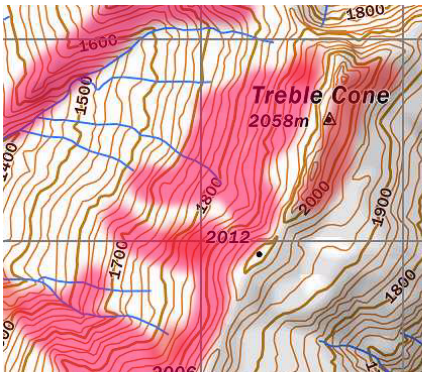


Slope angle is the most important characteristic of avalanche terrain. Avalanches most commonly occur when the slope angle is between 30° and 45° with slopes between 35° and 40° being the most common. Shallower are generally not steep enough for the snow to slide unless in unusual circumstances whilst on steeper slopes, snow will constantly slough and does not tend to accumulate.

Most avalanche terrain can be identified simply by using the contour information available on topo maps. To measure slope angle from a map measure the distance between the thick 100m contour lines on a 1:50,000 scale topographic map. Slopes less than 30°, will have a 3.5mm spacing between these thick contours. Areas with a similar contour spacing will have a similar slope angle. A useful exercise is to shade all slopes that are between 30° and 45° as a prompt to assess the avalanche danger before travelling into these areas.

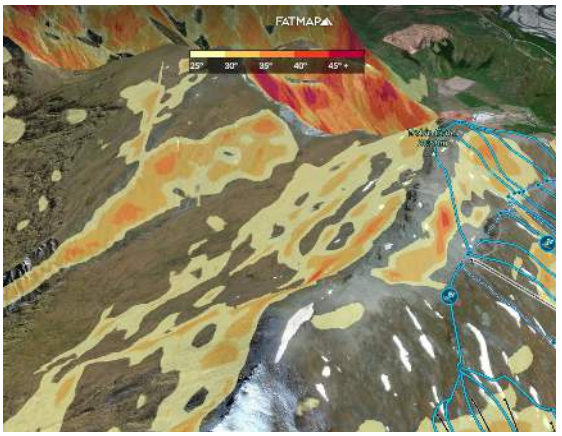






Assessing slope angle using a topo map

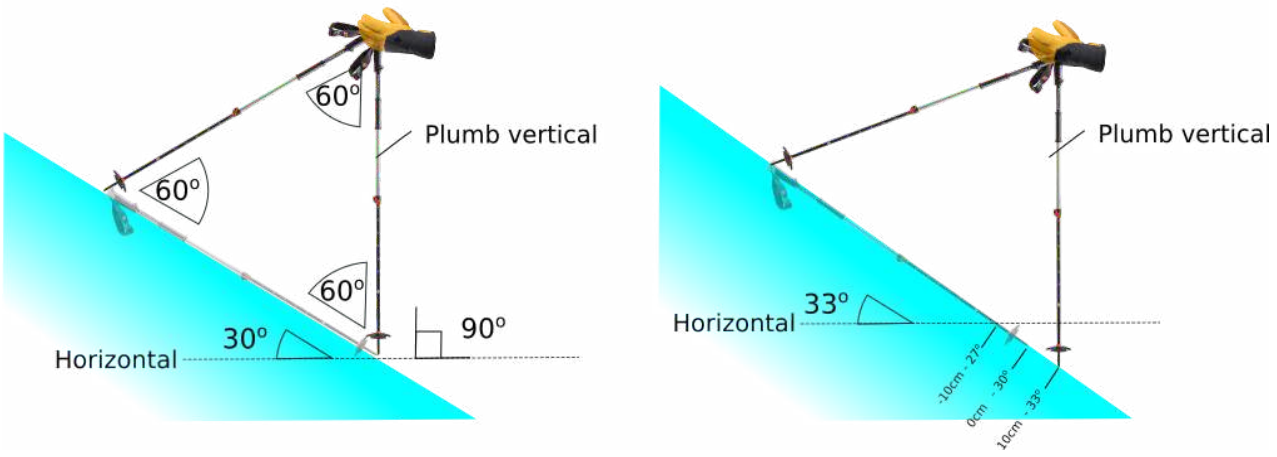
Websites and smartphone apps such as Fatmap® provide powerful tools for assessing avalanche terrain. These can be used as a guide to identifying the complexity of avalanche terrain using terrain overlays that highlight slope angles between 30º and 45º.



