

2023



International Ropeway Review

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OFFICIAL ORGAN OF OITAF



5-COUNTRIES SPECIAL



New 15-MGD completes trio in Jasná

Foto: Tatry mountain resorts, a.s.

ROPEWAYS

Interesting mountain
and urban projects

OITAF

Congress 2024 in
Vancouver, Canada

PISTE

Slope grooming in
Jasná, Slovakia

artificial snow fun
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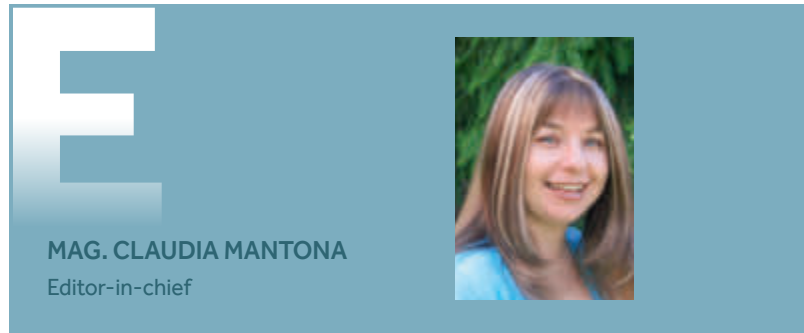
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DEAR READERS,

Did you get to attend InterAlpin, the world-leading trade show for alpine technologies, which was held this year from April 19 to 21 in Innsbruck (AT)? There was a sense of new departures among the 650 exhibiting companies from 50 countries and 35,000 trade visitors from no fewer than 120 countries. After a four-year interruption in the InterAlpin cycle due to the Covid-19 pandemic, attendees were all the more appreciative of the opportunity to meet face-to-face again instead of only virtually via videoconference. Next year, by the way, the International Organisation for Transportation by Rope (OITAF) will be holding its 12th International Congress in Vancouver, Canada, from June 17 to 20 (see p.11).

By the time you start reading this edition of ISR, the summer season will already be underway in most European ski resorts. There is a continuing trend – and growing financial need – for mountain resorts to operate their facilities all year round, although many ropeway companies still generate the major share of their revenues in the winter season. The 2022/23 winter season differed greatly in some cases between the Czech Republic, Poland, Bulgaria, Romania and Slovakia. The Czech Republic, for example, had one of the best season openings in years. A four-week thaw starting at the end of December, however, caused a drop in visitation at many ski resorts, which was partially offset by a February

that was ideal in terms of weather and visitor numbers. Due to the warm temperatures in March, lower-lying ski resorts had to end their winter season somewhat earlier than usual, while ski resorts at higher altitudes continued to operate until mid-April. In general, however, there was also a trend to shorter visitor stays. Many vacationers came for an extended weekend or a day or two more at most. The increase in the cost of living, driven by a very high inflation rate, forced many winter visitors to tighten their belts. This also led to lower revenues in the mountain restaurants. Higher-lying winter sports destinations and ski areas with extensive snow-making generally achieved better results for the season as a whole. Compared to the last winter season before the outbreak of the pandemic, revenues at Czech ski resorts were down by 15% to 30%.

I would like to close by thanking everyone who has made a contribution to this ISR special, and I wish you, dear readers, an interesting and enjoyable read.

Kind regards,

Claudia Mantona
claudia.mantona@verlagholzhausen.at

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“New results concerning ropes of tramways” (1970)



UNIV.-PROF. DIPL.-ING. DR.
TECHN. JOSEF NEJEZ
Technical Editor of ISR

In connection with his professional activities in the field of ropeway engineering – as a lecturer and assistant professor, sworn expert to the courts and public bodies, and technical editor of ISR – Professor Josef Nejez has personally witnessed the developments in the ropeway industry over the last fifty years and has many a story to tell.

fessor at the Institute of Railway Engineering and Transport Economy there, which I immediately accepted. One of the subjects covered by the institute was ropeway engineering. We assistants had a good theoretical grounding in the field, but contact with the practical side of ropeway construction and operation, i.e. with ropeway manufacturers, ropeway operators and the ropeway authorities, was minimal to non-existent.

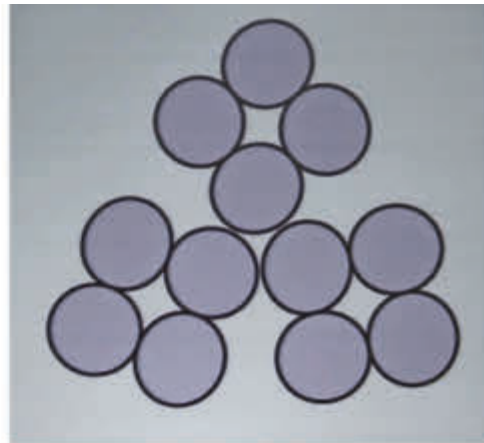
That was when ISR came into my life. In those days its English title was *International Tramway Review*, with *General Snow Service Techniques* and *Official Mouthpiece of the International Organisation for Transportation by Rope (OITAF) and the Competent Authorities* in the subtitle. As the only genuine trade journal in its field, it had an important function for us young academics: It kept us up to date with the latest developments in the entire ropeway industry.

1970 – HOW IT ALL BEGAN

In 1970, I graduated in civil engineering at the Faculty of Civil Engineering and Architecture of the Vienna University of Technology (TH) and was offered a post as an assistant pro-

ISR ARTICLES FROM THE EARLY DAYS

Now that I can look back on fifty years of involvement with ropeways, I thought it would be a good idea to select individual ISR articles from the beginnings of my ropeway career



Albert's wire rope: The invention of the wire rope by Julius Albert in 1834 was a prerequisite for the development of the ropeway. The rope had three strands with four iron wires each. In the figure you see the cross-section and top view of an original piece of Albert rope and the cross-sectional drawing.

and track subsequent developments with regard to the various aspects of ropeway engineering dealt with. The first of these "Ropeway Stories" is about ropeway ropes, with an article on "New results concerning ropes of tramways" by Dr. E. Müller of Stuttgart, which appeared in issue 3/1970 of the *International Aerial Tramway Review*, as the point of departure. Passages of original text taken from that article in ISR are indented and printed *in italics*.

"NEW RESULTS CONCERNING ROPES OF TRAMWAYS"

The author begins his article with a review of the origins of ropeway engineering and cites the invention of the wire rope by Julius Albert (see box) as the decisive prerequisite for the introduction of ropeway systems. He briefly discusses the development of the monocable and bicable systems before turning to the subject of rope construction. Here is an excerpt from the somewhat unorthodox original English translation.

For moving ropes, the following type is carrying through: six-stranded parallel lay worked out in Lang's lay. The reason for that is that the durability is longer because of the favourable contact conditions of the wires in the strands and the way the Lang's lay is lying in the groove of a sheave. Normally the Seale construction seems to be most suitable. In special cases the filler wire rope has proved good. In some cases Warrington construction has led to non-sufficient results because of slackening of some thin outside wires.

A significant part for the construction of a rope is the core. Mostly it will be a fibre core.

The main purpose of a fibre core is to support the strands radially. For this purpose the core must have enough volume and keep this volume for the lifetime of the rope.

Does this still apply? What has changed with regard to ropeway ropes? Not very much with regard to the basic principles, but although the ropes – and the thinner ropes especially – look much as they did fifty years ago, significant technological developments have taken place in line with the growing demands of the ropeway manufacturers in terms of the higher rope tension needed to cope with increases in carrier weight. While the diameter of a carrying-hauling rope used on a double chairlift would normally be 38 mm at that time, for example, the diameter of the rope of a modern 10-passenger gondola lift is now 56 mm.

In terms of rope construction, they are usually Warrington-Seale ropes. (For information on rope construction, you are referred to my article titled *The ropes used on ropeway installations* in ISR 2/2019, p. 124). Since the mid-1980s, wire diameters for the rope cross-section have been calculated using computer programs that take into account the exact sectional shape of the wires in the rope structure. This ensures, to the best possible extent, the even distribution of pressure between the wires, which is a prerequisite for long rope life.

Other developments in moving ropes include the use of compacted ropes or strands as well as seven or eight-strand, round strand rope. Compacting flattens the outer strands of the ropes and reduces the diameter of the strands, so that rope diameter is reduced while breaking

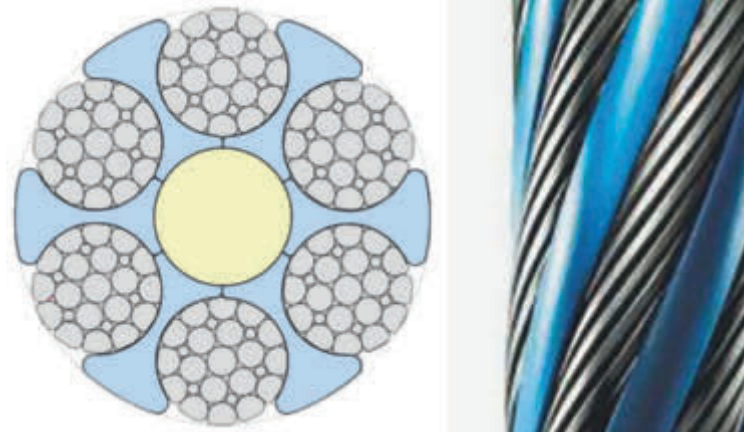


Fig. 1: Drawing of Fatzer's Performa rope: Six compacted round strands separated by six extruded synthetic rods are arranged around an extruded polyethylene rod.

