

33 YEARS IN THE SERVICE OF THE AVALANCHE-SAFETY-TEAM IDALPE - A LOOK BACK AT IMPORTANT MILESTONES AND DEVELOPMENTS IN THE AVALANCHE RISK MANAGEMENT OF THE ISCHGL SKI RESORT

Serafin Siegele¹, Paul Dobesberger^{2*} and Harald Riedl³

¹ *Silvrettaseilbahn AG, Ischgl, Austria*

² *Wyssen Avalanche Control, Innsbruck, Austria*

³ *Land Tirol, Innsbruck, Austria*

ABSTRACT: 33 winters, Serafin Siegele was an integral part of the avalanche-safety-team in the ski resort Ischgl. Not only are the slopes in the ski area and the access road into the Paznaun Valley at risk from a large number of avalanches, Serafin's parents' house is also located between two large avalanche paths. Serafin Siegele can therefore claim without exaggeration that avalanches have been part of his life since his earliest childhood.

Founded in 1962, the ski resort Ischgl is located in the Paznaun Valley in Tyrol and transports up to 17 million passengers a year on its 45 cable cars and lifts. Due to its high alpine location in the Silvretta mountain range, the ski resort is very snow-sure, but on the other hand, large parts of the 238 km long network of slopes are at risk of avalanches. This is also impressively demonstrated by the 450 blasting-points spread across the entire ski area, where avalanche triggering is carried out between November and May on a regular basis using a wide range of different methods.

In this article, we take a look at the most important milestones and developments of the last three decades in the avalanche risk management in Tyrol and Ischgl and how the daily work of the Idalpe avalanche-safety-team has changed and developed as a result.

In addition to changes in the legal framework, the training program for avalanche commissioners, the expansion of the weather station network, the further development of forecasting models, the switch to a full-time avalanche-safety-team with 5 members and the enhancement of controlled avalanche triggering can be seen as the most important milestones. However, the development of a comprehensive weather and avalanche database by the Idalpe avalanche-safety-team in conjunction with its own nearest neighbor model for avalanche forecasting also testifies to the professionalism with which the topic of avalanche risk management is approached in Ischgl. Despite all these important achievements, Serafin Siegele is certain, even at the end of his three decades as chairman of the Idalpe avalanche-safety-team, that the most important link in the daily assessment of avalanche risk is still the human factor.

KEYWORDS: avalanche risk management, avalanche safety team, ski area management, controlled avalanche release, RACS.

1. INTRODUCTION

The Ischgl ski resort is located in the Paznaun Valley in the Tyrolean Oberland and first opened its slopes just over 60 years ago. The foundation stone for the Silvretta Arena was laid in 1961 by 73 shareholders - mostly farmers from Ischgl and the surrounding area - with the founding of the Silvrettaseilbahn AG and the construction of the Silverttabahn, which led directly from Ischgl to the Idalp.

In the early years, avalanche risk management was not a major issue in Ischgl, as all the action took place around the Idalp and the existing downhill runs - there were no marked and groomed slopes at the time -

were in normal conditions not at risk from avalanches. Moreover, in the early days of the ski area, it was not a problem that parts or even the entire area could be closed in times with high avalanche risk until the weather conditions and snow cover had stabilized.

In the following years, more lifts were built and from the 1970/71 ski season, the slopes in Ischgl were groomed by people for the first time. In the mid-1970s, also in the neighbouring Swiss town Samnaun a ski resort was founded and lifts were built. Shortly after its foundation, the Silvrettaseilbahn AG from Ischgl also became the majority owner of the ski area in Samnaun with 51% and in the following years pushed ahead with the cross-border connection of the two areas with several lifts and slopes. From the 1978/79 winter season onwards, the two ski areas were connected, making cross-border skiing between Austria and Switzerland possible in the Silvretta Arena.

* *Corresponding author address:*

Paul Dobesberger, Wyssen Avalanche Control, Archenweg
52, 6020 Innsbruck;
tel: +43 512 21934600
email: paul@wyssen.com

With its high alpine and snow-sure location between 1,377 and 2,870 m above sea level, a winter season from the end of November to the beginning of May and a network of 238 km of slopes, Ischgl is now one of the largest ski areas in the Alps and attracts up to 17 million guests to the region every year. Along with the expansion of the ski area, the steady increase in vacation and day visitors and the transformation from a small mountain village to a world-famous vacation destination, the demands on the safety of guests and the availability of lifts and slopes has also increased.

