AVALANCHES ARE DANGEROUS!

- Even small avalanches can result in death or cause serious injuries.
- About 90% of all avalanche victims triggered the fatal avalanche themselves.

General precautions for risk reduction
- Educate yourself
- Stay informed on weather and avalanche conditions, trip planning.
- Wear transceiver on TRANSMIT, shovel and probe are in the backpack.
- Continuously reevaluate local conditions, terrain and human factors incl. schedule.
- Ride extremely steep or otherwise challenging sections one at a time.

Equipment

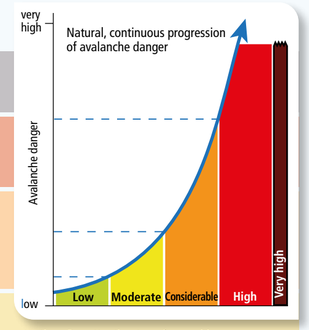
Standard avalanche safety kit:
- Avalanche transceiver (beacon)
- Probe
- Shovel

Other important equipment:
- Helmet
- Climbing aids (skins, snowshoes, crampons)
- Emergency first aid kit
- Mobile phone or satellite-based emergency device
- Navigation aids (map 1:25'000, GPS, altimeter, compass)
- Protection against sun and cold

Additionally recommended: Avalanche airbag

AVALANCHE DANGER SCALE (synopsis)

	Characteristics	Recommendations for backcountry recreationists
5 VERY HIGH	**Extraordinary avalanche situation** Numerous very large and extremely large natural avalanches can be expected. These can reach roads and settlements in the valley.	You are advised not to engage in winter sports beyond open ski runs and trails. Very rarely forecast. Around 1 % of avalanche fatalities.
4 HIGH	**Very critical avalanche situation** Natural and often very large avalanches are likely. Avalanches can easily be triggered on many steep slopes. Remote triggering is typical. Whumpf sounds and shooting cracks occur frequently.	Stay on moderately steep terrain. Heed runout zones of very large avalanches. Unexperienced persons should remain on open ski runs and trails. Forecast only on a few days throughout the winter. Around 10 % of avalanche fatalities.
3 CONSIDE-RABLE	**Critical avalanche situation** Whumpf sounds and shooting cracks are typical. Avalanches can easily be triggered, particularly on steep slopes with the aspect and elevation indicated in the avalanche bulletin. Natural avalanches and remote triggering can occur.	**The most critical situation for backcountry recreationists.** Select best possible route and take action to reduce risks. Avoid very steep slopes with the aspect and elevation indicated in the avalanche bulletin. Unexperienced persons are advised to remain on open ski runs and trails. Forecast for around 30 % of the winter season. Around 50 % of avalanche fatalities.
2 MODERATE	**Mostly favourable avalanche situation** Signs of instability can occur in isolated cases. Avalanches can be triggered in particular on very steep slopes with the aspect and elevation indicated in the avalanche bulletin. Large natural avalanches are not to be expected.	Routes should be selected carefully, especially on slopes with the aspect and elevation indicated in the avalanche bulletin. Travel very steep slopes one person at a time. Pay attention to unfavourable snowpack structure (persistent weak layers, old snow problem). Forecast for around 50 % of the winter season. Around 30 % of avalanche fatalities.
1 LOW	**Generally favourable avalanche situation** No signs of instability present. Avalanches can only be triggered in isolated cases, in particular on extremely steep slopes.	Travel extremely steep slopes one person at a time and be alert to the danger of falling. Forecast for around 20 % of the winter season. Around 5 % of avalanche fatalities.



Avalanche danger levels

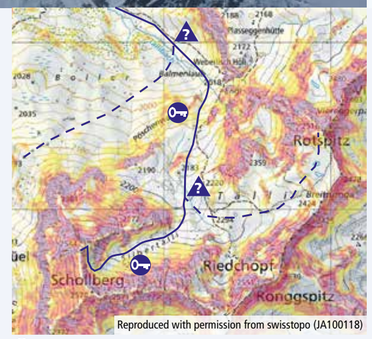
TRIP PLANNING

Goal

Recognise and avoid potential problems early enough (conditions, terrain, human factors)

Important considerations during trip planning

1. Choose appropriate trip (feasible/realistic). You can use various websites, tour platforms and guide books.
2. Gather information on conditions, terrain and human factors.
3. Draw the route on a detailed topo map (do it yourself!).
4. Identify cruxes and assess the risk.
5. Determine decision points and plan alternatives.
6. Estimate timelines, determine fixed times.
7. Review your entire trip plan and think about what could go wrong.