This terrain analysis can be used as a guide for avalanche decision-making and can be further refined out in the field by observation and measuring. Inclinometers or smartphone apps provide accurate slope angle measurements. Otherwise using two ski poles of equal length works well:

1. Lie a pole down on the snow making an indentation;
2. Place the tip of the first pole at the handle end of the indentation;
3. Hold the handle of the other pole next to the handle of the first pole and let it hang plumb vertically;
4. If the tip of the plumb vertical pole meets the tip of the indentation, the slope is 30º.

For every 10 cm beyond (down the hill) the plumb vertical pole hits the surface of the snow, add 3º to the steepness. Subtract 3º for every 10 cm it lands above the tip of the indented pole.



Measuring slope angle in the field

Aspect

The aspect of a slope will determine the slope's position relative to important conditions factors such as loading from the wind or warming from the sun (see Observations below). In NZ north facing slopes will generally be warmer and have more effect from the sun than cold and shady south-facing slopes. This is opposite to the Northern Hemisphere. An awareness of a slope's aspect is vital and can be determined by studying the map beforehand and having a compass handy when out in the field to confirm the aspect. You can also use the position of the sun and shaded areas to identify common aspects across a slope. Local slopes of the same aspect will likely have similar snowpack characteristics.

Altitude

The air temperature will determine at what elevations precipitation has been falling as snow or rain. Higher elevations will generally receive higher levels of precipitation, stronger winds, and colder temperatures. Temperatures will influence how the structure of the snowpack has changed whilst it has been on the ground. During precipitation, the temperature will reduce by 0.6 degrees per 1000m of elevation. This is known as the wet lapse rate. Information from the danger forecast will determine at which elevation there is likely to be an avalanche problem.

Terrain traps

Terrain traps are features below that increase the consequence of an avalanche involvement. They include gullies, cliffs, rocks, benches, crevasses, etc. Terrain traps can make even small avalanches have big consequences.

Trigger points

Trigger points are terrain features or areas within slopes where there is an increased likelihood of triggering an avalanche. Slopes that are gradually getting steeper (convex), especially if the slope is unsupported and ends in a cliff or crevasse, are common trigger points.

Exposed rocks or trees (not common in NZ) provide good anchoring to the snowpack. Buried rocks can however present hidden trigger points being locally weak due to thinner snow depth.

Weather and Snowpack

Gathering information about previous and current weather and observations of the snow surface or snowpack structure can provide an indication of an avalanche danger being present. Take particular note of observations that are contrary to the perceived avalanche danger forecast, giving an indication that the actual conditions might not match those that were forecasted.

Recent avalanches

Evidence of recent avalanches will give good evidence of a current potential avalanche danger. Slab avalanches that have released within the last 48 hours are very significant since the instability that caused them will most likely still exist in other slopes with similar terrain characteristics. Evidence of slab avalanches can remain for many days or even weeks.

Signs of instability

Signs of snowpack instability include shooting cracks, 'whumpfing', pinwheels, or glide cracks. Weak layers within a layered snowpack are sometimes so unsupportive that when they are walked or skied over them they will suddenly settle making a 'whumpfing' sound. This can occur on flat or low-angle slopes where there is no avalanche danger but it does give an indication of similar snowpack conditions in avalanche terrain and may even remotely trigger avalanches on adjacent slopes. Sometimes they are accompanied by cracks appearing on the snow surface. On steeper slopes, this sudden settling can trigger avalanches.

Loading

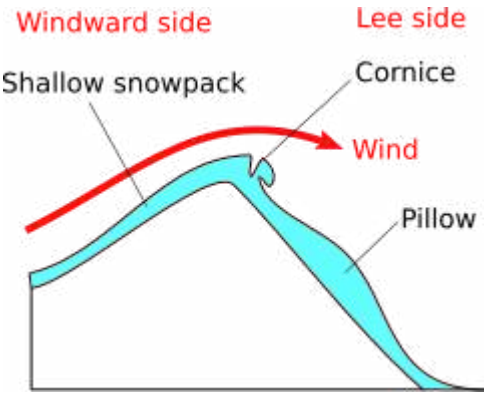
Avalanche danger will increase whenever additional weight is added to the existing snowpack. This could include new snow, rain, and particularly wind (see below). The additional load may overload, or bring the snowpack close to overloading, weakness within the old snow, or at the boundary between the new and old snow.