2. THE BEGINNINGS OF AVALANCHE SAFETY

With the increasing expansion of the ski area, more and more areas were opened up that are at risk of avalanches, some of which are very large. As a result, the avalanche risk in the catchment area of these endangered slopes had to be constantly assessed and, where possible, reduced to an acceptable level in order to avoid longer closures of parts or even the entire ski area. The majority of the 238 km long slopes network in Ischgl is potentially at risk from avalanches, but only 11 km are secured with permanent measures such as snow bridges or galleries. This fact proves that Ischgl relied on the risk assessment by a local avalanche commission and the preventive triggering of avalanches early on to secure slopes and lifts.

The work of the Idalpe avalanche-safety-team is facilitated by the favorable ski area structure, at least to the extent that the slopes can be secured step by step starting from a safe core area and then the associated slopes can be prepared and opened. First thing in the morning, the area around the Idalp and the valley runs are secured, groomed and normally open to guests by 08:30. As two large areas are already open for skiing, the avalanche-safety-team can work their way to the other areas and assess and secure each slope without the pressure of having to open the ski area as quickly as possible. However, as avalanche blasting per hand is very time-consuming, the use of RACS (remote avalanche control systems) for the controlled triggering of avalanches was used very early on in Ischgl (see also Siegele et al. 2018).

As early as the 1972/73 season, the first avalanche blasting by hand were carried out in the ski area and, more or less at the same time, three avalanche blasting ropeways were installed in areas that could not be reached or only with great effort or high risk for the employees. These blasting ropeways were initially operated with diesel engines and later converted to electric drives, which considerably improved their operation and significantly increased their reliability. The fact that the controlled triggering of avalanches was still in its infancy in Ischgl at the time can be seen

from the fact that only one bunker with a capacity of 25 kg of explosives was available for blasting work in the area, which only covered the daily requirements at the time.

Parallel to the general expansion of the ski area, the avalanche risk management in Ischgl was also constantly expanded and modernized over the following decades and, with the support of the management, also new paths in the field of avalanche risk management were explored.

In 1991, Serafin Siegele started his first season with the Idalpe avalanche-safety-team - at that time, it still had 10 to 15 members, consisting primarily of ski instructors and mountain guides. However, as these people had to work full-time during the day, Serafin was often left to his own during the day to assess the changing avalanche situation in the ski area.

When the state law for avalanche commissions was introduced in Tyrol in 1992 (Amt der Tiroler Landesregierung, 1991), Serafin took this as an opportunity to restructure the Idalpe avalanche-safety-team together with Raimund Mair, who was responsible for avalanche warning and avalanche commissions at the state of Tyrol. Once again, the management was also in favor of this innovation and released the necessary funds so that one of the first full-time avalanche commissions in Austria was created in Ischgl for the 1993/94 season. From then on, the new Idalpe avalanche-safety-team consisted of four full-time employees with the main task of continuously assessing the avalanche risk in the ski resort, as well as suggesting necessary avalanche safety work and closures and in some cases carrying them out themselves.

Also in 1993, the first two GAZEX ignition pipes from the French company tas were installed in the ski area. The use of these automatic avalanche triggering systems increased the safety of the blasting teams and significantly reduced the time required for avalanche safety work in the area. By 1998, a total of 36 GAZEX RACS had been installed in the Ischgl ski area, some of which are still in use today.



Figure 1: Pre-emptively triggered avalanche using GAZEX RACS.

Thanks to the consistent expansion of avalanche safety measures in the area, the Silvretta Arena came through the catastrophic winter of 1998/99 relatively unscathed. Due to massive avalanche blasting, partly in the morning and in the evening, the ski area only had to remain closed on one day. Major damage to the infrastructure caused by extreme avalanches was also avoided thanks to the regular unloading of the slopes by means of controlled avalanche triggering. However, due to the extremely heavy snowfall in January and February 1999, the consumption of explosives was extremely high and the access roads into the Paznaun Valley were closed, so that explosives had to be flown into the ski resort by helicopter from the Inn Valley in the middle of the season in order to continue the blasting work.