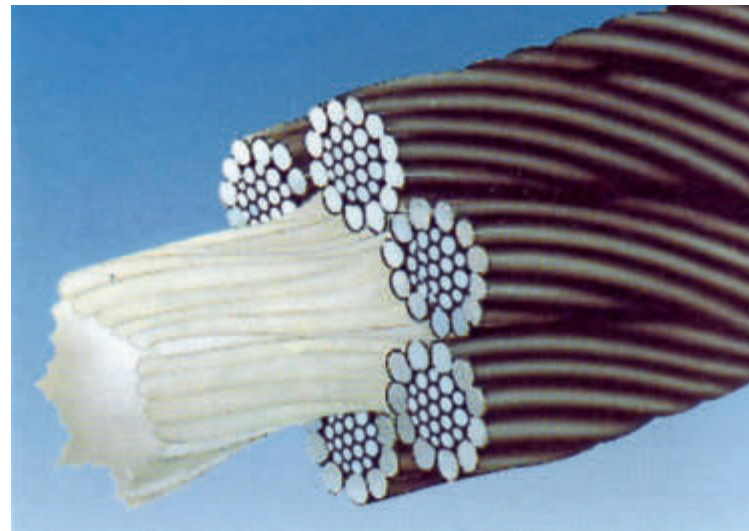


Fig. 2: For its compact monowire core ropes, Tréfileurope uses an elastic synthetic rod as a rope core, in which the strands are evenly embedded during stranding while it is warm.

force remains the same. The "rounder" surface also makes for smoother running of the rope over the sheave trains and round the bullwheels. Seven- or eight-strand carrying-hauling ropes offer smoother running, because the valleys between the strands are less pronounced than those of six-strand, round-strand ropes. A rope construction in which the rope surface comes even closer to a cylindrical shape is the *Performa* rope. Six compacted round strands separated by six extruded synthetic rods are arranged around an extruded polyethylene rod that serves as the core (see Fig 1). There have also been new developments in rope cores, but they must still meet the same requirements as those described by Müller above. One such development is the use of an elastic synthetic rod as a rope core, in which the strands are evenly embedded during stranding while it is warm (see Fig 2). This gives the synthetic rod a star-shaped cross-section.

Another rope manufacturer uses a synthetic rope core in combination with plastic inserts or support profiles between the strands to ensure even strand spacing (see Fig 3).

Returning to the article written in 1970, the author has the following to say on the subject of track rope constructions (again quoted from the original English translation):

The construction of the carrying ropes seems to depend on the borders of the different countries. In Germany and Switzerland, exclusive use is made of full locked coil ropes while Austria and Italy prefer multi-strand ropes. Obviously that is not a question of technical facts but a question of composition of the supervisory boards. In Germany the use of full locked coil rope is practically prescribed because this kind of rope has got some advantages: greater corrosion resistance by profiled wire locking, smooth surface, smaller diameter by higher degree of filling, more favourable behaviour at vibration stressing by better condition of wire contact, better behaviour at braking, and wires of the outer layer easy to replace.

Of course the full locked coil rope has to be well fabricated. Typical manufacturing defects:

- *Cork-screws caused by loosening of the outer layer. Here the outer layer is archlike propping in itself instead of exerting pressure on the core. By that a profiled wire is squeezed out of the outer layer*
- *Rope twist: The reasons for it are not quite known, but maybe the reasons can be found in the different tension of the wires at stranding and in too small pretension of the rope at the moment when it is pulled out of the stranding machine. Here, too, the rope can form like a cork-screw.*
- *Too little lubrication: Here, some of the hollows of the inside of the rope are not completely filled. There will be corrosion in the inner layers at disturbance of the judgement of the state of the rope when magnetic-inductive inspection is done. It has showed in practice that the mechanical sealing of the profiled wires is not entirely hermetic. So water can penetrate into the rope if there is no additional sealing. If rubber lined rollers are running on the rope, the mixture of grease and rubber will be a sufficient additional sealing of the rope. If the rollers which are going to be used are steel or nylon lined, this additional sealing will be missing. Therefore, special attention has to be paid to the inner and outer lubrication of the rope.*

There is little to be added to these comments today, except that the author has not mentioned another advantage of full-locked track ropes: The smooth rope surface means less wear on the linings of the carriage wheels.

The problem of differences between the industry codes of the various ropeway countries depending on the personal views of the staff in their supervisory authorities was one of the reasons for the creation of uniform ropeway standards by Technical Committee TC 242 of the European Standards Institute (CEN). With regard to ropeway ropes, the use of multi-strand ropes as track ropes for new ropeway installations is no longer permitted. Nobody would even think of it today!

Josef Nejez

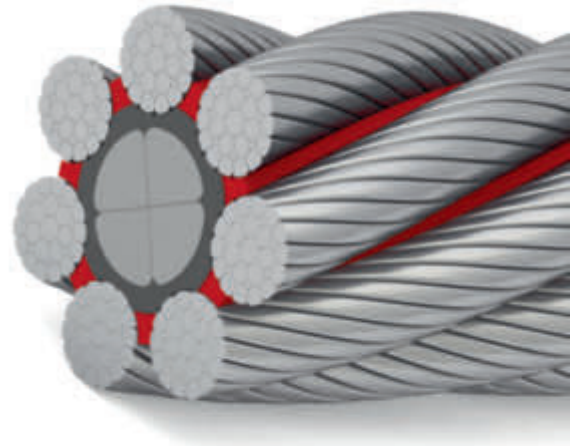
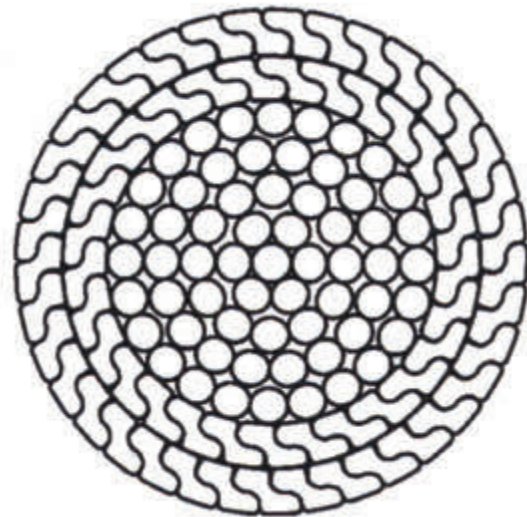


Fig. 3: Teufelberger's seven-strand, round-strand Solitec® Max7 rope has plastic inserts or support profiles between the compacted strands to ensure even strand spacing.



Cross-section of a full-locked coil rope as used as for ropeway track ropes



The variety of ropes used in ropeway engineering as shown at the stand of rope manufacturer Fatzer at Interalp 2015

High-capacity gondola lift eliminates the bottleneck in Jasná

ISR REPORT (by Roman Gric) A new 15-passenger gondola lift supplied by Doppelmayr/Garaventa opened for the 2022/2023 winter season as a link between the parking lot at *Biela Púť* and the center of the area at *Priehyba*, greatly improving direct access to the Jasná ski area from the north.



Bottom station at Biela Púť in Jasná with the colored RGB LED lighting

Jasná in the Low Tatras, the largest ski resort in Slovakia, was developed after the Second World War between 1949 and 1957 with the construction of four Von Roll VR-101 detachable chairlifts, which provided access to Chopok Mountain (2,024 m) on both the north and south sides. Apart from a few surface lifts, it was not until the 1970s that further rope-



Development began in the 1950s with the construction of four Von Roll double chairlifts.



The first gondola lift in the area is now a thing of the past, too (*Otupné – Brhliská*, 1984 – 2009).

ways were built in the area, namely two Poma fixed-grip double chairlifts. Then, in 1984, a 4-seater Tatrapoma gondola lift, from *Otupné to Brhliská*, was built under license from Poma. In the 1990s Tatrapoma delivered more fixed-grip and detachable chairlifts to the area, partly as replacements for the retired chairlifts built in the 1950s.

SKI AREA UPGRADE STARTING IN 2003

Due to technical defects and the ravages of time, the remaining two stages of the old Von Roll chairlifts to the top station on Chopok were closed in 1997 and 1998, so that the summit area was only served by surface lifts.

In 2003, the first detachable 6-seater chairlift with bubbles, the *Zahrádky – Rovná Hola* lift, was built in Jasná as the first of its type in Slovakia. On the basis of a tender procedure, the ropeway engineering was supplied by Doppelmayr, who also built most of the subsequent ropeways in Jasná. Following the construction of the 6-seater chairlift, the operating company *Tatry Mountain Resorts* (TMR) intensified its capital investments in Jasná, as reported in several issues of ISR (e.g. ISR 4/2011, pp. 18–19; ISR 3/2013, pp. 30–33 and ISR 5 Countries 2017, pp. 11–13). Today the resort has one funitel, four gondola lifts, one inclined elevator, eight chairlifts and six surface lifts, providing access to 51 km of slopes covering an area of 151 hectares.

HIGH-CAPACITY ACCESS SYSTEM

Access from the parking lot at *Biela Púť* to the bottom station of the funitel at *Priehyba* previously involved riding a fixed-grip quad chairlift followed by the Twinliner inclined elevator. Because of the limited transport capacity of the inclined elevator especially, the lift lines were often long.

