

A first analysis of snow, ice, mixed and ice climbing near-miss and accident reports in the SERAC database

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In spring 2020 (30/03/2020), the SERAC database contained 397 stories relating to ski touring (163), sport climbing on multi-pitch routes or crags (88), high-mountain rock or traditional climbing (61), snow, ice or mixed climbing (59), ice climbing (7), hiking (16), paragliding (2) and mountain biking (1). Snow, ice or mixed climbing accounted for 15% of the stories in the SERAC database. This will be our focus here, together with ice climbing, which accounted for just 1.8% of the stories.

To read all of the snow, ice and mixed climbing stories in the database click [here](#) and to read the ice climbing reports click [here](#).

Foreword

The SERAC database is an experience sharing platform developed to gather and publicise individual stories of accidents, incidents or critical situations, for the ultimate purpose of initiating a collective learning process. Its aim is to provide the means for individuals to personally reflect on their own experiences and those of others. Since December 2018, it has formed the basis of a scientific analysis undertaken as part of a PhD thesis.

An initial review of the stories was published in January 2017 based on 184 accounts covering all types of activity. Today, we offer a more detailed analysis of the stories recounted on the topics of snow, ice, mixed and icefall climbing. The SERAC method used to process the material is dynamic and must evolve according to the expectations of mountain sports enthusiasts. The SERAC system is a collaborative tool that forms part of a participatory approach. To encourage its use and continue to improve the system, we look forward to receiving your feedback and suggestions about this document. Do the situations covered seem relevant? What type of analysis do you think is the most pertinent?

When you read an account... *Please reflect on how it resonates with you. What does this story tell you about your own way of doing things?*

When you provide testimony... *Thank you! Your experience is precious.*

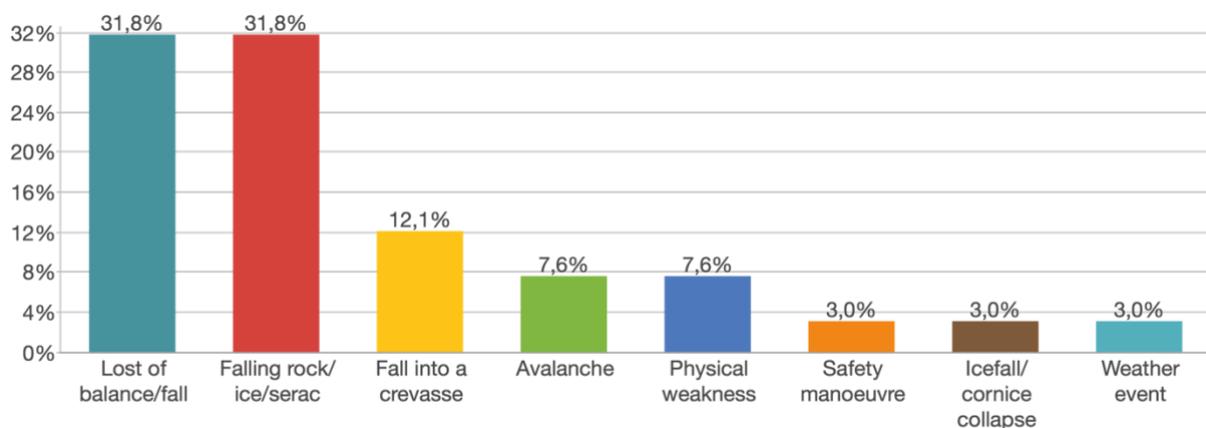
Do not hesitate to detail your actions, perceptions and feelings the moment your accident or near-miss occurred, and immediately before or after the event. On what did you base the decisions you made? Complex situations without undesired outcomes, where everything ended well, are also of interest. Ask yourself what you did to manage the situation and what resources you used to adapt to it.

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1. What are the main types of event that cause near-misses or accidents?

Reminder:

In order to consider both minor incidents and serious accidents, we chose to situate the undesired event at the instant when the situation could lead either to serious consequences or to an event causing no physical harm. In cases where a chain of events occurred with the potential to produce certain consequences, the first event in the sequence was taken into account. For instance, in the case of a fall or a loss of balance caused by a hold or a block being pulled out and triggering a rockfall that threatened the rest of the rope team, the fall or loss of balance was considered to be the main event.