3. TRANSITION TO AN INTEGRATED AND MODERN AVALANCHE RISK MANAGEMENT

The avalanche winter of 1999 got things rolling in Tyrol - for example, the Tyrolean avalanche warning service was staffed up and the network of automatic weather and snow stations was expanded in the following years to become one of the densest in the world. Avalanche warning was also improved from season to season through the expansion of the observer network and improved forecasting models. At the same time, a comprehensive range of training courses for avalanche commission members as well as a corresponding training manual was created, covering the entire spectrum of tasks of an avalanche commission, from assessing the current avalanche danger to taking measures and rescuing avalanche victims (Amt der Tiroler Landesregierung, 2022).

Another major milestone in avalanche risk management in Ischgl was the permanent stationing of a rescue helicopter from the company Schenk Air directly

in the center of the ski area on the Idapf from the 1999/00 season. Although this helicopter is primarily used for emergency medical care and the transport of injured persons to the surrounding hospitals, there was also an agreement from the outset that the Idalpe avalanche-safety-team could access this helicopter at any time if necessary to carry out situation assessments and avalanche blasting. This meant that the avalanche commission was no longer reliant on the availability of helicopters from further afield and could call on this helicopter to support its work at any time and without any lead time.

In 2003, the ski resort Ischgl introduced the AFADE software solution to record weather conditions, snowpack build-up, avalanche blasting and explosives consumption. This tool also made it possible to find similar days in the database and to draw conclusions about the current avalanche situation based on the avalanche activity recorded on this day in the past. The introduction of this software also represents the starting point of one of the most comprehensive digital data sets with information on weather conditions, snow cover and avalanche activity in the Alpine region.



Figure 2: Members of the Idalpe avalanche-safety-team triggering avalanches by explosives with the Schenk Air helicopter permanently stationed in the ski area.

As the constantly increasing avalanche control work in the ski area meant that the consumption of explosives was also constantly rising, the decision was made in 2004 to build two new explosives bunkers, each with a permissible storage capacity of 5 tons. These two bunkers are located at the edge of the ski area, which makes it possible to safely prepare explosives even while skiing is in progress. In addition, larger trucks can now reach the bunkers directly and

supply them with the required annual consumption without time-consuming reloading. A forecourt was paved in front of the bunkers so that the helicopter can now land directly in front of the bunkers to pick up the crew and the explosives for avalanche blasting missions.

In 2009, the Idalpe avalanche-safety-team decided to change the system for the construction of new RACS and to use the relatively new avalanche blasting towers from the Swiss company Wyssen Avalanche Control instead of the gas system preferred up to that point. As the system has proven itself very well in daily use and also a larger area could be covered by one of the new systems compared to the previously used gas systems, only Wyssen avalanche towers have been installed since then. The avalanche-safety-team currently has 74 avalanche towers at its disposal for daily avalanche control work. Construction work is currently underway for a further nine towers in the area and, according to Serafin Siegele, these will not be the last RACS installed in Ischgl.



Figure 3: Controlled triggering of an avalanche using a Wyssen avalanche tower.

The expansion of RACS in Ischgl was given a major boost by the changes to the law (Seilbahnerlass) in 2011 (BMVIT 2011). Due to the amended law, it was now also permissible for lifts and slopes to be secured only by controlled avalanche triggering. Until these adjustments were made, the recovery safety of the cable car and the avalanche safety of at least one associated slope had to be ensured with permanent measures. This new legal situation not only made it easier to implement new projects, but also meant that some existing steel snow bridges were dismantled and replaced by RACS.

Even though the constant expansion of the RACS in the ski area meant that the slopes could be opened much more quickly and safely, the access roads to Ischgl were sometimes closed for several days after

large amounts of fresh snowfall due to the increased risk of avalanches. To remedy this situation, a pilot project was launched in 2011 by the municipality of Ischgl together with the province of Tyrol and the federal agency for torrent and avalanche control (WLV) to secure the two avalanche paths Großtal and Hoher Zug using RACS. The expertise of the Idalpe avalanche-safety-team and Serafin Siegele in the field of controlled avalanche release was gladly called upon. Together, a concept was developed for securing the only road between Ischgl and Galtür as well as a winter hiking trail and a cross-country ski trail also crossing these two avalanche paths. At the end of the study, the decision was made to install eight Wyssen avalanche towers and an avalanche radar. Since the installation the road in this area has no longer had to be closed, with the exception of the control work itself.