This bottleneck was eliminated in time for the 2022/2023 winter season with the opening of the new high-capacity and wind-resistant *Biela Púť – Priehyba* 15-passenger gondola lift with spacious 15-passenger cabins and a transport capacity of 2,800 pph. The new gondola lift saves skiers at least 20 minutes transit time, taking them straight to the bottom station of the *Priehyba – Chopok* funitel. As the new ropeway and stations have barrier-free access, Chopok peak can now be reached by people with walking disabilities and families with strollers, too. The new gondola lift also makes it much easier to supply the eateries on the mountain, thus eliminating the need to transport goods by snow groomers – a positive effect in terms of the environment. The spacious 15-passenger Omega IV cabins with room for ten seated and five standing passengers were specially developed by CWA for Jasná several years ago and have proved themselves to be a wind-stable and comfortable solution. The new gondola lift is the third to be equipped with such cabins in Jasná, and the same cabins are used on a fourth lift



On the north side, the 24-passenger funitel runs from *Priehyba* to the top of *Chopok*.



The bottom station at *Biela Pút*, with the parking rail on the right

also operated by TMR in the High Tatras.

The new bottom station is located on the site of the former parking lot, so no previously unsealed land was used to build it. The original 65 parking spaces are now located underground on two levels. These underground stories also house technical equipment, offices, storage and staff rooms, and public toilets. The bottom station itself is located on the upper floor, which is at access level from the slopes. The investor attached great importance to the architecture of the building, as indicated by the use of RGB LED lighting to illuminate the bottom station during evening events. The station received an award as an "exceptional and progressive solution" in the 2022 Slovakian Architecture Competition. The haul rope is tensioned in the bottom station, and the drive system is located in the top station. The ropeway is equipped with RPD rope position detection. All 25 cabins plus a maintenance car and a freight car are parked in the bottom station on the station turnaround and a spur rail. Construction work started in 2021 and the new ropeway – costing a total of 17.5 million euros (ropeway engineering and stations) – was inaugurated on December 3, 2022.

PHOTOS: R. GRIC

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The bottom station has two-story underground parking for 65 cars.



The bottom station also houses the tensioning system for the haul rope.



Double grips for the 15-passenger cabins



ISR talking to chief funitel engineer Branislav Uličný and Jasná operations manager Ivan Temniak (from the left)

TECHNICAL DATA

Biela Púť – Priehyba gondola ropeway, Jasná, Slovakia

Altitude bottom station	1,119 m
Altitude top station	1,349 m
Line length	933 m
Vertical difference	230 m
Number of towers	10
Rope diameter	52 mm
Tensioning	bottom station
Drive	top station
Drive output (start/rated)	526/407 kW
Cabin capacity	15 pax
Number of cabins	25 + 1 maintenance and 1 freight car
Rated line speed	6.0 m/s
Ride time	3.9 min
Rated transport capacity	2,800 pph

Contractors and year of construction:

Ropeway engineering, year	Doppelmayr/Garaventa, 2022
Cabins	CWA
Rope	Fatzer
Station architecture	SIAL, s.r.o. Liberec
Construction works	Desať, s.r.o



The drive in the top station



The top station of the gondola lift provides direct access to the funitel summit lift.

OITAF Congress 2024 – program and call for papers



OITAF “Ropeways – Smart Transport Solutions” is the motto of OITAF’s 12th International Congress for Transportation by Rope, which will be held in Vancouver, Canada, from June 17-20, 2024.

The International Congress for Transportation by Rope, which normally takes place every six years, has had to be postponed by one year due to the Corona pandemic. Following the 11th Congress in Bolzano in 2017, 2024 will be the year of the 12th edition of this key event of OITAF – the global organization that brings together all persons, institutions, authorities, manufacturers and operators with an interest in ropeways.

The preparations for the event have long since begun at OITAF. Now it is up to the ropeway community to submit the papers needed to flesh out the motto “Ropeways - Smart Transport Solutions”. Below, you will find the conference program, which is divided into four sessions, and basic information on the submission of papers.

SUBJECT GROUPS

Session 1: Development of ropeways in urban and tourist areas

- Developments
- Potential applications
- Future projects

Session 2: Operation of ropeways

- Staff training. How to attract new talents?
- Management of exceptional situations
- Inspection and maintenance

Session 3: Ropeway technology, new developments

- Electrical/mechanical availability
- Safety
- Noise reduction
- Remote monitoring
- Improving the safety of old installations

Session 4: Dimensions of sustainability

- Protection of the natural landscape
- Conservation of resources
- Energy consumption, life cycle
- Snow-making: energy consumption, energy management, water management
- Ropeway operation and winter sports – perception in public opinion
- Comparison with other transport systems

CALL FOR PAPERS

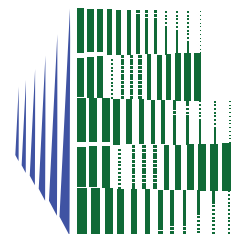
OITAF invites all interested persons to present a previously unpublished paper on one of the listed groups of topics. In addition to submitting a publication-ready manuscript, speakers are expected to make an informative and suc-

cinct presentation as the point of departure for an in-depth discussion.

Those who wish to present a paper at the congress must send an abstract in English via the OITAF Congress website www.oitaf2024.com by September 4, 2023 at the latest. In addition, original-language versions in German, French, Italian and Spanish may also be submitted. Papers received after the deadline will not be considered.

Further details regarding the application process, preparation of manuscripts, the OITAF selection process, submission of the final version of the paper if accepted, presentation of papers, and reimbursement of travel and lodging expenses for speakers can be found on the OITAF Congress website.

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Top station of the *Roháče Express* 6-seater chairlift with *Salatín* (2,048 m) providing an impressive backdrop

The *Roháče – Spálená* ski area, an insider tip in the Western Tatras, Slovakia

ISR REPORT Unlike the High Tatras, where tourism development began in the 2nd half of the 19th century already, few tourist facilities were constructed in the neighboring Western Tatras, so that the unspoiled character of the mountains has been preserved until today.

Although *Roháče – Spálená* in the Western Tatras can be considered a small destination, it is actually the largest and best equipped ski resort in the whole of the mountain range. As was the case in many other locations in the former Czechoslovakia in the 1960s, here too it was the local sports club that built the first surface lift (Transporta VL 1000) at the end of the long *Roháčska dolina* valley on the northern slopes of the dominant *Salatín* (2,048 m) in 1969. In 1993, the small ski area including the hotel in the neighboring village of *Zuberec* was taken over and privatized by the Tatra-west s.r.o. company.

STEP-BY-STEP SKI AREA DEVELOPMENT

In addition to the replacement of the old surface lift with a new *Tatrapoma H210* surface lift and the construction of two more surface lifts, the first chairlift in the area, a fixed-grip quad – also from *Tatrapoma* – was opened in 2003.

The biggest ropeway project in the area to date was the construction in 2014 of the modern *Roháče Express*, a detachable 6-seater *Leitner* chairlift. The direct-drive chairlift with a transport capacity of 1,800 pph has heated seats and blue bubbles and automatic carrier parking in the bottom station. It links the parking lot with the highest point in the ski area at 1,498 m above sea level.

The 654 kW direct drive is located in the bottom station. The haul rope with the entire drive unit including the standby



Conveyor loading in the bottom station



The 654 kW direct drive in the bottom station



Overall view of the bottom station, with the carrier parking shed and staff rooms in the background on the right

drive and brake hydraulics is tensioned hydraulically on the drive platform in the bottom station. All the chairs are parked in a carrier parking shed next to the bottom station. The top station was built as a fixed return terminal. After nine years of operation, the chairlift is still state-of-the-art in terms of equipment and the quality of the ride. There are currently two chairlifts and three surface lifts operating in the ski area.



Top station with 90-degree unloading

INSIDER TIP FOR UNSPOILED SCENERY

In the *Roháče – Spálená* ski area, both winter and summer tourists can enjoy the unspoiled countryside and the unique panorama of the main ridge of the Western Tatras.

The ski trails from the top station follow two main routes, and in addition to the red and blue slopes there is also a black trail. Snowmaking is of course provided. The ski area is also noted for the quality of the snow grooming, with two Leitwolf winch groomers and one Prinoth T4S in operation.

There are also cross-country skiing trails, and there is a ski mountaineering route from the top station to the summit of *Salatín*.

Since the ski area is located in the Tatra National Park, a number of conditions had to be met to obtain the necessary permits. The parking lot at the bottom station for 500 cars and 10 coaches, for example, had to be underlaid with a water-proof membrane and drained via a high-efficiency oil separator. A second access road was also built to eliminate the problems caused by one-way traffic on the old narrow road.

POPULAR FOR SCHOOL SKI COURSES

Following the shutdown of the ski area due to Covid, the guests have now returned. This is especially evident in the case of the school ski courses. In the 2022/2023 winter sea-

TECHNICAL DATA

**Roháče – Spálená I six-seater chairlift
(*Roháče-Express*)**
(with direct drive, heated seats and blue bubbles)

Elevation of bottom station	1,036 m
Elevation of top station	1,498 m
Line length	1,959 m
Vertical difference	462 m
No. of towers	16
Haul rope diameter	46 mm
Drive	bottom station
Rated output (starting/continuous)	654/531 kW
Haul rope tensioning	bottom station
No. of chairs	69
Max. line speed	5.0 m/s
Transit time	6.5 min
Rated transport capacity	1,800 pph

Contractors

Manufacturer, year	Leitner, 2014
Haul rope	Fatzer



Diesel engine for the hydrostatic emergency drive in the bottom station

son, up to three cohorts all came to *Roháče-Spálená* at the same time, as there was so much catching up to do after the end of the pandemic with regard to a school activity that is always highly popular. Tatrawest offers special conditions for school groups, and the government also subsidizes the ski courses to the amount of 150 euros per student.