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Crux
Decision point
Precisely planned route
Possible alternatives

NOTE:
Don't cut short the process of going through the important considerations for trip planning (points 1-7) when using online tools or available GPS tracks.

Useful web links

- whiterisk.ch
- tourenportal.ch
- skitourenguru.ch
- map.geo.admin.ch
- camptocamp.org

Tipps:
- Maps with coloured slope angles are very useful.
- Note: Bring a hard copy of the map as a backup.

ASSESSMENT AND DECISION FRAMEWORK 3X3

1. TRIP PLANNING

Trip destination with alternatives and schedule.

Conditions	Terrain	Human factors
• Avalanche bulletin • Weather forecast • Tour reports from online community platforms (with caution) • Time of the day/season • Other info	• Plan route on a topo map 1:25'000, incl. alternatives • Map layers with slope angle and avalanche terrain • Tour websites and guide books • Info from locals	• Who is participating? • How many people? • Responsibility • Participants' wishes and expectations • Skills and fitness of participants / leader • Equipment • Timelines with buffer

Decision
Which tour is feasible?

2. LOCAL EVALUATION

Beliefs and conceptions = reality? Stay aware throughout the entire day, revise trip planning if necessary.

Conditions	Terrain	Human factors
• Look for signs of instability • Avalanche problems? Or is the avalanche situation favourable? • Is the current avalanche situation similar to what is described in the bulletin? • Current weather, trend • Visibility	• View into cruxes • Possible critical areas • Route choice and possible alternatives • Existing tracks	• Transceiver check • Check equipment • Physical and mental state (personal, group) • Timelines realistic? • Heuristic traps • Who else is out there? • Encourage feedback culture • Group dynamic processes

- What is the primary avalanche problem today?
- Where is it present in the terrain?
- How severe is the problem?

Decision
Which route?

3. INDIVIDUAL SLOPE

Finalise risk assessment, take precautionary measures or avoid the slope.

Conditions	Terrain	Human Factors
• Avalanche problems in the slope? How severe are they? Or is the current avalanche situation favourable? • Visibility • Frequently traveled • Other dangers (glacier, cornice, etc.)	• Steepness • Aspect and elevation (favourable/unfavourable) • Shape of terrain • Slope dimensions • Possible consequences/terrain trap • Trail selection	• Mental state (group, personal) • Facts ↔ Feelings • Tactics (spreading out, riding one at a time, regrouping at «islands of safety») • Communication • Leadership/discipline

Next trip

Do the assumptions match reality?

Decision
Individual slope possible? How?

Go/Go here — **No go**

Reflection: Critical evaluation after a trip enhances the experience.
Were there any suprises?
What would you do differently next time?

AVALANCHE BULLETIN

The SLF avalanche bulletin forecasts the avalanche danger in the Swiss Alps and in the Jura. It describes the avalanche situation for a region (gradual transitions between regions!) but not for individual slopes.

The avalanche danger is described by the danger level incl. elevation and aspect where it applies (danger plot), the prevailing typical avalanche problems and a text.

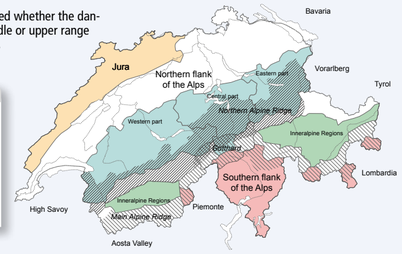
The danger level depends on:
- Snowpack stability
- Frequency of the hazard locations
- Avalanche size

For dry avalanches, it is also indicated whether the danger is more in the lower range, middle or upper range of the danger level (e.g. 3-, 3=, 3+).

Example danger plot
Persistent week layers, wind slabs
1800m
The aspects and elevations coloured black indicate where the danger level prevails.

Avalanche bulletin Switzerland
(Issue: 8 and 17 h):
www.slf.ch or App «White Risk»
Weather:
www.meteoswiss.ch
European avalanche bulletins:
www.avalanches.org

Geographical terminology



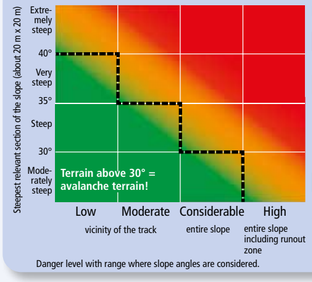
GRAPHICAL REDUCTION METHOD GRM

Simple check by combining avalanche danger level with slope angle as well as aspect and elevation (favourable / unfavourable).

The GRM provides a rough estimate of the release probability, hence the danger at the slope scale. For assessing the risk, the consequences must also be considered (Risk Check).