Most common undesired events that occur while snow, ice, or mixed climbing

The most common undesired events in snow, ice, mixed and icefall climbing are loss of balance, a fall or a slip, on the one hand, and falling rocks, ice or seracs, on the other. These two factors account for the same proportion of stories (32%), in contrast to rock climbing, where falls are by far the most common factor (69% of accounts). Here, the types of event are more varied, with a greater prevalence of so-called objective risks, i.e., those relating to environmental conditions (falling rocks, ice or seracs, avalanches or icefall collapses).

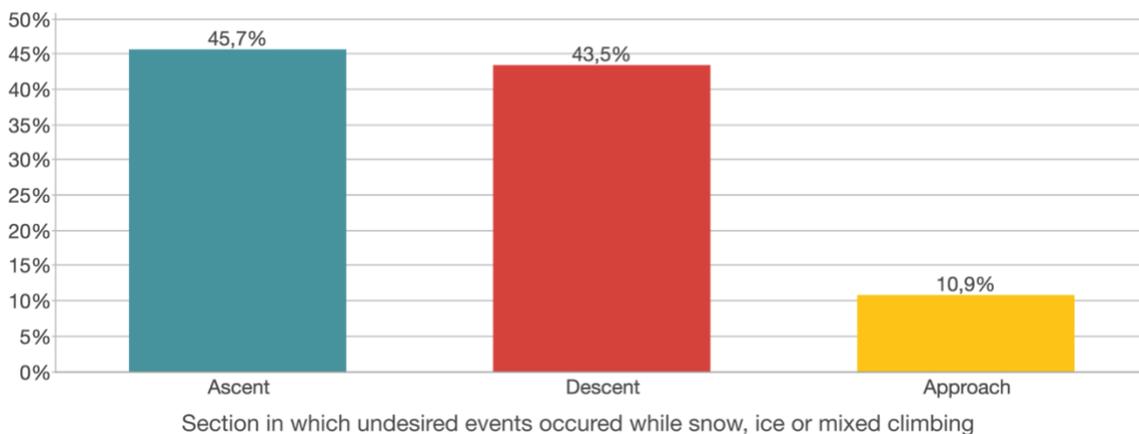
The causes of certain types of event can be defined according to their triggering factors. **The vast majority of falls or losses of balance (82% of the stories involving falls) are due to the individual's movements** (technical error, placement, physiological resources, a slip, etc.), rather than the terrain. The remainder are caused by "holds or blocks being pulled out" (1 account), "bolts being pulled out" (1) and equipment failure (1). Conversely, when rocks, ice or seracs fall it is usually a natural phenomenon (14 out of 21 accounts). When the origin of such events is human, they are caused either by another rope team (5 accounts) or by the leader (2 accounts).

2. In what types of configuration do incidents or accidents occur?

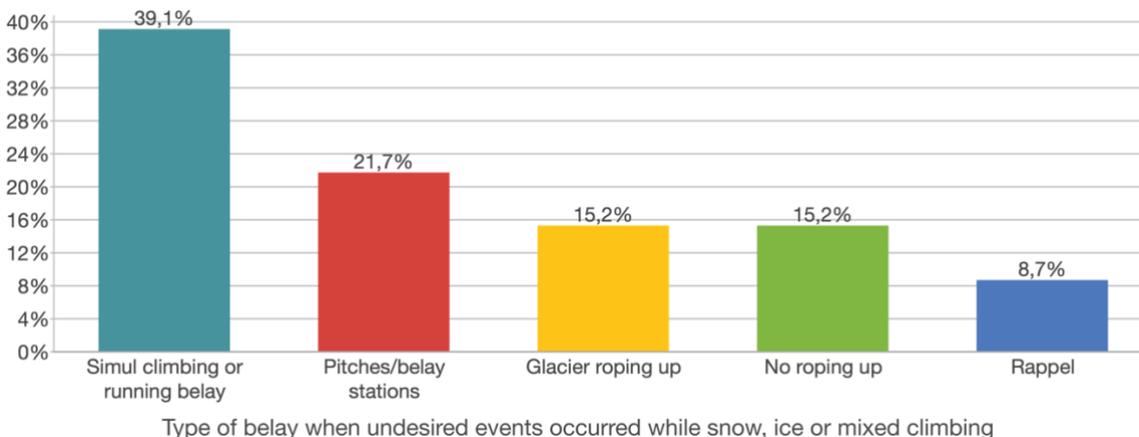
In 12 cases, the account provides no detail beyond the nature of the main event (e.g., “rockfall”). For this part of the analysis, we will only consider the 47 accounts that tell us about the context of the event: the type of group (single rope team, lone individual or several independent rope teams), the section of the route, the terrain and the type of belaying put in place.