Accommodation for winter visitors is available in the village of *Zuberec* about 8 km away, where there are a number of pensions and the *Tatrawest Hotel* run by the operator of the ski area. There is a free ski bus connecting the villages of *Zuberec* and *Habovka* with the ski area.

SUMMER OPERATION

The 6-seater chairlift also operates in summer. There are several waymarked paths in the area. For conservation reasons, some are only open from mid-June to the end of October.

Roman Gric

Two sustainable 6-seater chairlifts for Kitzbühel

LEITNER In the Tyrolean premium ski resort KitzSki the old “Gauxjoch” and “Trattenbach” ski lifts are being replaced by two modern 6-seater chairlifts. For this 23 million euro project, Bergbahn AG Kitzbühel is again placing its trust in its long-standing and successful partnership with Leitner and the South Tyrolean company’s state-of-the-art ropeway technology.



Top station of the new *Gauxjoch* lift. The 6-seater chairlift is due to open in December 2023.



Bottom station of the new *Trattenbach* 6-seater chairlift

The chairlifts come with all the features needed to ensure the most comfortable ride possible: premium seats with intelligent seat heating, lightly tinted weather protection bubbles and line speeds of 5 m/s and 6 m/s for a rated capacity of 2,400 pph. Leitner’s efficient and environmentally friendly DirectDrive will be used with the LeitDrive frequency inverter in an intelligently matched combination that guarantees an impressive overall efficiency of 96 percent in all load ranges.

AUSTRIA’S FIRST LEITNER ECODRIVE

The two new chairlifts will be the first in Austria to implement the Leitner EcoDrive in their control systems. The automatic adaptive speed control regulates the line speed for



Martin Leitner, board member of Leitner AG, stresses the long-standing partnership between Bergbahn AG Kitzbühel and Leitner and their shared commitment to quality.

energy savings of up to 20 percent. Near-natural design for the operation buildings in addition to the technical features of the two new Leitner chairlifts, the operations buildings will also be impressive. The interiors have been planned with ergonomics in mind and the exteriors designed with an eye for the natural environment. The fully automatic loop line garage is discreetly integrated into the landscape and provides a high level of comfort for the employees.

CURVED PV ELEMENTS FOR ENERGY PRODUCTION

As a further innovation, the station enclosure will incorporate a photovoltaic system, with the polycarbonate panels of the Leitner Premium station replaced by curved panels with PV elements. The station, with its Pininfarina design, is an ideal solution for maximum energy production throughout the winter.

SMART SEAT HEATING SYSTEM

The new 6-seater chairlifts have heated seats incorporating Leitner’s Intelligent Heat Detector (IHD) system, which helps save energy and make seat heating sustainable. A sensor detects the temperature on the surface of the seats and passes this information on to the system. Also, a direct connection is established between the electric gates and the heating system to ensure that only chairs on which passengers are sitting are heated.

“The long years of our successful partnership with Kitzbühel can be explained by the fact that we treat each other as equals. Like Kitzbühel, Leitner has very high standards of quality, and they are visible in all our products and in every ropeway we build,” says Leitner board member Martin Leitner as a final comment.

DK

Success story in Mexico

LEITNER The urban ropeway system in Mexico is a record-breaker. With the official opening of *Mexicable 2 – Linea Verde* on March 30, 2023, the latest aerial public transport link in the metropolitan area of Greater Mexico City completes a self-contained, high-capacity urban ropeway system offering safe, fast and environmentally friendly mobility and maximum efficiency in terms of passenger movements.

Ecatepec de Morelos, a city with more than 1.6 million inhabitants located in the greater Mexico City urban area, has a global reputation for pioneering the integration of ropeways into its urban transport network. The city's success story began in 2016 with the construction of the five-kilometer-long *Mexicable 1 – Linea Roja*. Since its commissioning, the ropeway – with its particularly user-friendly operating times of more than 18 h per day – has made more than 41 million journeys and achieved an outstanding availability of 99.8%. A major factor in the success of the project is the significant time saving compared to traveling by car: Instead of standing in traffic jams for 50 minutes, passengers can connect with the Mexican capital's public transport network in just 19 minutes.

LINEA VERDE CLOSES A MAJOR GAP

With the official opening of *Mexicable 2 – Linea Verde* on March 30, 2023, a major gap in the ropeway network of Ecatepec de Morelos has now been closed. The system, which comprises three interconnected ropeway lines, is designed to transport around 35,000 people a day from the municipalities of Ecatepec de Morelos and Tlalnepantla de Baz to Mexico City. With its low noise emissions, the ropeway also helps to protect the Zacatenco areas of natural beauty in the Gustavo A. Madero district.

FAST ACCESS TO THE SUBWAY SYSTEM

With its intelligent route, the *Linea Verde* is the perfect addition to the public transport network. Starting from the second station of the *Linea Roja*, the 300 Leitner Diamondcabs carry passengers along an 8.5 km line with seven stations

to the Indios Verdes subway station. "The system provides local residents with convenient, safe and fast access to the subway network. The link comprises three consecutive ropeways, each with a middle station. Together with the terminal stations, that makes seven stations in total. The use of three independent systems gives us greater flexibility, enabling us to guarantee transport services with maximum availability," says Giacomo Trattenero from Leitner.

CHALLENGING LOCATION

The topography of the area and the density of the buildings proved to be a serious challenge for the project. "In view of the very limited space available, we sometimes had to deliver materials at night and in many cases could only use small cranes and trucks. Since the line crosses one of Mexico City's busiest highways, and closing it was not an option, we even had to use drones to install the pilot rope between the towers," says chief line engineer Patrick Rudigier.

HIGH LEVEL OF ACCEPTANCE FOR ROPEWAYS

Since 2021 a Leitner ropeway has also been making a significant contribution to reducing urban traffic volumes in the Iztapalapa district in the south-east of Greater Mexico City. With a line that is more than 10 kilometers long, *Cablebus 2* offers the area's 1.8 million residents a much better connection to workplaces, schools and leisure facilities. In this case, too, the crucial factor in the positive response to the new transport system is the impressive saving in time: At just 36 minutes, transit time for the journey has been more than halved.

DK



Mexicable 2 – Linea Verde, which was inaugurated on March 30, 2023, has closed a major gap in the ropeway network of Ecatepec de Morelos, a city with more than 1.6 million inhabitants in the metropolitan area of Greater Mexico City.

Prague's Petřín Funicular

ISR-REPORT There can be few visitors to the Czech capital of Prague who are not familiar with the funicular leading to the top of Petřín hill. Originally constructed with a water balance drive in 1891, it was rebuilt in 1932 and completely refurbished in 1985. An unusual feature of the funicular is the emergency brake, which grips a separate brake cable instead of one of the two rails as in the normal case.



100-passenger car of the *Petřín Funicular* at the Nebozízek midline station

During a visit to Paris in 1889, members of the *Club of Czech Tourists* were inspired by the Eiffel Tower to construct a smaller version in Prague, and the *Petřín Lookout Tower Cooperative* was founded for the purpose. The result was a 62-meter-high riveted truss structure that was erected on *Petřín* hill to mark the *General Land Centennial Exhibition* held in 1891.

In order to provide convenient visitor access to the attraction, a funicular leading from the *Malá Strana* district to the top of *Petřín* hill was built by the *Petřín Lookout Tower Cooperative* and opened in time for the centenary exhibition on July 25, 1891.

FIRST EVER WATER-POWERED FUNICULAR

Prague's *Petřín Funicular* and the city's similarly designed *Letná* funicular were both built in 1891 as water balance systems. Like most funiculars of the first generation before the invention of the Abt switch, these two Prague funiculars ran on a three-rail track – with the middle rail used by both cars – except for a simple symmetrical passing loop with four rails in the middle of the 396.5 m track. The gage on the *Petřín Funicular* was 1,000 mm. To control travel speed, with a permissible maximum of 2.0 m/s, a rack with two rows of teeth based on the Abt system was located in the middle of the track. This was an unusual solution, because most funiculars of this type used a Riggerbach rack rail for braking. The two two-axle cars with a capacity of 46 to 50 passengers each were supplied by the *Ringhoffer* railroad car manufacturing company of *Prague-Smíchov*. They were designed with a wooden body with windows along the sides, four staggered passenger compartments and a narrow open platform at either end for the driver, who also acted as brakeman. During the ride, water was continuously released from the descending car to compensate for the increasing



The bottom station located in a building from the Baroque period

length and hence weight of the rope. Operation of the funicular was often interrupted due to the inadequate water supply in the top station. This first *Petřín Funicular* remained in service until 1914, when it closed, although a number of unsuccessful attempts were made to reopen it.

THE SECOND PETŘÍN FUNICULAR

An *All-Sokol Slet* – a highlight of the physical education activities of the *Sokol* (Falcon) organization – is a show of mass gymnastics performances for the general public. In 1932, the 9th edition of this gymnastics meeting was to be held in the new *Strahov Stadium* near *Petřín*, and the idea of rebuilding the *Petřín Funicular* was revived, with the project managed by the *Electrical Enterprises of the Capital City of Prague* (public transport and electric power utilities). The tender



The first *Petřín funicular* built in 1891. At the front of the car on the right you can see the funnel for filling the tank with water.

was won by the Českomoravská Kolben-Daněk (ČKD) company with its project partner, the German Pohlig company. The line of the funicular was retained almost unchanged, but the track was extended at both ends for a total length of 510 m. This made it necessary to excavate a cutting for the line to pass under the *Hunger Wall*, which dates back to the 14th century, and the new top station was built above the wall. The new bottom station was integrated into a building dating back to the Baroque period. The second funicular, with its 1,435 mm standard gage track, had two rails and an Abt switch in the middle of the line. A midline station serving the *Nebozízek* Restaurant was built above the passing loop. The new funicular was the first in the world to be equipped with the Pohlig brake cable system. The brake cable – with a separate cable for each car – remains stationary during normal operation; it rests on small rollers near the center of the track along the full length of the line, and runs over small sheaves located in the chassis of the car and through a grip that is open in the normal case. In the top station, both brake cables are wound on drums equipped with powerful brakes; in the bottom station, the brake cables are tensioned with counterweights. Only if the haul rope breaks or detaches from the car, and also if the maximum permissible speed is exceeded by 20%, is the brake cable grip in the car activated, with braking force transmitted via the cable to the brake drums in the top station. In the event of an emergency stop, this elaborate system was designed to provide smoother braking compared with the conventional solution with emergency brakes acting on one of the rails*).