Favourable slopes:
For slopes with aspects or elevations NOT indicated in the avalanche bulletin, the next lower danger level can usually be assumed.

Unfavourable slopes are often:
Slopes with aspects and elevations indicated in the avalanche bulletin.



Estimate of release probability
- Travel in avalanche terrain not recommended
- **Caution! Experience required!**
  - Detailed assessment necessary
  - Defensive behaviour
  - Risk reduction measures
  - Inexperienced riders should avoid this area.
  - Training and experience required.
- Generally safe if no signs of instability are present.
- Recreationists with limited experience should stay below this line.

Alternatively, automated assessments can be used (e.g. Skitourenguru.ch).

Avalanche bulletin and Graphical Reduction Method GRM

TYPICAL AVALANCHE PROBLEMS

		Typical indicators	Typical spatial distribution	Travel tips	GRM
New snow → wait Duration: 1 – 3 days	New snow can form a slab and release as an avalanche.	• Critical amount of new snow has been reached. • Signs of instability (especially recent slab avalanches)	• Danger often widespread • Danger often increases with elevation.	• Difficult to avoid • Be aware in summer too.	Useful
Wind slab → avoid Duration: 1 – 3 days	Recent deposits of wind-drifted snow can easily be triggered as a slab avalanche.	• Signs of wind action • Can be hard or soft • Variable ski penetration when breaking trail • Cohesive snow • Signs of instability (recent slab avalanches, shooting cracks)	• Lee side of terrain features (terrain breaks, gullies, depressions) • Frequent at high elevations close to ridge lines • Highly variable over short distances	• Avoidance possible with careful route selection • Fresh wind slabs often problematic on slopes steeper than 30°	Limited (most useful in planning)
Persistent weak layers → travel cautiously Duration: Weeks to months	Persistent weak layer below a cohesive slab	• Unfavourable snowpack structure • Signs of instability (especially «whumpfs»)	• Areas with a shallow snowpack • Terrain transitions (e.g., convexities, edges of depressions and gullies) • Slopes with cliffs • Often northerly aspects	• Difficult to recognise • Avalanche bulletin provides useful snowpack information. • Simple snowpack tests can offer valuable insight. • At moderate avalanche danger avalanches may also release in deeper layers and become dangerously large.	Useful, apply defensively
Wet snow → go early, return early Caution during rain! Duration: hours	Water weakens the snowpack.	• Rain / wet snow surface • Lack of overnight freezing • Temperatures above freezing / strong solar radiation • Substantial ski and foot penetration • Natural avalanche activity	• Variable across aspects and elevation bands (dependent on time of year and time of day) • Often close to cliffs that warm up in the sun	• Return early • Wait for cooler period • Beware of very large naturally triggered avalanches	Not really applicable
Gliding snow	Glide snow avalanches are a secondary problem on backcountry tours.	• Glide cracks	• Needs smooth ground (e.g. grass or rock slab) • Particularly on sunny slopes, typically also below tree line	• Do not stay below a glide crack for an extended period of time.	Not applicable

Typical avalanche problems

RISK CHECK FOR CRUXES

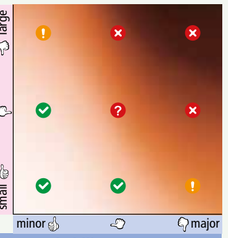
Identify and assess **danger** → Assess **consequences** → Consider precautionary **measures**, evaluate **risk**

Consequences
small: not completely buried, uninjured
large: deep burial, fatal injury

More details
- How much snow is coming?
- Escape possibilities?
- Rescue?

How big is the slope above me?
<20 m | >100 m
What's below me?
smooth runout | terrain trap, trees, rocks
Are several persons affected?
no | yes
Most unfavourable criterion is decisive for assessment.

Assessment small — large



Exponential increase

high risk
Not recommended. Choose alternative.

elevated risk
Detailed assessment necessary, otherwise not recommended. Effective additional measures are appropriate.
Caution! False evaluation quickly leads to high risk. In case of uncertainty → Turn around

low risk
The crux can be passed as long as the measures are respected.

Danger: Release probability
minor: favourable avalanche situation
major: weak snowpack, spontaneous avalanches

Planning/GRM:
Signs of instability: rare — widespread
Many existing tracks or frequently travelled
Rough assessment: minor — major
Detailed assessment: minor — major

Often major release probability when:
- significant new snow amount
- fresh wind-drifted snow
- Very weak snowpack layering
- Water penetrates into snow cover for the first time.