Wind

One of the most common causes of avalanches in NZ, which should be of particular concern to climbers and skiers, is wind. Wind scours snow off the slopes facing into the wind, known as the windward side, leaving a shallow snowpack with an often textured surface. This snow is deposited on the slope facing away from the wind, known as the lee side in a pillow of *Wind slab*. Windslab will often have a smooth surface and feel hollow when encountered. If there is loose snow that can be shifted by the wind then there does not need to be new snow for there to be new loading. A small amount of new snow or lots of snow available for transport combined with moderate winds can result in a meter or more of freshly loaded snow on the lee side and a

significant avalanche danger. Any time snow can be seen blowing off ridge tops then there is likely new snow loading, and this is very common in NZ.

Along pronounced ridges running perpendicular to the wind direction, snow will often form into cornices, often overhanging the lee side. Any obvious cornice formation should be regarded as an indication of likely wind slab formation on the lee side. Cornices should also be given a wide berth as they can fracture a surprisingly long way back from the crest.



Wind slab formation

Textured surface of windward slopes

Rapid temperature changes

If the upper snowpack is wet due to the warming effects of the sun, above freezing air temperatures, or rain, especially if the change has been rapid, then the snow can become unstable. These problems are commonly an issue during the afternoon in late winter.

Rain will add warmth to the snowpack tending the temperature of the snow towards 0°C. The easiest observations of this type of instability are known as pinwheels- little snowballs that roll down the slope, or glide cracks- cracks forming as the snowpack slowly slides down the slope under its own weight. Rain events are common in NZ and whilst people tend not to be traveling in the mountains while it is raining, traveling immediately after a rain event should be avoided, giving the snow time to settle and refreeze.

Sun on snow has a big effect, especially during late winter and spring. Snow warming from the sun will be aspect related. Slopes facing North will be hardest hit. Plan travel routes to avoid these slopes when they warm up later in the day, particularly when there is freshly loaded snow or when warm temperatures of cloud cover has prevented the snowpack from refreezing overnight.

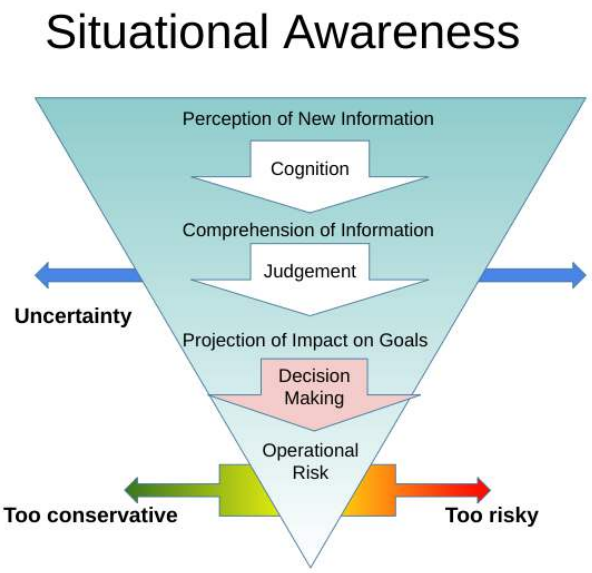
Human Factors

Having an understanding of where and when avalanches are likely to happen is a start but they are an incredibly complex phenomenon and making an accurate assessment of the danger can be difficult and subjective. Making good decisions around riks management is therefore the most important part of backcountry travel.

Decision-making

Purely rational decisions would involve weighing all alternatives such as potential costs against possible benefits. While we strive to make rational choices, human judgment is subject to limitations such as the amount of time and the amount of available information. In an effort to reduce effort, simplify complexity, and increase speed in everyday life, we are often guided by rules of thumb. These rules of thumb often include unconscious motivations and biases that can lead to decision-making traps, also known as heuristics, that can cause us to make unsafe decisions.