The cars for the new funicular, this time with a capacity of 100 passengers each, were also built by the Ringhoffer company. At a travel speed of 4.0 m/s, the funicular was able to carry up to 1,300 pph to the top of *Petřín* hill. Five catenaries were installed above the track, which served for signal transmission, lighting and heating via pantographs on the roofs of the cars.

Work on the reconstruction project made rapid progress; dismantling of the old system began in November 1931 and the new funicular was officially opened on June 5, 1932. It soon became a popular attraction in Prague and was in almost continuous service even during the 2nd World War, except for a few interruptions lasting a couple of months. In 1962 the funicular carried its 15 millionth passenger.



In 1932 the funicular was rebuilt and the line extended to its current length.



The two brake cable drums in the top station

MORE PROBLEMS WITH WATER

Water again caused problems for this second funicular, although this time there was too much rather than too little water. In June 1961, damage was detected to the retaining walls and the trackbed caused by the seepage of groundwater. Temporary repairs were carried out on the retaining wall and measures for continuous monitoring of the trackbed were initiated as no construction company had free capacity for the work needed for permanent stabilization at the time. On June 7, 1965, after a long period of rain, a major



The funicular still operates with the drive train installed in 1932; in the photo, the bullwheel with two wraps of the haul rope



**renaturation & stabilization
of ski slopes & tow lift tracks**

erosion control mats & grass pavers

landslip caused serious damage to the trackbed, thus preventing further operation of the funicular. Although refurbishment of the funicular was unrealistic, in particular following a second big landslide in 1967, former employees of the operating company worked as volunteers to conserve the drive and the car floor frames plus wheelsets and safety brakes in the hope that they could be reused at a later date.



The Abt switch, looking down the line. Green arrows: the two sections of the haul rope; red arrows: the two separate brake cables

PETŘÍN FUNICULAR MARK 3

It took a full 16 years for the Prague metropolitan authority to make a final decision on the reconstruction of the funicular and, above all, on the rehabilitation of the slope itself. Thanks to the installation of a new drainage system, the slope was stabilized to such an extent that reconstruction of the funicular was feasible. Work started in January 1983 with the construction of a bridge structure founded on deep micropiles in the landslide area in the middle of the line and the refurbishment of the *Nebozizek* midline station. A new trackbed and track with rope sheaves were laid over the full length of the line, and the drive and brake cable system were re-installed. The station buildings, which had deteriorated in the meantime, were also refurbished, with the top station reconstructed around the preserved motor room. The *Tatra Studénka* company fitted new car bodies in a modern design to the preserved undercarriages with the Pohlig emergency cable brakes. Power for the lighting and heating is supplied to the cars while standing in the stations via fixed contacts and current collectors mounted on the car roofs. The new funicular has the same basic operating parameters as the 1932 system. On June 15, 1985, the *Petřín Funicular* reopened after a 20-year break.

In 1996 the funicular's electrical equipment and control system were modernized. The drive was equipped with a frequency converter; the Ward-Leonard group was retained as a backup power source. A telemetric link was established between the cars and the motor room, although the funicular still operates with car attendants, who can override the programmed controls if necessary. After the turn of the millennium, renovation work again had to be carried out several times on the retaining walls and the trackbed. Between autumn 2015 and spring 2016, the funicular again had to be shut down for reconstruction of the bridge near the midline station. At the end of 2018 a new control system was installed. The funicular is operated as

part of Prague's public transport network. Day tickets and passes issued by the Prague Public Transport company are also valid on the *Petřín Funicular*. A single ticket to ride the funicular costs 60 crowns (about 2.5 euros).

The Prague metropolitan authority is now planning to replace the funicular with a new system. A design competition for the new cars has already been held; they will have glass roofs for enjoyment of the Prague panorama with St. Vitus Cathedral and nearby Hradcany Castle. In addition to a general refurbishment of the trackbed, all ropeway system components will also be replaced. The new ropeway will be equipped with a standard safety brake acting on one of the rails.

Roman Gric / JN

TECHNICAL DATA

Petřín Funicular, Prague (today's system)

Elevation of bottom station	194 a.s.l.
Elevation of top station	324 a.s.l.
Line length	510 m
Vertical rise	130 m
Gage	1,435 mm
Haul rope diameter	35.5 mm
Drive	top station
Rated output	106 kW
Max. line speed	4.0 m/s
Car capacity	100 persons
Ride time (without/with midline stop)	3.0/6.0 min
Rated transport capacity	1,400 pph

Contractors

Manufacturer, year of construction	ČKD Prague, 1932
Refurbishment	ČKD Engineering Prague, 1985
Car manufacturer	Vagonka Studénka, 1985
Current control system	PEG s.r.o. Prague, 2018



A new control system was installed in 2018.

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Roman Gric / JN

*) We are not aware of any other funicular in public service that employs this brake cable system. In the USA there used to be funiculars with two haul ropes and a brake cable running round a deflection sheave in the top station.



The exhibition hall of the Carpathian Mountain Fair in Cheile Gradistei in Fundata, Romania

Carpathian Mountain Fair 2024

TRADE FAIR From June 5th to 7th, 2024 the second edition of the *Carpathian Mountain Fair* will take place in Cheile Gradistei, Romania.

The fair will be held in the heart of Eastern Europe's majestic Carpathian Mountains, at the Cheile Gradistei Resort, covering a total area of 1,800 m². Numerous international and Romanian exhibitors from various sectors are expected to present their products to the Romanian ski resort operators.

The first *Carpathian Mountain Fair* took place one year ago, and ISR correspondents Dietrich Kops and Petre Popa were present. The 2024 fair promises to be bigger, better and more groundbreaking than ever before.

The 2024 *Carpathian Mountain Fair* is a platform to explore and implement cutting-edge technologies that will revolutionize snow business and upgrade the summer season experience. The organizers have set themselves the target of

- unleashing the potential of artificial snow and innovative snow management techniques to ensure optimal skiing and snowboarding conditions throughout the season;
- enhancing summer offerings with state-of-the-art equipment, sustainable practices, and immersive experiences that captivate thrill-seekers, hikers, and nature enthusiasts;
- exploring the realm of intelligent systems, data analytics, and digital infrastructure, in order to optimize operations, enhance guest experiences and unlock new business opportunities;
- sharing insights, exchanging ideas, building long-lasting relationships, and helping visitors connect with industry experts, decision-makers and potential partners during the exclusive networking sessions;
- communicating valuable knowledge and inspiration from renowned speakers and thought leaders who are

shaping the future of the mountain tourism industry, so that visitors can learn from their successes, challenges and visionary perspectives.

The *Carpathian Mountain Fair* presents a global marketplace at a region level. It attracts visitors and exhibitors from across Eastern Europe and beyond, providing unparalleled exposure and access to new markets.

For exhibitor opportunities, the conference schedule and registration details, go to the Facebook page "*Carpathian Mountain Fair*".



Gernot Fischer, project manager for Doppelmayr Romania (left), and Petre Popa, ISR correspondent for Romania and Bulgaria at the *Carpathian Mountain Fair 2022*.

Looking forward to the next 25 years: moving carpets for Serfaus

SUNKID The partnership between Sunkid and the Serfaus-Fiss-Ladis ski area in Tyrol, Austria, goes back to the early days of Sunkid's foundation in 1996. Today more than 30 Sunkid moving carpets are in operation in this holiday region. For the 2022/23 winter season, two new Sunkid *Type N* conveyor lifts were installed, replacing existing facilities.



Two state-of-the-art Sunkid *Type N* moving carpets with 21 m long conveyor belts were installed in the Team Ingo area of the Serfaus ski school for the 22/23 winter season.

Ahead of the 22/23 winter season, Seilbahn Komperdell GmbH joined forces with the Serfaus ski school and tourism association to replace two Sunkid moving carpets that had done reliable service for a quarter of a century, carrying more than six million children in total, with two brand-new facilities of the current *Type N* generation. Equipped with the innovative *iControl* operating system and an *Evolus* canopy, Sunkid and its customer are both looking forward to a safe operational future covering the next 25 years.

EXTRA FUN FOR KIDS

Below the Komperdell midline station (2,000 m), the two 21 m long moving carpets are used by students of the Serfaus ski school on the *Kinderschneealm* slope. The facilities ensure smooth operations for all-day lessons for "kids with prior snowplow experience" in this part of the Team Ingo area, where children can improve their skiing and have fun at the same time. Carpet lifts and *Teach & Learn* equipment from Sunkid's *Sunny Stuff* range, including the innovative *Snow-V* snowplow aid, add to the fun and variety of the ski lessons.