- **Is there a weak layer? Can a failure be initiated?**
  Typical: faceted snow surface or surface hoar recently buried / in the upper half metre
- **Is there a slab? Does it support crack propagation?**
  Typical: at least slightly bonded layers above the weak layer
- **Is the snowpack homogeneous across the entire slope?**
  Typical: low variability favours widespread crack propagation
- **Other factors?**
  Additional hazards due to remote triggering, other people, spontaneous avalanches, etc.

Slope incline:
The probability of triggering is lower for:
- Track ≤ 30° or
- Entire slope < 35°

Assess risk

Important questions:
- How large are the uncertainties? Is the assessment correspondingly defensive?
- What is the influence of human factors?
- Does the risk suit me and the group?

Effective measures

Can measures be taken to reduce danger and/or consequences?
- Travel on the flattest part of slopes,
- Prefer ridge-like (convexe) terrain,
- Stay within already tracked areas,
- Avoid large loading (falling, gathering, jumping),
- Avoid fresh wind-drifted snow,
- Avoid places with a higher risk of fall or burial,
- Gather group in non-exposed areas («islands of safety»),
- As much as possible, only one person in the exposed area (one at a time, spread out).

Combine measures to reduce the risk!

Risk check for cruxes

IMPORTANT OBSERVATIONS

Signs of instability

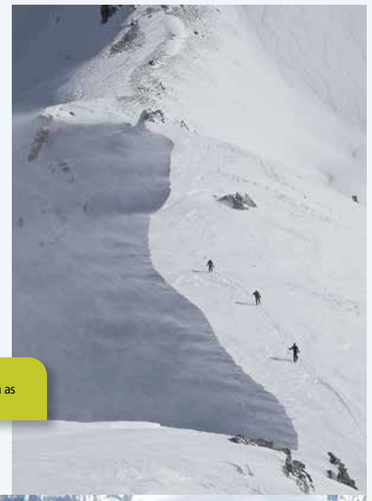
Typical for avalanche danger level Considerable (level 3) or higher:
- Recent slab avalanches
- «Whumpf» sounds or
- Shooting cracks when stepping onto the snow surface

Simple observations which indicate increasing avalanche danger

- New snow and wind (critical amount of new snow)
- Fresh deposits of wind-drifted snow
- Rain on a dry snowpack
- Marked warming of snow close to the melting point (0 °C; especially after snowfall)

NOTE:
Collect as much information as possible regarding the crux.

Remark:
- Pay attention to diurnal variations in spring!
- Poor visibility (fog) makes assessment very difficult!



EDITED BY:

The «Snow Sport Avalanche Accident Prevention» core training team (www.slf.ch/kat), consisting of:
• WSL Institute for Snow and Avalanche Research SLF, Davos • Swiss Alpine Club (SAC) • Federal Office of Sports, Magglingen (BASPO) • Association of Swiss Mountain Guides (ASMG) • Swiss Army (Cen exce mtn tng) • Swiss Ski • Swiss Snowsports (SSSA) • Swiss Cableways (SBS) • Friends of Nature Switzerland (FNS) • Alpine Rescue Switzerland (ARS) • Rescue Organisation of Canton Valais (KWRO) • SSBS - Swiss Snowsports Association for Instructors and Schools • BFU – Swiss Council for Accident Prevention • Suva

Where to order: from the editors

Eighth, completely revised edition (2nd version): © 2023

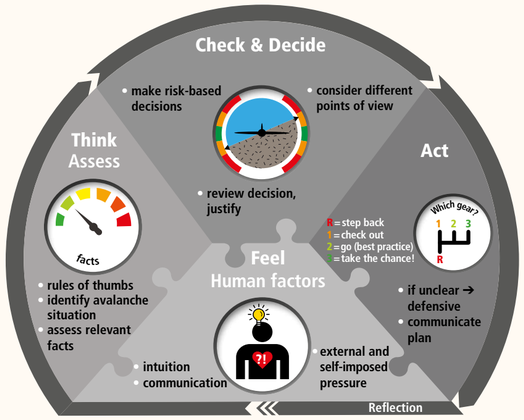
Authors: • Stephan Harvey (SLF, Editorial) • Hansueli Rhyner (SLF) • Lukas Dürr (SLF) • Jürg Schweizer (SLF) • Hans Martin Henny (Core Training Team Principal)

Photos: Chapter Slab Avalanches (© M. Boss) • Illustration chap. avalanche accident: MountainSafety.info

Concept/Graphics: Eliane Friedli, Wabern

This leaflet is for avalanche training and is not completely self-explanatory.

COCKPIT FOR DECISION MAKING



Human factors (Feel)

External and self-imposed pressure:
- What is important to me/us?
- Do I feel under pressure? Or am I building up self-imposed pressure?
- What is my mental state?
- Could I be stuck in perception traps?