F	Familiarity	Something that is more familiar to us feels safer. This looks like a slope we've skied dozens of times before, with no bad consequences.
A	Acceptance	This is the desire to fit in. This trap is often seen in mixed-gender groups. Mixed-gender groups are found to expose themselves to more obvious hazard indicators than single-gender groups.
C	Commitment or consistency	We've come all this way, we can't turn back now. You've committed to friends, you've spent hours, and good money to be here.
E	Expert halo	Someone in your group with high knowledge or expert skiing ability, or simply the confidence they exude can influence the entire group and dampen all other concerns. If there is a perceived expert in the group, other group members might not speak up if they have alternative opinions, thinking that the "expert" must know what they're doing.
T	Tracks/ scarcity	The race for first tracks can cloud our judgment. In addition, the thought that the resource (fresh powder) is quite limited and you must go now while the getting is good.
S	Social proof or social facilitation	Previous tracks on a ski slope will give you a false sense of security and therefore does not mean it is safe. Just because other people are in the same zone, does not mean that zone is safe.



Accessing and recongisning the information that is available to make good decisions depends on maintaining situational awareness. This starts with a perception of what hazards we are exposed to, beneath our feet, from above, and the consequences below, including all the observations we can make about the avalanche hazard. We then need to comprehend this information, judge it's value, and project it onto our goals.

One or two pieces of sensational information may distract from other critical data or reasoning or cause you to be distracted from making a realistic assessment. We can often also fall into the trap of ignoring or dismissing information that conflicts with pre-established opinions or augmenting and prioritising any information that confirms those opinions.

We need to be cognitive of any inherent uncertainty, something that depends on how much information is available and the quality of the information. We need to be and apply this to the margin of error within our decision-making. This ensures that risk is kept within acceptable levels whilst acknowledging differences between the actual and perceived risk. During times of higher uncertainty then it is appropriate to maintain a wider margin of safety and be conservative with decision-making.

Mitigating the Human Factor

Planning

Good decision-making can be supported by thorough planning. This includes reviewing and understanding the weather and avalanche forecast and analysing terrain and possible routes to determine what areas may be safe or dangerous.

We are particularly interested in the previous 24-48 hrs of weather and the forecast for the time we are in the field. This includes:

- Wind strength and direction
- Precipitation type and amount
- Temperature at different elevations

This information is used to form a picture of what conditions to expect, what information to target to confirm or challenge this picture, and where would be good points to gather this information. These are all important considerations when planning routes. Timing is also often critical as patience will allow for danger to reduce after, for example, new snow, rain, or wind.

Trip plans should identify critical decision points (time or location) and have contingency plans in place. This pre-loads decision-making so you are not having to make things up in the field when you may be tired, cold, wet, or subject to other heuristic traps.

Finally, you should understand your group's goals, experience, abilities, strengths, weaknesses, and risk acceptance level so that you can choose objectives appropriate to the group and match expectations and approach before going into the field

Communication

It is always important to communicate well within your group. Communication should ideally be conducted in a safe and comfortable place, out of weather, and with hoods down. Well-matched teams should be able to share observations and opinions, encourage discussion, and make consensus decisions where everyone can have a veto. Often nominating a 'devil's advocate' can help to test any safety critical decision.

Identifying a common group mindset for any trip, helps align decision-making. This should be agreed upon daily by the group somewhere warm, dry, and comfortable before you head out. A group mindset helps to look at the facts and information without outside influences like awesome snow, perfect conditions, and weather (hot, cold, windy, snowy) affecting your thought process. Mindset is a mental attitude or disposition that would evolve from hazard assessment, local knowledge, and personal level of risk acceptance, perception of conditions,

terrain, and level of uncertainty or confidence in the forecast. These can include keeping it mellow, avoiding avalanche terrain, checking things out, or acknowledging improving confidence in an assessment of conditions.

Discipline and Safe travel techniques

Following a disciplined and systematic approach to your planning, preparation, and travel in the backcountry will minimise your exposure to risk. Whilst we try and make good assessments of avalanche danger, we have to recongise that we can be wrong, and safe travel discipline will avoid us from getting caught out if taking shortcuts.