COMPLETE ENCLOSURE

The complete enclosure using the new *Evolus N* polycarbonate canopy is a joy for skiing instructors and ropeway personnel alike, guaranteeing a comfortable ride for young skiers in bad weather while also keeping the return and drive stations clear of snow. The entire enclosure can be closed off with a roll-up curtain at the entrance and exit at night or when the system is not in operation.

MAXIMUM SAFETY

For maximum safety, the two moving carpets feature such details as photoelectric sensors at the exits with specially

shaped covers to prevent objects catching on them, and three emergency-off switches, one at the start, one at the end and one in the middle of the enclosure. Each canopy also has an emergency exit in the form of an easily opened slide-up door located on one side.

CONTROL TERMINALS WITH HMI TOUCH DISPLAYS

The switch cabinets for the conveyor lifts are well protected under foam covers, while the control terminals with HMI touch displays are integrated into the canopy arches. The terminals are used for everyday operation of the moving carpets and also to set the various functions and parameters. They also support periodic inspections, supply general information (e.g. operating hours and fault messages) and help in rectifying faults (via the operating instructions or remote maintenance). Finally, another legacy system in Serfaus is going to be replaced by a new 60 m long *Type N* Sunkid moving carpet for the upcoming 23/24 winter season. No wonder Sunkid is so happy about the trust shown by this loyal customer.

DK

FACT BOX

Team Ingo 6 + 7 moving carpets (identical designs)

Application	beginners' area
Length	21 m
Belt width	600 mm
Surface	Blue Eye
Drive	5.5 kW
Max. speed	0.7 m/sec
Canopy	Evolus N
Special features	Type N, <i>iControl</i>



The moving carpets are completely enclosed with Sunkid *Evolus N* canopies. The control terminals with HMI touch displays are integrated into the canopy arches.

What managers can learn from kids

Agility, for example. Because no one is as agile as children at play. They adapt to changing situations at lightning speed, develop new ideas and apply them



**MAG. URSULA
WEIXLBAUMER-NORZ**

Expert for Kids and
Family Marketing
kids&fun consulting

As is well known, new challenges cannot be solved with the same mindset that caused the problem in the first place. We need solutions that are fundamentally designed to take advantage of change: an approach that does not assume that the world is constant and predictable but takes account of the fact that basic conditions must be continually reconsidered. We are all familiar with the term by now: What we need is “agile” solutions.

REACTIVE, FLEXIBLE, ADAPTABLE

But what exactly is agility? Agility is the ability to react on a flexible basis, i.e. to adapt. Children under the age of eight – in developmental psychology we call them “preoperational children” – do just that. They do not think strategically and do not plan for longer periods. They literally take one step at a time and react to obstacles the moment they encounter them. Trying to teach a young child in this age group to play chess is bound to fail – except in the case of a child prodigy – because it is totally impossible for them to think three or four moves ahead. It is not until about the age of eight that they begin to plan their actions and think in strategic patterns.

For such young children, play is always a matter of here and now. Any change that occurs is immediately incorporated into the setting. If the little tower of building blocks falls over, they are quickly turned into a racetrack, because giving up is not an option. All life is play and play is life. This is how children learn.

SOLUTIONS FOR THE HERE AND NOW

Why can adults not do the same? Why should we not make use of agile play to find solutions that bring us the decisive step forward? This is the question that the university professors Johan Roos and Bart Victor and LEGO® CEO Kjeld Kirk Kristiansen asked themselves back in 1996 when they were looking for new and creative planning tools and systems. From the beginning, it was decided that the new tools should include the use of LEGO®. This enabled them to develop a new model to help employees achieve a – literally – hands-on experience of their visions and thoughts. The LEGO® Serious Play® method became an integral part of corporate planning and management at the company in the early 2000s, and it has since gained popularity far beyond the LEGO® corporate world.

LEGO® SERIOUS PLAY® – WHAT’S IT ALL ABOUT?

The method is an agile, yet clearly structured facilitation process employing elements of play. This allows questions from the business world to be processed and answered. The method can be used in companies, teams and also with individuals.

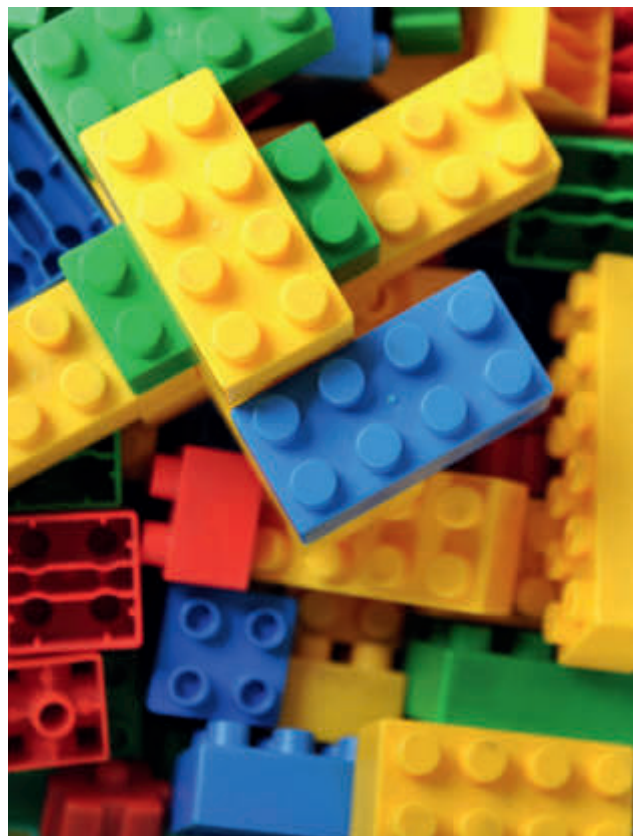
The use of LEGO® is designed to permit new ideas to be generated and problems solved in the context of strategy consulting. As a result, managers and decision-makers can draw on resources that are essential in the working world of the future: empathy, creativity, lateral thinking and the ability to engage others

DRIVING INNOVATION AND CREATIVITY

LEGO® Serious Play® is not about letting adults play with LEGO®; the LEGO® bricks are a catalyst for innovation, new ideas and discussion on given topics. Physical LEGO® models help build thought structures and simplify ideation. The whole thing is an agile process, and this agility is something we adults first have to (re)learn.

LEGO® Serious Play® is particularly suitable for working with teams – for example in team building, designing team processes and team challenges – as well as in strategy work. There, the method can be used to find ideas and innovations and to solve complex problems.

Ursula Weixlbaumer-Norz





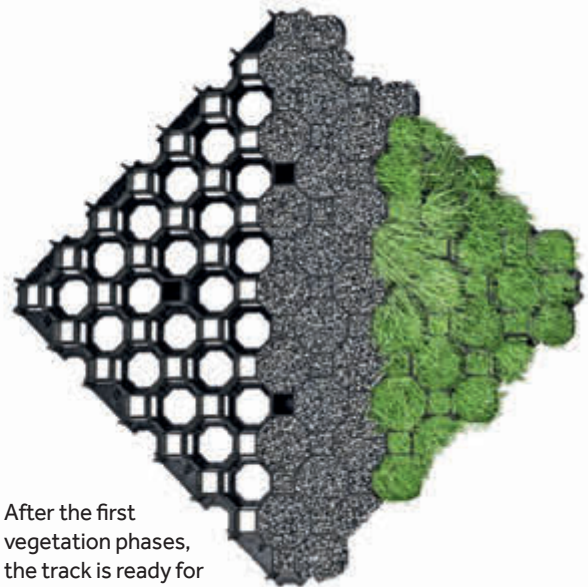
Hard-wearing grass pavers laid for regrassing and stabilization of a surface lift track

Stable vegetation cover for surface lift tracks

AQUASOL Aquasol grass paver systems are ideally suited for use in high-traffic areas such as surface lift tracks, while Aquasol coir fiber netting supports revegetation measures on slopes and embankments at high altitudes.

Surface lifts are a key facility in alpine regions: In winter they are used to transport skiers and riders uphill, while in summer mountain bikers are towed up the mountain several times a

day using dedicated towing devices. The tow tracks are increasingly subject to erosion and instability caused by the bikes' wide tires, especially in wet conditions. To overcome



After the first vegetation phases, the track is ready for full use.



Aquasol KGW 400 is a fully biodegradable geotextile for erosion control during the first vegetation periods.

these problems, highly durable grass paver systems can be installed to stabilize the tow track and support revegetation. Aquasol grass pavers are made of hard-wearing and weather-resistant HDPE plastic. The honeycomb grid, which is filled with a special substrate, provides great stability. This makes Aquasol grass pavers ideal for use in high-traffic areas such as surface lift tracks. They prevent rutting in the tracks and ensure a safe and comfortable uphill ride.

In addition, Aquasol grass paver systems support the build-up of fresh vegetation cover. Correct installation and grassing with the right seed types for the site are the basis for a durable green lift track. With these systems, costly repair work and possible restrictions on lift operations can be avoided.

After the first vegetation phases, the track is ready for full use. The resulting surface blends in almost seamlessly with the surrounding terrain. Also, the soil is not sealed as the pavers have an approx. 95% open structure.

NATURAL FIBERS FOR STABILIZED REGRASSING

Earthworks in ski areas often result in embankments and slopes that need to be greened using seed selected for the specific site conditions. For optimum results in such applications, Aquasol coir fabric has been in use for many years as erosion control netting. Permanently greened surfaces are achieved in combination with the right seed types for the location.

Aquasol KGW 400 is a fully biodegradable geotextile that performs the function of erosion control during the first ve-

getation periods. Subsequently, the geotextile decomposes completely. This solution offers protection for ski slopes, embankments and the banks of snowmaking reservoirs. The system ensures that the conditions for renaturation and growth are significantly improved and revegetation measures can be successful.