By way of comparison, the configuration specified in the majority of accounts relating to high-mountain rock and traditional climbing was as follows: the incident or accident occurred during the ascent (67% of the stories), the belay method involved pitches and belay stations (60%) and a single rope team was affected (79%).¹

However, the undesired events recounted were more varied in terms of their context: they occurred during the ascent in 46% of cases and during the descent in 44% of cases. The remainder occurred during the approach (11% of cases).



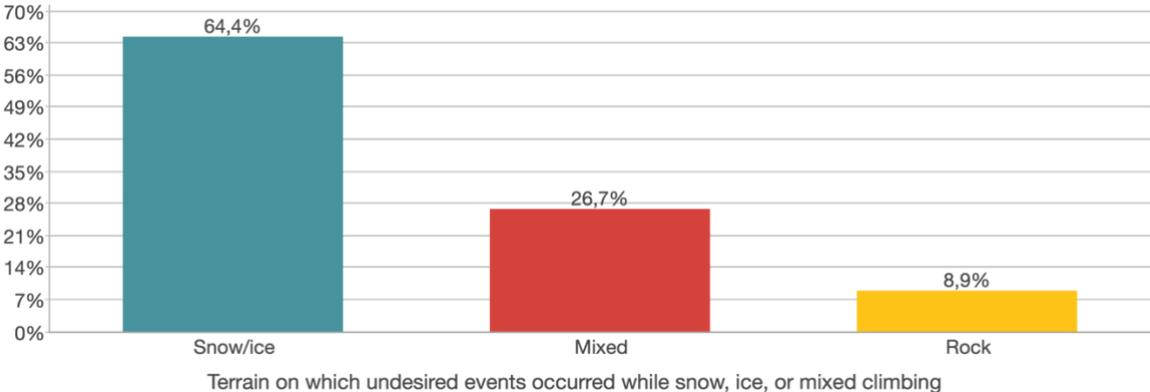
In 39% of accounts, the incident or accident occurred when using a moving belay, while in just 22% of cases it occurred in a section featuring pitches and belay stations.



¹ Download the report on mountain rock climbing [here](#)

The use of a moving belay is probably more common in snow, ice and mixed climbing than in exclusively rocky terrain. Rock climbing is more likely to involve technical and vertical terrain with several pitches and belay stations, whereas snow, ice and mixed routes often involve standard snow or ridge climbing on less technical terrain, for which a moving belay is suitable. These results illustrate the link between accident rates and the frequency with which each different configuration is used.

The undesired events took place in sections covered in snow or ice (64%), on mixed terrain (27%) or on exclusively rocky terrain (9%). This distribution may be attributed to the types of safety system that can be used on each type of terrain: it is easier to install reliable safety systems in rocky or mixed terrain (friends, stoppers, spits, pitons, etc.), than in snow. The fact that snow climbs are often easier and more accessible (not as steep or technical) can also cause climbers to be less vigilant.



Lastly, the vast majority of critical situations involved a single rope team (80% of accounts), with 14 stories involving several independent rope teams and two involving a lone individual.

3. Contributing factors to critical situations

Of the 59 accounts considered, 25 explain how the critical situation in question occurred. We will focus on these 25 stories in the remainder of this analysis.

Reminder:

In the mountains, high-risk situations are complex, dynamic and subject to great uncertainty. They are multifaceted and the critical situations to which they lead generally involve multiple factors. What ingredients, elements and contributing factors combine to generate a situation where an individual loses balance and makes a final error (even slight) that can have dramatic consequences? It is no easy task to place these factors in order of importance so as to determine which event leads to the other and which is truly the "root cause". It is also difficult to establish causal links between the various elements of a situation, individual behaviours, the techniques used and the occurrence of an accident or, in other words, to identify the single factor that was key in enabling the undesired event to take place. Moreover, doing so could amount to an over-interpretation of the facts. The aim is more to describe what mountaineers perceive during a potentially hazardous situation, bearing in mind that none of the factors presented are necessarily dangerous or sufficient to cause an accident if considered in isolation.