Intuition:
- How is my gut feeling? Can the feeling be clarified?
- Have I experienced a similar situation before?

Communication culture:
- Do we share our expectations, fears and feelings in the group?
- How can we communicate honestly?

PERCEPTION TRAPS
- Rigidity / Wishful thinking / Goal orientation
- Crowds / Large group
- Familiarity / Habit
- Non-event feedback
- Exclusivity
- Social acceptance
- Blind trust

Assess (Think)

Assessing relevant facts:
- What are the relevant facts today? Danger? Consequences?

Identify situation:
- What is the main problem today? Avalanche problem? Group composition?
- Can the situation be assessed objectively enough?

Rules of thumb/concepts:
- Are basic concepts and rules of thumbs taken into account?

DECEPTIONS
- Slope steepness is underestimated on sunny slopes.
- Hard packed snow seems safer than soft snow.
- In poor visibility it is difficult to assess the terrain.
- Strong winds will likely make it impossible to hear whumpf sounds.
- Existing tracks tend to make a slope appear favourable.

Check & Decide

Risk-based decision-making:
- What are the opportunities and risks?
- What risk am I/are we willing to take today?

Consider different points of view:
- What is in favour, what is against?
- What do alternatives look like?

Check and justify the decision:
- Have I sufficiently accounted for uncertainties, and is my decision accordingly defensive?
- Do the objective facts match the gut feeling?

DECISION MAKING STRATEGIES
- Time-Out: Take a 2 minute breather at decision points to make sure you have the necessary time and space to make a proper decision.
- View the situation from the outside: How would I explain and justify my decision to an external person?
- Six Thinking Hats: Visualize the problem from various perspectives.

Group decision:
- Majority decision (without prior discussion) by simultaneous voting.
- Right of veto for each individual against a more risky alternative.

Act

- What «gear» is used to act?
- Am I aware of the characteristics of the chosen gear?
- Which behavior is effective?
- How do I communicate the decision and its implementation to the group in a comprehensible way?

CHARACTERISTICS OF THE GEARS
- **R** Stop! Alternative necessary.
- **1** Check out: Continue cautiously and gather additional facts. In principle «No go» with the option of a last chance.
- **2** GO considering appropriate measures.
- **3** Everything fits surprisingly well together. Take the opportunity, but remain attentive.

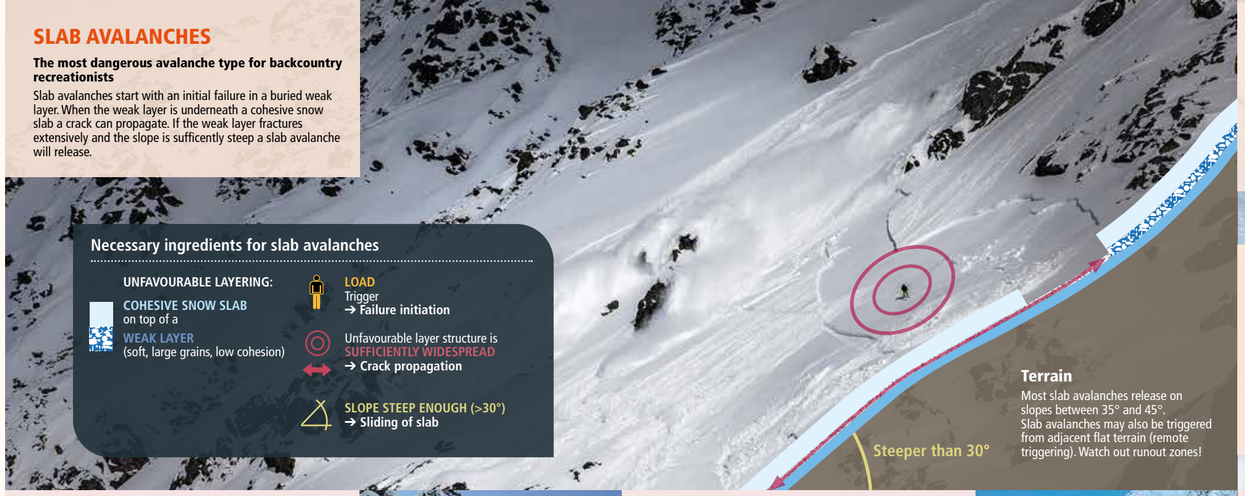
COMMUNICATION
- Pay attention to non-verbal communication (eye contact, body language, etc).
- Communicate early enough and honestly.
- Get feedback: Has everybody understood the directions, and will they be followed?
- If necessary, define communication rules.