The terrain you choose will greatly affect your safety in avalanche terrain. Avalanche involvements are mostly triggered by another member of the party so regardless of the perceived avalanche danger, discipline in applying the precautions of safe travel techniques will further mitigate any risk when traveling in avalanche terrain.

Space out so that no more than one person is exposed to avalanche hazards at one time. The spacing will therefore vary depending on the complexity of the terrain and the size of avalanche paths.

Maintain visual contact at all times. This may mean positioning a spotter for blind pitches of skiing and looking back to the last person skiing the slope.

Regroup in safe spots or islands of safety that are not exposed to hazards from above or have terrain traps below. These depend on the nature and expected size of the current avalanche danger.

Chose safe routes that are low angle or follow ridges.

Follow good communication protocols within your group. Communication will be more difficult with bigger groups, when fatigued, or when environmental conditions are challenging.

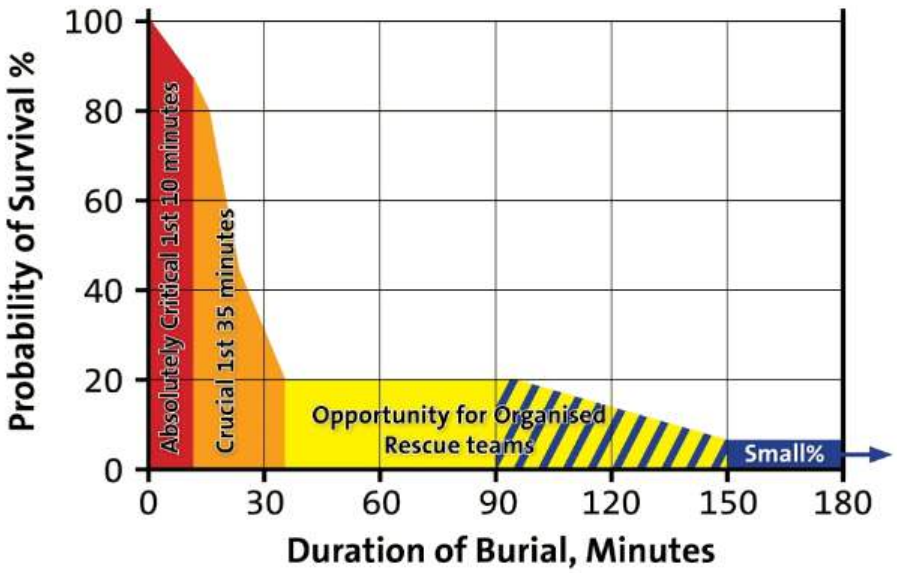
Before entering avalanche terrain, identify escape routes that can be followed in the event of an avalanche to attempt to get you out of and away from any further danger.

Companion Rescue

Survival

In order to minimise the consequences of an avalanche involvement, it is vital that all members of the group carry rescue equipment and are trained and practiced in avalanche rescue regardless of the perceived danger.

Rescue within the first 10 minutes of a burial is essential for the largest chance of successful recovery. Due to this tight timeframe, the only chance of live rescue of a buried subject realistically lies with the group on site. Beyond 10 minutes, the probability of a live recovery decreases quickly the longer they are buried.



Underlying generic principles of avalanche rescue

Rescue procedure

In order to quickly recover a person, efficient procedures have been developed:

1. **Coordinate** - Make sure all members of the team are aware of the situation and keep visual of the victim for as long as possible. Make note of the last seen point as this will narrow down the most likely burial areas. Appoint a leader and other rescue roles. Depending on the number of available rescuers, everyone should be involved in the intial response to maximise the chance of survival. Define your search area and likely burial

areas through interrogating witness(es), identifying last seen point, surface clues, and terrain traps;