Given the variety of situations reported and the fact that it is impossible to verify the interpretations made by the climbers out in the field, the technical and environmental causes of incidents (snow and weather conditions, falling rock or ice) are not analysed in this paper. Rather, the greatest insights to be gained from the stories told relate to the impressions of the mountaineers in terms of vigilance, the perception of danger, external influences and decision making. This approach is broadly in line with cognitive psychological research on unconscious biases, while also echoing the work conducted in social psychology with regard to the interactions between mountaineers. Said research provides helpful means of interpretation that allow for a better understanding of the phenomena of attention, perception, representation and decision making. However, it is important to bear in mind that real-life situations are often more complex, making them impossible to model according to general principles. Finally, confronting and accepting risk is, to a certain extent, an inevitable component of all mountain sports. Every individual has a unique relationship with risk and their own way of approaching it, which has a significant bearing on how accidents unfold.

The following five factors are mentioned as having played a role in triggering a critical situation in more than 10 of the accounts examined (40%).

3.1. An inadequate risk assessment and/or decision-making process (14 accounts)

The assessment and reassessment of risks are sometimes influenced by external factors or are simply rushed through. This might be due to certain reassuring factors, such as the presence of a more experienced individual, a guide or abundant equipment. Two slightly different scenarios can take place: the danger is well understood, but the individuals remain committed, spurred on by various pressures, or the risk assessment itself is hindered by external factors and there is a failure to perceive the danger. The line between the two is a fine one, because the perception of danger signs, their analysis and the decision made as a

result are cognitive processes that are interwoven and superimposed. Thus, the contextual elements that influence our decision making also influence how we gather information about the situation and, therefore, what we do and do not perceive. Our perception of even familiar danger signs can be distorted by certain factors. In other words, we sometimes “choose” to see only those indicators that support the decision we want to take.

The following are possible explanations for a rushed risk assessment:

→ *When the value assigned to the goal skews the risk analysis (10 accounts)*

In 10 of the stories there is an awareness of the danger, but the attraction of a long-dreamed goal, the sense of scarcity, repeated frustrations in the past or the investment that has gone into the project come into play.

The value assigned to a goal that is no longer attainable sometimes clouds the perception of danger signs, their analysis and the resulting decision-making process. This observation echoes the concept of cognitive bias advanced by cognitive psychology and, in particular, that of “summit fever”:

Summit fever causes reckless behaviour that is motivated solely by the objective. Other considerations are neglected and the climber becomes oblivious to danger signs². In the aviation sector, the term “destinationitis” is used to describe an excessive focus on one’s chosen destination. These feelings can be reinforced by the **sunk cost effect**, which is defined as the tendency to ramp up investment in stock in which one has already invested irretrievable resources (time, money, effort) (Roberto, 2002), or even by the **scarcity effect**, i.e., the tendency to assign disproportionate value to opportunities considered rare or limited, or which have not yet been accessed by others.

A parallel can be drawn with consistency or commitment bias, as described by McCammon (2004), which refers to the tendency of humans to maintain internal consistency between their various actions and decisions. Thus, it is easier to make a decision that is consistent with those made previously than it is to change one’s goal. Instead of analysing every new change in circumstances, we continue to rely on our initial impressions despite the existence of new signs of danger, which we tend to ignore. **Confirmation bias** can then prompt us to search our environment solely for information that confirms our initial analysis.

² The concept of summit fever is also referred to in business and finance. It was cited, notably by Roberto (2002), after the tragedy on Everest in 1996.

Extract no. 1, the importance placed on reaching the goal: "As soon as we arrived at Plan Glacier, considering the shape I was in we should have turned back or even taken the same route up and down, which would have been shorter than the loop we had planned to do. That's easier to say than do for someone who had repeatedly visualised, dreamt of and even fantasised about the ascent. Not to mention the sense of loyalty and duty I felt, because I did not want my climbing partner, who was eager and feeling strong, to pay the price for my weakness, however unusual and, therefore, all the more frustrating it might have been."

Extract no. 2, frustrations: "Too eager. Too few outings in snow and ice over the course of a miserable winter and after a summer spoiled by lumbago. I was absolutely determined to complete a climb before spring (20 March was the first day of spring). So the motivation I felt was "negative" (fuelled by the need to gain revenge against time), because it pushed me to ignore the danger (avalanche risk)."

Extract no. 3, previous investment and/or the scarcity effect: "The idea of reaching the highest point in Austria was quite compelling. The fact that we were so far from home probably had a bearing on our decision to attempt the climb, despite the bad weather."