Based on the findings of this pilot project, the Tyrolean provincial government decided in 2012 to draw up guidelines for the use of temporary protective measures against avalanches for other projects of this kind (Amt der Tiroler Landesregierung 2013, Riedl et al. 2018). The follow-up project in the neighboring municipality of Kappl has already been implemented on the basis of these guidelines whereby another avalanche path, which endangers the access road to Ischgl, has been secured using three Wyssen avalanche towers and an avalanche radar.



Figure 4: Harald Riedl (Province of Tyrol) and Serafin Siegele (right) presenting the Großtal pilot project as part of a training course for avalanche commissions in Tyrol.

Due to the further expansion of avalanche towers, storage space for the deployment boxes became increasingly scarce over the summer, so in 2012 the decision was made to build a warehouse for the Wyssen deployment boxes between the two existing explosives bunkers. This created a unique infrastructure for the storage and preparation of explosive, which makes the loading of the avalanche towers and the preparation of the charges for blasting from the helicopter much easier and also significantly safer. Thanks to the location on the edge of the ski area, since then it is possible to carry out preparation helicopter bombing and for reloading the RACS even while skiing is in progress.



Figure 5: Warehouse between the two bunkers for the deployment boxes of the actually 74 Wyssen avalanche towers from the ski resort and 8 from the municipality of Ischgl.

In 2013, the ski area was once again significantly expanded with the development of the Val Gronda area. In order to maintain the same high level of safety, the Idalpe avalanche-safety-team was increased by one additional person, so that the team now consisted of five full-time avalanche commissioners, with at least three team members on duty on the mountain every day. Also the development of these new big terrain involved the construction of additional RACS to secure the new slopes.

After 15 years on the market, the control unit of the Wyssen avalanche tower were completely overhauled by the manufacturer and brought up to the latest state of the art. The main communication was switched from radio to mobile radio (GPRS) and the software was changed from a permanently installed desktop application to a browser-based online application. In 2015 in Ischgl, the decision was also made to convert all 65 existing avalanche towers to this new control system so that all avalanche towers have the same technical standard. The new control system made it much easier and quicker to establish a connection with the RACS and also created the option of multiple triggering of all towers in a sector, significantly reducing the time required to trigger all RACS. Together with an intuitive and web-based user interface, the upgrade of the control systems has made the work of the avalanche-safety-team and the documentation of blasting operations much easier.

The Idalpe avalanche-safety-team had already provided important input during the design of the new software for controlling the RACS and was also heavily involved as a development customer in the following years when additional modules for avalanche-safety-teams were added to the software. With the 2021/22 season, these jointly developed modules of the WAC.3 software environment were also taken over into operational service, which means that the Idalpe avalanche-safety-team can now carry out or log the majority of its daily work via the WAC.3 software environment. In addition to the operating software for the avalanche towers, WAC.3 in Ischgl includes further modules for gathering information, internal communication, structured situation and risk assessment, documentation of helicopter bombing, documentation of avalanches as well as for the explosives inventory management. The Nearest Neighbor approach for determining the most similar days in the past from the AFADE software has also been completely revised and integrated into the WAC.3 Cockpit. In the same process the daily simulation of the snowpack using the Swiss SNOWPACK model was added in the WAC.3 Cockpit as further support for the decision-making process, whereby the focus in the visualization of the results was placed on the easiest possible interpretation.

This investment in a completely new software environment also made the day-to-day work of the Idalpe avalanche-safety-team much easier on the one hand, and on the other, this changeover also brought the standard in the process of information gathering, situation assessment and documentation of the decision-making process up to the latest state of the art. Thanks to the continuous orientation of all modules towards mobile use, it is now also possible for the avalanche-safety-team members to call up current information, record notes, create situation assessments and trigger RACS at any location.

4. CONCLUSION

In recent decades, thanks to the legal and operational framework and the daily efforts of the Idalpe avalanche-safety-team, avalanche risk management in the Silvretta Arena has been raised to an extremely high level, even by international standards.