Groups
- In each group, dynamics occur which influence the action and the resulting risk.
- A group is only as fast as the weakest member of the group. → Group-check tool SOCIAL

SLAB AVALANCHES

The most dangerous avalanche type for backcountry recreationists

Slab avalanches start with an initial failure in a buried weak layer. When the weak layer is underneath a cohesive snow slab a crack can propagate. If the weak layer fractures extensively and the slope is sufficently steep a slab avalanche will release.



Necessary ingredients for slab avalanches

UNFAVOURABLE LAYERING:
- COHESIVE SNOW SLAB on top of a
- WEAK LAYER (soft, large grains, low cohesion)

LOAD
Trigger → **Failure initiation**

Unfavourable layer structure is SUFFICIENTLY WIDESPREAD → **Crack propagation**

SLOPE STEEP ENOUGH (>30°) → **Sliding of slab**

Terrain
Most slab avalanches release on slopes between 35° and 45°. Slab avalanches may also be triggered from adjacent flat terrain (remote triggering). Watch out runout zones!

LOOSE SNOW AVALANCHES

Loose snow avalanches start from a single point and often release in terrain steeper than 40°. Compared to slab avalanches they are slow. New snow or wet snow with low cohesion is released. Wet loose snow avalanches are more dangerous than dry ones because they are often larger and the snow is heavy.

GLIDE SNOW AVALANCHES

Glide snow avalanches form due to a loss of support between the snowpack and the smooth ground. The snow at the snow-ground interface must be moist or wet. The steeper the slope, the sooner the snow starts to glide.

Glide snow avalanches cannot be triggered by backcountry recreationists.

Avalanche formation and types of avalanches

NEW SNOW PROBLEM

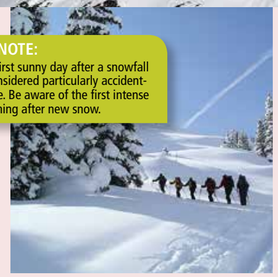
Critical amount of new snow reached = at least Considerable avalanche danger

10–20 cm when conditions are unfavourable
20–30 cm when conditions are fair to mixed
30–50 cm when conditions are favourable

Favourable:
light wind, temperatures around freezing, old snow surface with small scale irregularities (e.g. frequently travelled, wind eroded), generally favourable snowpack

Unfavourable:
strong winds, (> 40 km/h, roaring wind), low temperature (below –5 to –10 °C) especially at the beginning of snowfall, smooth and loose old snow surface, new snow denser towards the top, generaly unfavourable snowpack

NOTE:
The first sunny day after a snowfall is considered particularly accident-prone. Be aware of the first intense warming after new snow.



Important questions:
- Characteristic of the old snow surface?
- Is a failure in the lower part of the new snow possible?
- Amount of new snow?
- Properties of the new snow? Influence of wind? Temperature evolution during snowfall?

after 2-3 days

WIND SLAB PROBLEM

Wind is the architect of slab avalanches through the creation of wind slabs.

Wind slabs form when loose snow is transported by wind.

Conditions for wind slab formation:
- Sufficiently strong winds
- New snow or erodible snow surface

Wind slabs are cohesive (= ideal slab) and may be hard packed or soft. Wind slabs in lee areas are often highly variable.

NOTE:
Recent wind slabs can easily be triggered. Very strong winds form hard wind slabs which may falsely suggest more stable conditions.

Important questions:
- What lies beneath the wind-drifted snow?
- Is a failure within the wind slab possible? Age of the wind slab?
- Thickness of the wind slab?
- Are wind slabs widespread?

after 2-3 days

WET SNOW PROBLEM

Water weakens the snowpack and may cause wet snow avalanches. Especially the first wetting period is critical. Water infiltration into an already wet snowpack is less critical.

Typical wet snow situations:
- Spring situation: Increase of avalanche danger due to diurnal warming
- Rain: Water infiltration and additional loading, especially in a relatively warm snowpack with older weak layers, increase the avalanche danger, often in all aspects (particularly if the snow-pack is not yet completely moist).

NOTE:
The higher the water influx into the snowpack and the weaker the snowpack, the higher the likelihood of wet snow avalanches!

Temperature
The deciding factor for changes in the temperature of the snowpack is the energy balance, which is predominantly driven by the amount of incoming and outgoing radiation as well as the wind.