A selection of scenarios summed up in a few words:

Heavy rain on the Stalhorn	Unforeseen bad weather - the pull of the nearby summit - the importance placed on reaching the goal - decision to turn back made late - a hazardous descent in a storm
Aiguille de Bionnassay – southern ridge.	Accumulated fatigue - poor physical form during the climb - the importance placed on reaching the goal and the scarcity of the opportunity - the fear of disappointing their climbing partner - signs of fatigue ignored - commitment maintained - physical failings - rescue
Fall in the Avalon Couloir	Very strong motivation - the reassuring effect of another group - commitment maintained in spite of doubts - attention focused on the great physical effort required - immediate danger not recognised - avalanche caused by the heat
Falling blocks on La Meije	Very strong motivation on the part of the leader - limited motivation of the other participant - unfavourable weather - wrong route taken - danger signs barely perceived or underestimated - rock fall - rescue
Grossglockner: storm on the summit ridge	The importance placed on reaching the goal and the weight of prior investment - unfavourable weather - risk barely perceived or minimised - commitment maintained - storm

→ When choosing the least energy-intensive or the most efficient/fastest option takes precedence over safety (7 accounts)

Individuals often select the easiest, quickest or least tiring option, even if it sometimes involves greater risks than the alternatives. When faced with a less exposed detour or the need to rappel or put on crampons, we sometimes convince ourselves that “it’ll be fine”, even though we sense danger. The temptation to choose the least energy-intensive or the quickest option, so as to maximise efficiency, can sometimes lead to a failure to take adequate precautions. The notion of speed often comes into play: the idea that going faster is invariably a guarantee of safety is reflected in the stories told. While it is sometimes necessary to move fast in the mountains, doing things in a rush and with excessive urgency can lead individuals to act and make decisions too hastily, without this bringing any benefits in terms of safety. Efficiency through speed is achieved at the expense of caution, concentration and thoroughness (paying attention to every detail, doing things properly)³, which can be counterproductive in terms of safety. The notion of achieving the **best compromise between efficiency and thoroughness**⁴ is crucial here.

Extract: “I made the highly careless decision to leave my crampons in my bag (to save my ankles), together with my ice axe. If I hadn’t, I probably wouldn’t have fallen and, in any case, I would have managed to get out unassisted. The moral of the story? **Never compromise on safety, especially if it’s just a question of comfort.**”

Extract, [Roche Paillon ridge](#): “My partner had been in a rush since we started out that morning. He wanted to go fast for no particular reason (throughout the climb, that’s how I felt, like my partner was pulling me, despite my remarking on it several times): **we definitely didn’t take enough precautions when we were climbing back down.**”

A selection of scenarios summed up in a few words:

Icefall collapse	The appeal of choosing the least energy-intensive option - the exciting nature of the climb - an exposed but easy route - icefall collapse
Fall into a crevasse at the Dôme des Glaciers	The appeal of choosing the easiest option - inadequate perception of the danger/risk-free terrain - glacier route chosen rather than tough rocky terrain - fall into a crevasse
Sternum fracture, Mt Aspiring, NZ	The appeal of choosing the fastest and most efficient route - bivouacking in an exposed location, rather than taking a detour - serac fall - injury
Fall into a crevasse on the Allalinhorn glacier	The appeal of choosing the easiest option (convenience) - failure to use crampons - fall into a crevasse

³ While it is obvious that the shorter the time spent exposed to hazards, the lower the likelihood of accidents occurring, the question remains whether the risks are increased by the negative consequences of haste, such as stress or precipitation. One explanation may be that the emphasis is all too often placed on speed, under the influence of “mountaineering culture”. In recent years, the mountaineering world has been typified by a focus on speed, quickly linking together pitches, lightweight equipment that allows individuals to climb faster, and the times achieved on particular ascents. Many high-profile personalities from the world of mountaineering, such as Gaston Rébuffat, Christophe Profit and, more recently, Kilian Jornet, Uéli Steck, Paul Bonhomme and Alex Honnold, gained a reputation thanks to their ability to complete several routes in a short amount of time.

⁴ Hollnagel (2009) discusses the “Efficiency-Thoroughness Trade-Off” in the field of business security.