The Idalpe avalanche-safety-team currently has more than 100 RACS for controlled avalanche triggering at its disposal, as well as a helicopter stationed in the ski area for avalanche blasting. Together with those paths that are still secured by manual avalanche blasting, as well as pushing off with snow groomers, avalanches are regularly triggered preventively at 450 points throughout the ski area in order to guarantee the safety of guests and staff. The safety effort in Ischgl is impressively illustrated by the up to 3,500 avalanche control missions carried out per season or the explosives consumption of up to 12 tons per winter.

Despite all the technological advances and technical aids, Serafin Siegele is still convinced that people are still the most important piece of the puzzle in avalanche risk management and will probably remain so for decades to come.

Looking back on three decades in the Idalpe avalanche-safety-team, Serafin could not say that winters or avalanches in the ski area have changed. However what has definitely changed is the behavior of guests. On the one hand, the trend is increasingly towards shorter vacations. Whereas guests used to spend two to three weeks in the valley, the current trend is towards two to three days, which is why closure periods due to wind or high avalanche activity are no longer as acceptable as they used to be. This is one of the reasons why Serafin Siegele is certain that a ski resort like Ischgl could no longer be operated today without the controlled triggering of avalanches and that the expansion of RACS will probably continue even after his time at the Idalpe avalanche-safety-team.

In addition to the support of the management and the large investments that have been made in the expansion of avalanche risk management in Ischgl since 1962, the adjustments to the legal framework were

also a major milestone and have made many innovations in the ski area and in the Idalpe avalanche-safety-team possible in the first place.

Even if it is a real success story that Serafin and his team can look back on, there have also been downsides over the three decades. In 2012, for example, there was a tragic incident where a man was caught and killed in an avalanche in front of his two sons on an open slope. Even though the judicial investigation into the only avalanche victim on an open slope in Ischgl found that the avalanche-safety-team was not at fault and the event was classified as unforeseeable, such events leave their mark on everyone and encourage them to critically question their own work and the decisions made.

Another test for the Idalpe avalanche-safety-team was an accident during a company outing for the retirement of one of its members in 2020. During the trip to the Wyssen headquarter in the Swiss Kander valley, a small plane crashed during a sightseeing flight, killing two members of the Idalpe avalanche-safety-team, the CEO of Wyssen and the pilot. In addition to the severe stroke caused by the tragic loss of three good friends, the Idalpe avalanche-safety-team lost three long-standing members with a wealth of experience shortly before the start of the season. At least from this point of view, the COVID-19-related closure of the entire ski area the following winter came in very handy, as it allowed the three new members to spend a winter familiarizing with this responsible work and gaining their own experience with the snowpack and the avalanches in Ischgl.



Figure 6: Serafin Siegele inspecting a controlled triggered avalanche in the Ischgl ski resort.

After 33 winters in the first rows of avalanche risk management in Ischgl, last season was Serafin Siegele's last one as chairman of the Idalpe avalanche-safety-team. However, as a Paznauner, the topic of avalanches will certainly not let go him even in retirement and he will hopefully be able to observe them from the second row for many years to come.

REFERENCES

- Amt der Tiroler Landesregierung: Landesgesetz über die Lawenkommissionen, 1991.
- Amt der Tiroler Landesregierung, Abt. Zivil- und Katastrophenschutz, Lawenkommissionsangelegenheiten (Hrsg.): Praxisempfehlungen Lawensprengungen. Richtlinien für den Einsatz temporärer Schutzmaßnahmen gegen Lawinen, 2013.
- Amt der Tiroler Landesregierung, Abt. Zivil- und Katastrophenschutz, Lawenkommissionsangelegenheiten (Hrsg.): Ausbildungshandbuch der Tiroler Lawenkommissionen, 6. Edition, 2022.
- BMVIT: Erlass der Bundesministerin für Verkehr, Innovation und Technologie betreffend den Lawenschutz im Bereich von Seilbahnen (Seilbahnerlass 2011), 2011.
- Riedl, H., P. Dobesberger, and R. Sterr: Praxisempfehlung Lawensprengen – Richtlinien des Landes Tirol für den Einsatz temporärer Schutzmaßnahmen gegen Lawinen. In International Snow Science Workshop Proceedings 2018, Innsbruck, Austria, 2018.
- Siegele, S., W. Steinkogler and P. Dobesberger: Lawenrisikomanagement im Skigebiet Silvrettaseilbahn AG (Ischgl). In International Snow Science Workshop Proceedings 2018, Innsbruck, Austria, 2018.