The *Aquasol KGW 400* system ensures that the conditions for renaturation and growth are significantly improved and revegetation measures can be successful.

ADVERTISING

PHOTOS: AQUASOL

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The latest PistenBully 600W Polar in operation with the winch on the north side of the Jasná ski area

Slope grooming in Jasná, Slovakia

ISR REPORT Kässbohrer's snow groomers have a long tradition of service in the mountains of Slovakia. ISR visited what is by far the country's largest ski resort, where 17 PistenBully are currently located.

The Jasná ski resort dates back to 1949 when the first Jasná-Luková detachable double chairlift – the third rope-way to be built in Slovakia – was inaugurated. Between 1954 and 1957, three more stages of these chairlifts were added, providing access to Chopok Mountain (2,024 m) in the main range of the Low Tatras from Jasná in the Demänovská Valley from the north and Srdiečko in the Bystrá Valley from the south. In the 1980s there were already about two dozen PistenBully in the former Czechoslovakia, including some in Jasná.

The resort has been through phases of both development and stagnation during its almost 75 years of existence. With its 51 km of slopes, 42.5 km of which have snowmaking, plus 14 cable cars and 6 surface lifts, and with all the infrastructure that goes with a ski area of this size, Jasná is now by far the largest ski resort in Slovakia and also the largest north-east of the Alps.

SLOPE GROOMING ON 151 HECTARES

On the north side of the ski area, 110 hectares of slopes are groomed daily, and on the south side 41 hectares. The groomer fleet includes 15 PistenBully PB 600W, six of them in the Polar version. Except for one snow groomer, all the PistenBully PB 600 are winch versions. A PistenBully PB 100 is used to groom the cross-country ski trails, and another PistenBully provides passenger transportation to various events.

Since the 2017/2018 winter season the Snowsat system has been in use in the resort for snow depth measurement plus other system features including fleet and maintenance management. Thirteen PistenBully are equipped for direct snow depth measurement. A new PistenBully PB 600W Po-



Jasná is now by far the largest ski resort in Slovakia.

lar was delivered to Jasná in time for the 2022/2023 winter season. Jasná's PistenBully are in operation for a total of 10,000 hours a year, which explains the resort's program of continuous fleet renewal.

KÄSSBOHRER AGENT FOR THE CZECH REPUBLIC, SLOVAKIA AND WESTERN POLAND

Pavel Lipenský, Managing Director of the Topkarmoto company in Dlouhoňovice near Žamberk (CZ), explains the situation: "In 1999, Topkarmoto became the exclusive agent for sales and servicing for Kässbohrer snow groomers in the Czech Republic. In the last seven years Topkarmoto has also been responsible for the ski resorts in the western part of Poland and in the last four years in Slovakia, where 400 Pis-



Every day the PistenBully leave the garage in the Lúčky district for the nightly slope grooming operations.



The latest PistenBully 600W Polar at the bottom of the Lúčky-Vyhliadka 6-seater chairlift

tenBully are in operation today. Sales and service activities in Slovakia are handled from the Topkarmoto facility in Trnava (SK). Our seven-strong support team in Trnava comprises



Before moving on to the next section of the slope, the winch cable has to be released from the anchor point.

four mechanics, two back office employees and an office manager. Five service vehicles are also based in Trnava. If necessary, our Slovak colleagues can naturally receive assistance from our people in Dlouhoňovice.

In addition to new groomers, we also offer a range of very popular fully inspected or overhauled preowned models. Our company has a total of 30 permanent employees and 20 service vehicles. In winter, we provide a fast response to users' maintenance and repair requirements. We also rent out machines where necessary to ensure that slopes are kept in good condition in the event of a major fault. There is also great demand for our more economical summer inspection and service packages."

Roman Gric

Natural Hazard Protection



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The *SkiStar SummerSki* dry ski slope on Hammarbybacken in the center of the Swedish capital Stockholm is made of NP30 *Freeski Sustainable* plastic mats, which were specially developed for the project by Neveplast. The mats contain a high proportion of recycled materials and have received *International Sustainability & Carbon Certification (ISCCPLUS)*.

Artificial ski slope as a year-round attraction

NEVEPLAST/SKISTAR In September 2022 the Swedish Skistar Group opened a 9,000 m² artificial ski slope on Hammarbybacken in the center of Stockholm using mats specially developed by the Italian manufacturer Neveplast.

ISR conducted the following interview with Skistar's CEO Stefan Sjöstrand and Neveplast's CEO Niccolò Bertocchi about their experiences with artificial slopes to date, the demands made of the material and the future potential for dry skiing.

ISR: Skiing is generally associated with snow and winter. What were your reasons for building a 9,000 m² artificial slope for summer skiing in the middle of Stockholm?

Stefan Sjöstrand: SkiStar used to be a company focusing only on winter and downhill skiing. But a couple of years ago we decided to change our strategy and transform into the leading holiday operator for Scandinavia, offering memorable experiences all year round. We knew that Stockholm Hammarbybacken, with its unique position in the city center, would be a perfect place for an innovation hub where we can develop and test new activities and attractions for both visitors and the local people like summer skiing in the form of *SkiStar SummerSki*.

ISR: Mr Sjöstrand, what kind of visitors come to *SkiStar SummerSki* at Stockholm Hammarbybacken?

Stefan Sjöstrand: We only opened *SkiStar SummerSki* in September 2022. We had quite a few young people, mainly from the region, visiting us either alone or together with their families. They enjoyed the opportunity to try out skiing and develop their skills even when it's not winter. We also had some good partnerships with schools, and for many of the students it was their first time on skis. Now we are looking forward to re-opening *SkiStar SummerSki* at the end of winter and to our first full summer season.

ISR: Mr Sjöstrand, 9000 m² is a big area.

What were your specifications for the material?

Stefan Sjöstrand: We wanted a slope with a surface that has similar characteristics for skiing as snow. Also, we were looking for a manufacturer with a sustainable approach to working with plastics so as to limit carbon emissions as far as possible. Neveplast offered to deliver a plastic material that is 50% recycled, which we found very satisfying from the start.

ISR: Mr Bertocchi, how was the material for the Hammarbybacken slope developed?

Niccolò Bertocchi: The people at Skistar were especially impressed by the characteristics of NP 30 *Freeski*, which is ideal for skiers and riders of all levels. Based on SkiStar's requirements, we developed NP 30 *Freeski Sustainable* especially for them as a product that combines the advantages of NP 30 *Freeski* – like easy skiing and snowboarding on fun snow – with sustainability. Hopefully this will be the first of a long series.

ISR: How does skiing or snowboarding on Neveplast *Freeski* products differ from natural or artificial snow?

Niccolò Bertocchi: Our mission is to make winter sports more popular by providing people interested in skiing and snowboarding with slopes in cities and wherever there is no snow cover. To generate the necessary credibility, we rely on materials with properties that are as close as possible to those of natural snow. We are convinced that *Freeski* is a revolutionary product in the world of dry skiing. *Freeski* is easy, fun and intuitive. Snowboarders especially are highly enthu-



Neveplast's CEO Niccolò Bertocchi (left) with Swedish freestyler and SkiStar corporate ambassador Jasper Tjäder on the new artificial ski slope on Hammarbybacken



The location in the center of Stockholm is especially attractive for young people who want to improve their skills on the summer ski slope on Hammarbybacken.

siastic! Anyone who wants to test *Freeski* is cordially invited to visit us at our company headquarters in Bergamo (Italy). They won't regret it!

ISR: Mr Sjöstrand, Stockholm is relatively far north. How is the artificial slope used or groomed after a heavy snowfall?

Stefan Sjöstrand: In winter we offer conventional skiing on natural snow, and our groomers operate in the normal way. So as not to damage the plastic surface of the mats, we use a GPS snow depth measurement system, and that has worked very well this winter with both natural and man-made snow.

ISR: Mr Sjöstrand, Mr Bertocchi; where do you see the potential for artificial ski slopes?

Stefan Sjöstrand: We see them as an additional offering for the summer season rather than as a replacement for skiing



Stefan Sjöstrand, CEO of the Skistar Group

on snow. We are being affected by climate change as well, of course, but the latest research shows that we will continue to have cold weather and snow in the northern part of Sweden, where our destinations are situated. Skiing on artificial slopes is basically an activity for those times of the year when there is no natural snowfall or the temperatures are too high for the use of snow guns.

Niccolò Bertocchi: In view of climate change with warmer winters and less snow, I am becoming more and more convinced that dry skiing can be a tool to help ski resorts guarantee and extend their seasons and even move in the direction of all-year operation. Also, creating ski slopes in or near urban centers to teach children and beginners how to ski is one of the most effective ways to bring new skiers to the ski areas in the mountains. Last but not least, Italy will be hosting the Winter Olympics in three years' time, and I sincerely believe that Neveplast can do a lot to promote interest in winter sports in the cities.

ISR: Thank you for the interview!

Dieter Krestel

The interview was conducted via email in early March 2023.

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Borșa: a rewarding investment in a growing ski area

A follow-up to the article in ISR 1/2022 "St. Moritz in the footsteps of Borșa, or vice-versa" about developments in historical winter sport locations.