[Fall in the Barre](#)
[Noire couloir](#)

Section and route perceived as easy - the appeal of the easiest option:
“laziness” meant that the type of roping-up used wasn’t modified - climbing up the couloir roped up without belaying - a slip causing the whole rope team to fall

This behaviour illustrates a point made by a mountain rescue officer, who underlines the impact of these “moments of laziness”:

*“I am convinced that there is such a thing as **“fatal laziness”**, and that mountaineers often say to themselves “it’ll be ok” or “I should probably put on my crampons, but... I’ll be fine”. Not only is it annoying for them to have to carry crampons, if they do have them in the bag they sometimes think “it should be alright”. It’s crazy to think that someone died because they couldn’t be bothered to put on their crampons. It’s such a pity.”*

Rescue officer, French mountain police force

→ *The influence of one’s own group or another group (3 accounts)*

The group with which an individual is climbing can sometimes push them to behave in a certain way, either through explicit encouragement or due to the implicit atmosphere created (false sense of security, competitiveness, peer pressure, etc.). The presence of other individuals/groups and the example they set (“if others are doing it, then there is no danger”) can be reassuring or inhibit their own risk analysis.

Extract: “Had I been alone at the start of the climb, I would have quickly given up, because it was too windy and too hot. But there was a group there, from the Albi branch of the CAF, with two instructors and one high-mountain guide. The guide climbed alone for 50-60 metres to see if it was ok and he said he thought it was. That restored my confidence. Had he not been there, I would never have gone up. The thing is, he knew the route well and had a plan B: an escape route via the ramp to reach the safety of the ridge if any doubts crept in. I hadn’t thought about this option. That was a mistake on my part.”

3.2. A loss of focus or diverted attention (12 accounts)

Several stories cite a lack of concentration as a factor that influenced the perception of hazards (risks were overlooked), the analysis of the situation or simply the movement that led to an individual falling in terrain they might have considered easy. This lack of attention is expressed in different ways:

→ *Attention focused on a single obstacle or on external preoccupations (7 accounts)*

In some cases, a single aspect of a particular situation, obstacle or hazard monopolizes the individual’s attention, so that they fail to perceive the danger that ultimately leads to the undesired event. In other cases, the climber’s attention is focused on personal concerns unrelated to the situation (time constraints, work, family, etc.).

Extract no. 1: “We had made good time. But we were so keen to keep up the pace that we didn’t think (either before or during the climb) to stop when we reached the first snow-covered slopes, to hold a snow training session and practice arresting a fall with an ice axe.”

Extract no. 2: “When you’re descending, wracked with disappointment, you’re only thinking about what you’re going to do to make up for it and your imagination runs free. The snow was like concrete in this section. I suddenly realised that I was walking down this steep incline with my heels only digging in by about 3 cm. I slipped when I turned around.”

→ *When haste or pressure leads to carelessness (5 accounts)*

A feeling of urgency or pressure can sometimes prevent climbers from spotting certain danger signs or cause them to neglect safety procedures. This hastiness can be due to time constraints, e.g., if bad weather is approaching, but also to feelings of stress triggered by the presence of multiple rope teams or a desire for efficiency. The latter can be attributed to the emphasis on speed mentioned earlier on.

Extract, [Pic Bayle → Pic de l’Étendard traverse](#): “The accident happened on the snow patch that lines the western face. A hailstorm suddenly erupted and, in her haste, my partner began to walk down the snow patch without crampons or ropes. When she was halfway down the snow patch (on a 35-40° slope), she slipped and tried to catch herself by planting her ice axe, which she lost hold of.”

3.3. *The perception of easiness leads to the neglect of safety measures or a loss of vigilance (12 accounts)*

The way in which an individual approaches a climb as a whole, or a particular section of it (pitch, descent, easy terrain), influences how they prepare for it physically and mentally. The perception of easiness or a lack of danger is mentioned in 12 accounts. This observation corroborates the results presented in the report on the accidentology of mountain sports published in 2014⁵, which points out that the majority of fatal accidents involving mountaineers occur on unchallenging terrain, often with no belays in place.

This underestimation of the level of difficulty, either of the route as a whole or of the section in question (which is often part of the descent or located just after a more demanding section), very often leads to a loss of concentration and inadequate physical, mental or equipment preparation.

This belief that a route is easy is sometimes amplified by the familiarity of the terrain (a climb already completed several times, a “local” spot) or by the fact that the individual is used to passing through a particular point, is able to repeat certain movements

⁵ Circumstances of deaths in the mountains of Isère (2001-2006), cited in Soulé et. al (2014). *Accidentologie des sports de montagne, état des lieux & diagnostic* http://www.petzl.com/fondation/fondation-accidentologie-livret_FR.pdf

automatically or has completed multiple climbs over the course of the season. This combination of factors can lead to a lack of vigilance. In addition, the use of moving belays, in addition to individuals falling on snow or ice, often seems to be a characteristic of this type of scenario.