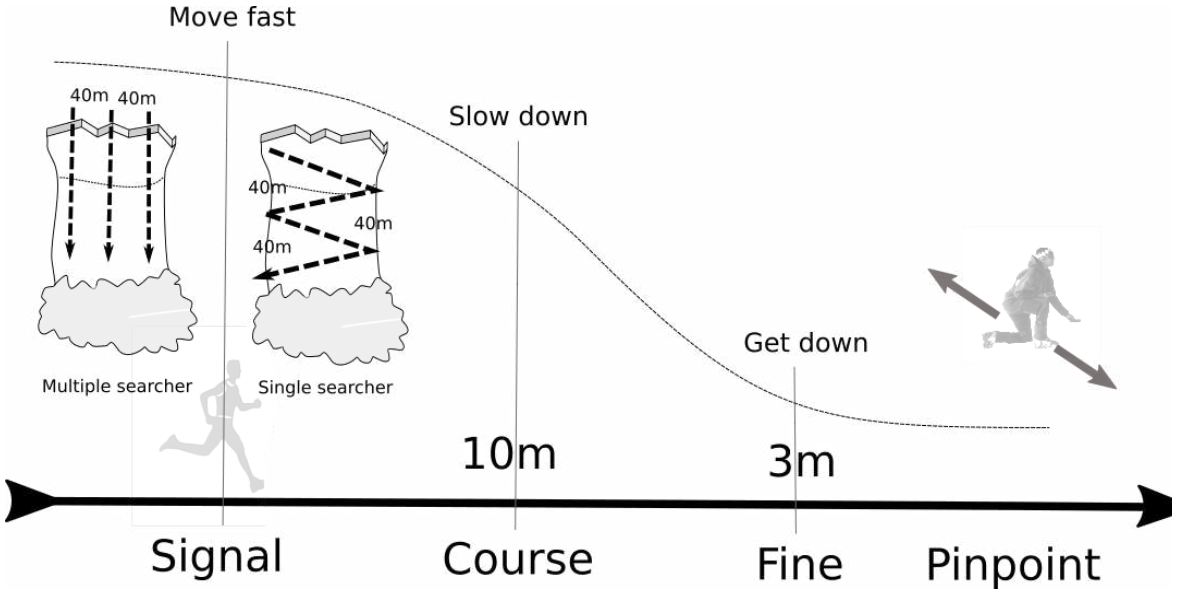
2. **Risk assessment** - Assess safety. Is there a risk of further avalanches? Limit more people becoming exposed to risk;

3. **Transceiver search** - Turn all transceivers to 'SEARCH'. Turn all electronic devices off or separate them by 10m from searched transceivers. Assign the minimum number of transceiver searchers for the size of the site based on the search strip widths of their transceivers.

   Begin a *Signal* search. Move as fast as possible during this phase not looking at the transceiver but for clues on the surface and listening for the transceiver to beep indicating that it has detected a signal.

   When the transceiver starts beeping and there is a direction arrow and distance, then begin the *Course* search following the direction arrow of the transceiver. Move fast. Based on flux lines, the number is the maximum possible distance to the buried transceiver. At 10m, slow down.

   At 3m move the transceiver to the knee and begin a *Fine* search and slow down further The direction arrow on the transceiver may disappear. Go back and forth along the trajectory that you enter the 3m radius, avoiding rotating the searching transceiver to pinpoint the point of the lowest transceiver reading. It is important to move slowly and methodically, to allow the transceiver to solve the problem;



4. **Gear up** - Remaining rescuers that are not searching for transceivers can get ready with probes and shovels and do a visual search or probe clues on the surface;

5. **Probe** - Once conducted a fine transceiver search or the transceiver reads within a meter start probing perpendicular to the snow surface. If unsuccessful on the first probe strike, go 25cm uphill and systematically probe outwards in a grid spiral pattern until the buried subject is struck. On a successful probe strike, leave the probe in place;

Avalanche rescue equipment - Transceiver, shovel, and probe (Ortovox®)

Grid spiral probing 90° to the snow surface and conveyor shoveling

6. **Dig** - Start digging one shovel length downhill from the probe. Do not lift the excavated snow but scoop and paddle it backward. If it is hard, chop blocks. With more than one rescuer, use a systematic conveyor shoveling technique with the other rescuers in a single line a shovel length below each other, rotating every 2 to 4 minutes;
7. **Patient care** - Dig towards the head and uncover the airway. If the buried subject is not breathing look for snow in the mouth as this indicates that they haven't been breathing for a while. If there is an ice lens and evidence of an air pocket, they are likely to have only stopped breathing recently. Clear the mouth of any snow and Initiate CPR. Especially for longer-duration burials, be careful when moving patients. Often the best place to treat them is by digging out a snow cave around the.