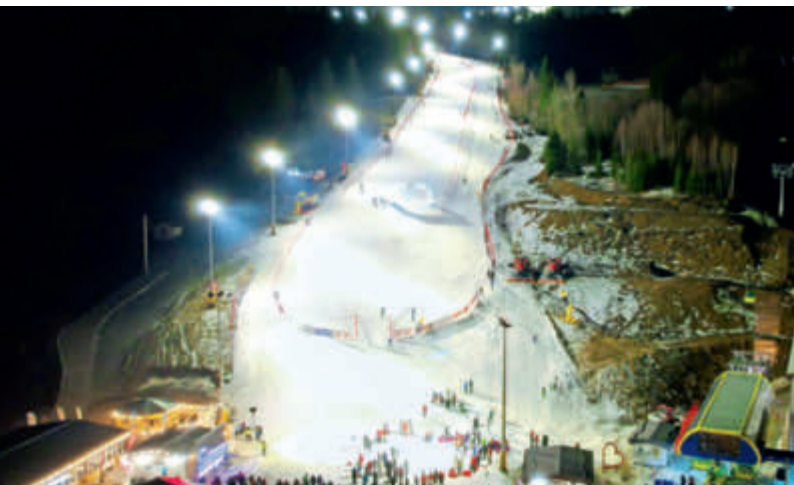


Testing the TR8 snow gun located at the highest point next to the top station of the gondola lift

Like almost everywhere else in Europe, the ski areas in Romania had to struggle with warm temperatures and a lack of natural snow in the 2022/23 winter season. Only the high-altitude ski areas and those with high-performance snowmaking systems could keep the ski slopes open. Thanks to its modern snowmaking system and dedicated workforce, Borșa was one of the latter and was able to host a FIS international ski event on February 21-25, 2023.

DEVELOPMENTS SINCE THE INAUGURATION OF THE GONDOLA LIFT

The Doppelmayr gondola lift, the highest in Romania with a vertical difference of 778 m, was inaugurated in December



The finish area of the ski slope by night, with the bottom station of the gondola on the right and the new restaurant on the left

2021. Thanks to the middle station on the uphill line, the lower section of the ski slope could be used in the 2021/22 winter season already. This generated good revenues so that the ski season was a success and therefore encourage-

ment for future developments. In spring 2022, as soon as the snow had melted and the slopes were dry enough, the local construction company Yanis Nord srl continued with the work on the upper part of the slope, finishing the piste itself and installing the snowmaking and lighting systems on this section. With gradients of more than 40%, the earthworks and installation jobs were a real challenge for the small construction company, but they were brilliantly mastered. Parallel with the works on the upper part of the mountain, an après-ski restaurant for 100 guests was built at the bottom of the ski slope. Furthermore, a private investor is building a restaurant and a small hotel at the top of the ski slope with breathtaking views of the Maramureș Mountains.

NEW OLYMPIC SKI SLOPE WITH SNOWMAKING AND ILLUMINATION SYSTEM

The entire ski slope has a length of 2.6 km, not including the connecting ski-tracks to and from the middle station of the gondola lift. The upper section (as far as the middle station) has a gradient of about 40% and the lower section about 27%. The FIS experts say that, with some safety improvements, the slope can become Romania's only ski slope suitable for organizing speed events (Downhill and Super-G).

The state-of-the-art snowmaking system was supplied by the South Tyrolean company TechnoAlpin. It consists of two pump stations, one with a centralized compressor system, and 33 TR8 snow guns mounted on towers/lifts. The system can cover the entire ski slope with snow in 40 to 60 hours, depending of course on the weather conditions. The water is taken from a creek next to the bottom station of the gondola, with two 10 l/s pumps installed to permanently feed the water into a pond located at an altitude of 1,300 m. The pond holds about 22,000 m³ of water, which should be enough to provide snow cover on the ski slope even when no water is being delivered from the creek. Below the pond is the main pump station with two 25 l/s pumps, compressors for centralized air for all the snow guns and a compressor for the aeration of the water from the pond. The two high-pressure pumps supply water to the snow guns located in the vicinity of the pump station, while the snow guns in the lower section of the ski slope are supplied with water by gravity.



The two high-pressure pumps that feed the storage pond

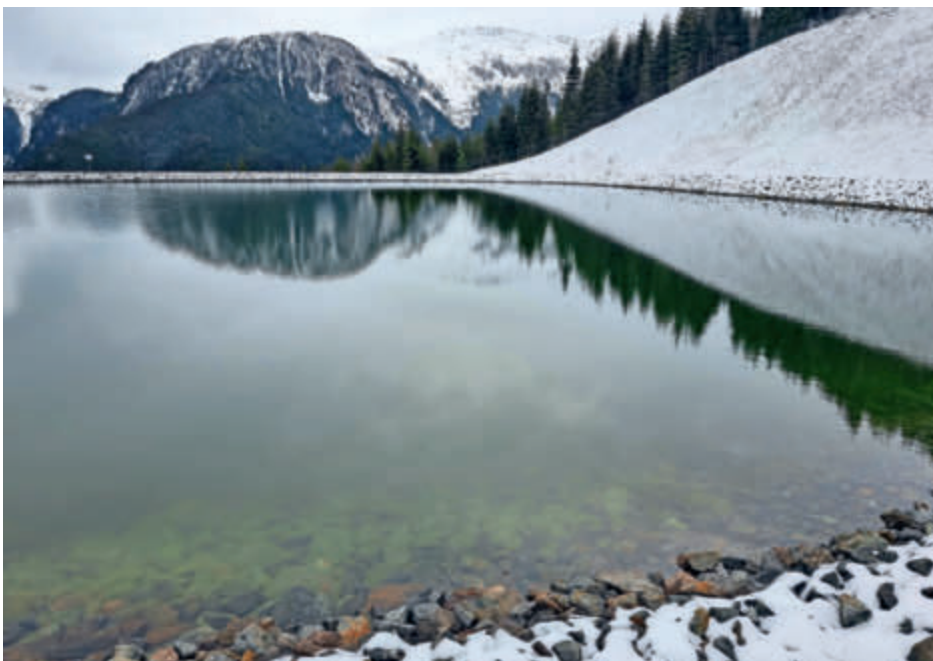


The top station and the start of the ski slope, with the future restaurant and hotel under construction on the left



The main pump station under construction just below the storage pond

With a system design that includes the permanent supply of water to the pond independent of the snowmaking process, a pond with a high storage volume, and the use of automatic flushing filters, the snowmaking system can be considered the most water-safe system in Romania. Also, thanks to the fact that all the snow guns are mounted on towers/lifts, snow cover can be created much more easily and



The storage pond located at an altitude of 1,300 m

TECHNICAL DATA

Automatic snowmaking system

Lower altitude (water intake)	855 m
Top altitude	1,633 m
Altitude of storage pond and main pump station	1,300 m
Length of slope with snow cover	2,600 m
No. of pump stations	2
No. of high-pressure pumps	2 + 2
No. of compressors	2 + 1
Volume of storage pond	22,000 m ³
No. of snow guns on towers/lifts	33
Model of snow guns	TR8
Operation system	ATASSpro
Supplier	TechnoAlpin
Year of construction	2021–2022

Illumination system

Length of the illuminated ski slope	2,600 m
Class of illumination	100 lx
Number of poles	57
Number of lamps	171
Model of lamps	Champion + Altis LED
Supplier	Thorn
Year of construction	2021–2022

Contractors

General contractor	Yanis Nord & TechnoAlpin
Gondola	Doppelmayr
Grooming machines	Kässbohrer

quickly. The lighting system for the ski slope was supplied by Thorn Lighting and consists of 57 poles equipped with LED lights. The system is designed for two different levels of illumination, with 30 lux for recreational skiing and 100 lux for competitions. This high-performance illumination system is also a premiere for ski slopes in Romania.

THE LONG-AWAITED OPENING CEREMONY AND THE FIS COMPETITION

By the beginning of the 2022/23 winter season all construction and installation works were finished, the gondola lift was open to the public, and everybody was waiting for the opening ceremony. The plan was to schedule it for a period with snow as in a typical winter ski resort. But the weather changed from one day to the next and from one week



The opening ceremony of the international FIS event

to the next, making it difficult to reliably plan the ceremony. Fortunately, the weather conditions finally permitted snow-making over the full length of the ski slope.

Ultimately it can be said that the changeable weather was actually an advantage for the ski resort of Borșa. As one of the few locations with good skiing conditions and a slope with FIS homologation, Borșa's Olympic slope was able to host its first international FIS ski race on February 21-25,

2023. Originally scheduled for another ski area, the competition had to be moved to Borșa, which was bad luck for the other venue and good luck for Borșa. After an 80-year break, competitors from nine countries (Czech Republic, Hungary, Israel, Italy, Macedonia, Romania, Slovakia, Ukraine and USA) were once again able to race on the Olympic slope in Borșa. The Romanian National Alpine Ski Championships were also held in this period. The races were held during the day and, thanks to the new lighting system on the ski slope, also in the evening. The competition itself was the best possible opening ceremony for the Olympic ski slope in Borșa.

This successful winter sports event held in such difficult weather conditions was further proof of the importance of investing in quality with regard to the ropeways, and snow-making and illumination systems on the one hand and of a determined and hard-working team on the other hand.

OUTLOOK

- First, the FIS recommendations for safety improvements will be implemented during the upcoming summer. The Olympic ski slope in Borșa will then be eligible to host speed events.
- Organization of further international FIS events of a high standard.
- Upgrading the ski area with additional slopes and lifts, making Borșa a great winter holiday destination for skiers.

Petre Popa

ISR correspondent Petre Popa with Ion Sorin Timis, Mayor of Borșa, Ionut Danci, manager/owner of the construction company, and Cristian Chilea, TechnoAlpin Romania (from left to right)



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