Extract no. 1: “We had convinced ourselves that this was an easy climb, and we probably didn’t take enough time to think about the difficulty of the terrain, not to mention the poor quality of the snow, which allowed crampons to be used, but was crumbly and quite variable. This was not the ideal terrain for beginners.”

Extract no.2: “Overconfidence during an unchallenging reconnaissance climb. I was too self-confident.”

Extract no. 3: “There was a feeling of having done the hard part after having descended the NW couloir of the Aiguille d’Olle, which had been quite tricky. The presence of sheer ice, even though visible, was not seen as much of a cause for worry. The potentially deadly hazard of a 35° sheer-ice slope leading to rocks was not identified.”

Extract no. 4: “An easy climb. We were in our comfort zone and the couloir is not especially awe-inspiring, especially the part where, if you slip, you can stop without too much trouble. I didn’t take any special precautions. It was supposed to be straightforward and not particularly dangerous... so I confess that I had let my guard down.”

A selection of scenarios summed up in a few words:

Slip on the Argentière glacier - Belledonne	Loss of vigilance at the end of the trip - danger underestimated - no belay - slip and fall in snow
Accident at the Tresenta	Independent rope teams - overestimation of the ability level of the participants - excessive haste - lack of snow training - a climb perceived as easy, difference between the perception of the leader and that of the participants - route error - terrain more difficult than expected - a rope team slipping and falling in snow/ice
Fall on Mont Pourri	Climb perceived as easy and a familiar situation - glacier roping-up - slip by a participant on snow/ice - rope team dragged away
Rope team slips in the eastern couloir of the Gélas	Section and route perceived as easy - poor assessment of snow quality - slip by the leader down a snow couloir - rope team dragged away
Mont-Blanc du Tacul: Modica-Noury	Total confidence in a person perceived to be an expert - unusual rope manoeuvre when rappelling - no explanation of the risks involved - end-of-rope fall
Chéré gully	Experience believed to be considerable - well-known and familiar route - decreased vigilance at the end of the trip - leader’s attention focused on the less experienced number two - no self-braking descender when rappelling - leader struck by a rockfall

→ *Gap between the leader’s perception of easiness and the impressions of other group members (2)*

The impression that a climb is easy is sometimes expressed as a gap between the leader’s perception of the terrain and that of the participants. This is particularly the case

when groups include individuals with varying levels of experience or ability. Inadequate communication or a poor assessment of the rest of the group's fitness, level of fatigue or technical ability may lead to the wrong choice of climb or route, or to the use of inappropriate types of belay. This gap often appears when the leader perceives the terrain as being easy based on their own level of ability, but does not take into account its suitability for the rest of the group. This explanation features in a number of accounts and seems to be particularly crucial in two of the stories. One offers just a summary, while the other recounts events in detail:

[Petite Aiguille Verte](#)

Difference in the level of difficulty perceived by the leader and by the other participants - overestimation of one participant's level of ability - moving belay when descending in snow - fall by the leader and rope team dragged away

[Midi-Plan traverse](#)

During the Midi-Plan traverse, just before the Col du Plan, the slope steepened and ice appeared. I decided to climb down. The section was about 15 metres high and I had done steeper ones in the past. I put in a screw at the top anyway, just in case a belay was needed. The ice was very hard and it took a lot of force for the points to penetrate. Just before I got to the bottom of the wall, I reached the end of the rope (Kiwi coil) and put in a second screw to continue climbing down with the rope taut. I was two metres short. When I reached an area that was less steep and with only a little snow, I moved over and got into position to belay my teammate, who slipped at that precise moment. His fall was arrested by the second screw. Nobody was hurt and the equipment did its job.

My mistake was not knowing my teammate well enough and he wasn't comfortable in this section. It would have been better to reel him in from above, or set up a rappel using an Abalakov. My second error was failing to react immediately when my teammate told me he was struggling for breath and getting a headache. There was quite a strong icy wind and I thought that was the reason (lack of fitness and sensitivity to the cold). I think the fact that he was starting to suffer from AMS (acute mountain sickness) was an additional factor that helped to trigger his slip. After his fall, he lost all confidence and his AMS worsened. We went no further than the mixed terrain at the point marked "3,532 m" and we had to turn back at the Col du Plan to go back down.