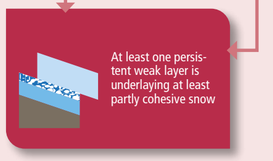
Important questions:
- Does water significantly penetrate into the snowpack for the first time?
- How deep does water penetrate into the snowpack?
- Are there distinct layer transitions or old weak layers?
- Penetration depth without skis?

after cooling

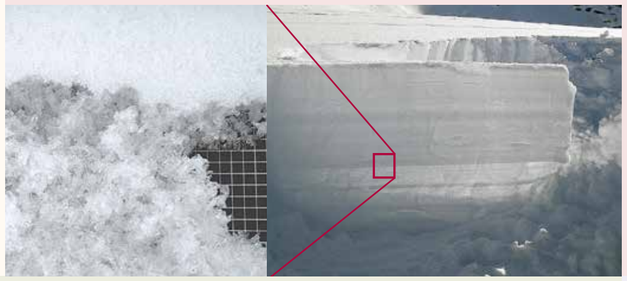
PERSISTENT WEAK LAYERS PROBLEM

With a persistent weak layers problem (or old snow problem) weak layers are predominantly characterized by:
- Soft layers with large facets or depth hoar with few bonds or
- Buried thin surface hoar layers

Important questions:
- How weak is the weak layer? Type? Age?
- How deep is the weak layer in the snowpack?
- Hardness, thickness, property and layering of the snow above the weak layer?
- Variability of the snowpack?



can persist for weeks or months



FAVOURABLE SITUATION

If there are no signs indicating an avalanche problem, the question arises:
Is the avalanche situation favourable?

NOTE:
Only if there is clear evidence for a favourable avalanche situation, it is advisable to travel large slopes mainly steeper than 35°.

Well settled large snowfall:
Settled, well bonded and thick layers of recent snowfall lead to a favourable snowpack. Often in regions rich in snow.

Massive old wind deposits:
Often favourable when old wind deposits are generally thicker than 1 m. Caution at the edges of the deposits!

Cooling after warm period:
Cooling after a significant warm period stabilizes the snowpack, e.g. supporting melt-freeze crust in the early morning in spring.

Favourable snowpack structure (combination slab / weak layer):
- The snowpack only consists of similar, well-bonded (slabby) layers.
- The entire snowpack consists of faceted snow with low cohesion.
- A weak layer lies on top of an otherwise strong snowpack.

SNOWPACK EVALUATION

The avalanche forecast and the SLF snow profile map provide information about the snowpack. In backcountry terrain several methods can be helpful for assessing the snowpack especially for persistent weak layers problems when signs of instability are absent.

Simple observations
- **Penetration depth (with and without skis):** Allows to estimate how compact the upper layers are and also allows to identify weak base layers in shallow snowpacks. Thin weak layers cannot be detected.
- **Pole test:** Allows to assess differences in layer thickness and hardness and can also highlight spatial variations in the characteristics of the surface layers.
- **Test small slopes:** Try to trigger slab avalanches on small, harmless slopes (especially in new snow and wind slab situations).

Rules of thumb:
- Lots of snow is better than little snow.
- A series of thick layers that are similar are better than a series of thin layers that are different.
- Today's snow surface may be tomorrow's weak layer.

The snowpack is particularly unfavourable when:
- soft layers with large grains,
- underlie denser, cohesive and slabby layers,
- in the upper metre of the snowpack.

Snowpack observations:
Ideal locations are small, undisturbed slopes with smooth runout and where the depth of the snowpack is slightly below average.
- Assessment of snowpack layering by recognising layer combinations
- Stability tests, e.g. ECT (extended column test): Allows to detect weak layers and to assess if a crack can be initiated and how well it propagates.

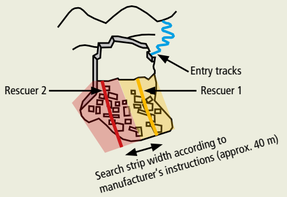
Note when doing stability tests:
- Combine the results from stability tests with snow profile information and other observations.
- Search for weaknesses in the snowpack. Inconsistencies are a serious sign of uncertainty.
- Cracks which fully propagate following slight loading indicate critial layering.

Typical avalanche problems (New snow, Wind slab, Wet snow, Persistent weak layers)

AVALANCHE ACCIDENT

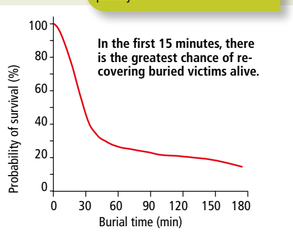
If caught
- Try to escape sideways,
- Release avalanche airbag if available.
- Throw away ski poles as they can act as an anchor.
- Try to stay on the surface.
- Keep mouth closed, protect face/airways with arms.

If not caught
- Watch the avalanche flow and the persons caught (note the last seen point)
- Gain an overview – think – act; assess your own safety, avoid further accidents
- Alert rescue service: If no connection, start immediately with companion rescue and alert later.