A lack of physical fitness due to the time taken up by other day-to-day activities and work. Mentally motivated and "ready".

This had long been a goal of ours and we knew that the Requin refuge was open and had some vacancies left. That's why we decided to do this climb.

The members of the rope team knew each other and got on well, having previously done a few climbs together.

4. Combinations of contributing factors within the scenarios

Critical situations are often the result of multiple factors interacting. The factors described above are discussed in isolation, but it is likely that they were actually part of a wider dynamic. What comes into play when a situation occurs in the mountains is closely linked to each individual's past history, their perceptions of the environment, etc. Taking this wider context into account after the fact is challenging, because it is difficult to gather all the necessary information. However, it is possible to identify combinations of factors that are

5. Risk prevention measures

This list of contributing factors is neither exhaustive nor definitive. Of course, in reality, the distinctions between these scenarios are much less clear-cut, with their respective contributing factors combining to create a huge variety of accident situations, each quite unique. Different situational dynamics and contributing factors may intertwine and overlap. Thus, a whole set of factors tend to contribute to the occurrence of critical situations that offer little room for manoeuvre.

Although it is not always possible to determine the importance of each of these factors, or even to identify those at play, these observations allow us to suggest a number of ways of reducing the risks involved in snow, ice and mixed climbing:

- Diligently **search for clues that are observable and indicate danger**, which you might overlook if you focus solely on reassuring factors (favourable weather, presence of tracks or other climbers, equipment in place, climb reputed to be easy, etc). You or another participant can push the exercise as far as possible by playing **devil's advocate**, i.e., identifying any information (conditions, terrain, group) that could justify adjusting the plan.
- **Slow down to save time**: speed does not always guarantee safety. Excessive haste can lead to critical situations that will cause you to lose time and face greater risks. It is important to strike **the right balance between speed/efficiency and thoroughness/caution**.
- **Spread your vigilance in an optimal way**: it is impossible to be vigilant at all times. While a technical section will automatically activate your vigilance, easy sections will tend to reduce it, even though they may be equally or even more exposed. When you are preparing for a climb, or as you progress up a route, identify the sections where your vigilance is liable to wane (e.g., after completing difficult sections, points at which tiredness may set in) but which remain exposed, as well as any sections where you can lower your vigilance without major risks. The aim is to **allocate your attentional resources as sensibly as possible**.
- **Be prepared to adapt and change the plan**: keep in mind that seemingly insignificant events, or weak signals, can unexpectedly trigger a process that leads to an accident. Thus, you must be ready to respond to unexpected circumstances, i.e., **“be prepared to be unprepared”**. **Preparing for the climb** the day before, either at home or in the refuge, will allow you to anticipate key sections and the points at which decision making, verbal communication and heightened vigilance will be required, in addition to the different options available if you need to alter your plans. **Choosing a climb that offers a wide range of options** makes it easier to adapt as the situation unfolds, while reducing the sometimes unconscious impact of becoming fixated on a particular goal. Identifying as many options or escape routes as possible and keeping them open for as long as you can will help you minimise the likelihood of “funnel” situations, in which you find yourself with limited room for manoeuvre and where one last misstep could have dramatic consequences.

- **Fight against your biases when assessing risks:** the desire to reach the summit, previous investment, group effect, shifting responsibilities to someone who is viewed as an expert, etc. So unconscious are the processes involved that it is difficult to completely eliminate these biases. However, the use of specific risk assessment **methods** (searching for risk indicators), the **communication and verbalisation** of risk indicators, good group organisation and shrewd decision making in critical situations will likely limit the influence of these biases. Cognitive biases, sometimes referred to more broadly as “human factors”, are an area worthy of further exploration, particularly for the purpose of reducing their influence. Understanding these biases, questioning their effects and verbalising them is the first step in the process.

Strengths and limitations of the analysis of SERAC data

These initial findings may reflect situations that many have encountered in the past. The resulting recommendations are intended to influence the way in which mountaineers approach and handle high-risk situations. However, these descriptions and interpretations should be treated with caution: the analyses put forward are highly dependent on the contents of the stories submitted and their level of detail. Therefore, they should not be considered representative of all incidents and accidents that occur when partaking in mountain sports. Thus, we must refrain from over-generalising based on our sample, which remains small, and we should be mindful of the filter created by the particularities of members of the *Camptocamp* community. Nevertheless, these analyses reveal certain trends and may therefore serve to prevent many of the risks encountered if individuals take them into consideration.