Search
- Determine primary search area (in the direction of flow below the last seen point)
- Begin searching immediately with eyes, ears and transceiver (turn off transceivers that are not in use)
- Pinpoint search with avalanche probe (leave probe at hit)
- As soon as search is terminated set all tranceivers to TRANSMIT again.

NOTE:
Companion rescue has the highest priority!



Alert
Phone (Call or SMS) / App
Switzerland (Rega): 1414 / Rega-App
Canton Valais: 144
International emergency: 112 / App Echo 112

Accident Report

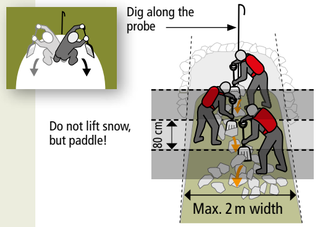
Where	is the accident location?
Who	is calling (Name, phone number, location)?
What	happened?
When	did the accident happen?
How many	completely buried victims, helpers?
Weather	in the area?

Air rescue
Landing place for rescue helicopters:
- 25m x 25m, no obstacles in the vicinity
- at least 100 m distance from the accident site
- No loose items (clothes, objects)

Behaviour near helicopter:
- Clear guidance, remain at location
- Keep eye contact with the pilot
- Do not approach helicopter when rotor is running
- Follow instructions / signs of the crew

Extricating
- Dig generously (conveyor belt system)
- Dig out head as soon as possible, check if airways are clear and if there is a breathing cavity. If the airway is full of snow, clear it immediately.
- Afterwards expose the chest and the whole body.

First aid
- According to BLS (Basic Life Support); if no existing vital signs, start with resuscitation
- Prevent further cooling
- Watch and take care of the victim very carefully



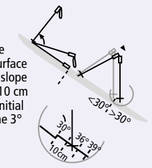
TERRAIN

Slope angle
- For snow slab avalanches to occur, the slope must be at least 30° steep.
- The steeper the more dangerous.
- The essential slope section for assessing the slope angle is 20 m x 20 m.
- Consider steep slopes above and below the route, especially at Considerable avalanche danger.
- Slope angle maps with coloured steepness are very useful to determine slope angles.

Rules for estimating slope angle:
- Kickturn necessary: > approx. 30°
- Slopes below large rock faces: approx. 35°
- Steep slopes with cliffs, moraines: > approx. 40°

Measuring methods:
with help from ski poles of equal length or with inclinometers

If the suspended pole contacts the snow surface below the mark, the slope is steeper than 30°, 10 cm of difference to the initial mark represents some 3° of slope angle.



Slope angle classification:

• Moderately steep:	flatter than about 30°
• Steep:	steeper than 30°
• Very steep:	steeper than 35°
• Extremely steep:	steeper than 40°

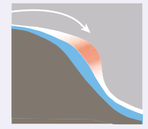
Slope angle and shape of terrain
- Shaded slopes (cold) are often less stable than sunny slopes.
- Sunny slopes may become critically unstable during intense warming.
- Variable terrain offers more alternatives for safer route selection.
- Sparse woods do not protect from avalanches.
- Ridges are generally safer than gullies and convex terrain.
- Ridgeline areas are generally critical after snowfall and wind.

When the terrain or the aspect changes, the snowpack layering often changes as well – in just a few metres!

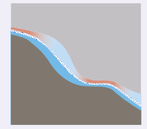
Slope dimensions, terrain traps
- How much area does the slope cover, does it run out smoothly?
- Is there danger of being swept over cliffs or of serious injury, e.g. collision with boulders or trees?
- Is there a danger of deep burial, e.g. in hollows or riverbeds?

Typical avalanche terrain
- Between 35° und 45° steep
- Relatively uniform
- Slightly concave terrain

Special avalanche terrain maps (e.g. CAT layer) show different characteristics of the avalanche terrain.

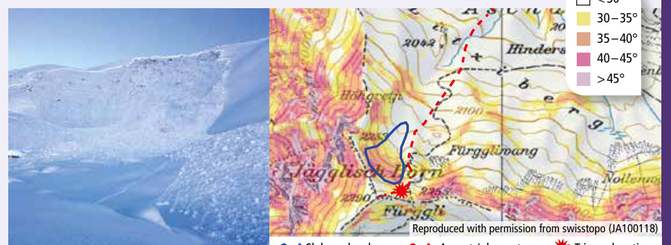


Particularly critical slope areas after wind-drifted snow situations



Particularly critical slope areas where avalanches can be triggered with persistent weak layers problem

Slope angle map



Terrain