SQUAW VALLEY FUNITEL

AN INSTALLATION FOR THE THIRD MILLENNIUM

Co presentation: Ernst Egli, PE
Director for Marketing and Sales
Garaventa AG
Switzerland

Hans Burkhart
Gen. Manager
Squaw Valley Ski Corp.
California / USA

Presented at: The OITAF 8th International Congress
San Francisco
May 23 – 27, 1999
Introduction:

Squaw Valley is now the home of the first FUNITEL in North America. The following presentation shall explain the FUNITEL system itself and shall enlighten the background of Squaw Valley Ski Corp.'s decision to install such an installation.

Structure of presentation:

1. System Introduction
   by Ernst Egli
   - What is a FUNITEL? Where does the name come from?
   - Squaw Valley FT Rope Guidance
   - Drive System
   - Tension System
   - Towers and Rope Guidance on Sheaves

2. Why invest in a FUNITEL?
   by Hans Burkhart
   - Development of the Skiarea in the last years.
   - Where and what are the recreation venues?
   - How to get there? Choice of Transportation System.
   - Operational Experience.
PART I

System Introduction, presented by Ernst Egli

What is a FUNITEL?

A FUNITEL is a double monocable, circulating ropeway system with a track width wider than the width of the carriers, designed for high transportation capacity and high wind stability.

The name FUNITEL is actually a combination of the designation of two traditional installations with typical design features like:

- The **FUNicular** = railway pulled by a wire rope, is known to be steady for loading and unloading as well as stable in high winds.
- The **TELéphérique** = aerial tramway in French, is known to be able to traverse long spans between towers.

Therefore, its inventor Denis Creissels came up with the idea to link parts of the words to the name **FUNITEL**

Double monocable, circulating ropeway?
The fact, that the track width of the two parallel running haul ropes is wider than the width of the carriers, allowed to "suspend" the carriers effectively between the haul ropes. This basic design criteria lead to unique features like:

♦ Short cabin hanger. The cabin can neither hit the tower sheave trains nor the hauling rope even with severe longitudinal oscillations.

♦ Immediately after the coupling area, the hauling rope in the terminals can be diverted downwards. Such a design allows a concentration of all rope related forces to a relatively limited area, which makes by definition an economical terminal construction possible. The remaining terminal area can be designed in „lightweight construction“.
♦ No lateral oscillation of the cabins while passing towers nor entering terminals is possible. This is one of the most important preconditions for safe operation in case of high winds and also offers increased comfort for passengers under severe operation conditions.

♦ Carrier guidance in coupling areas on the grip rollers and in the terminals on bottom rails. This provides a previously unknown passenger comfort in the loading and unloading areas.

♦ Compact terminal design with carrier parking in the terminal center.

♦ High system availability, since normal operation is possible even in high winds.

**Single drive with „double groove“ drive sheave:**
Such a drive arrangement is possible under the condition that the drive sheave grooves are exactly of the same diameter and no generative load on the drive machine will occur for a longer period of time. Even if the grooves of the drive sheave would not be exactly of the same diameter at the beginning, they will be equalized by the wear of the bigger diameter and stay equal due to the fact that the friction between drive sheave and wire rope is always in a positive sense.

**Field of application**

The ideal field of application for the GARAVENTA FUNITEL is, above all, in the economic provision of transport requirements for passengers and goods, where the following issues are required:
♦ high transport capacities
♦ long spans
♦ high wind stability
♦ high availability
♦ long transport distances combined with
♦ important vertical rise

By showing the short video about the Squaw Valley FUNITEL, I conclude my presentation and be happy to answer questions at the end.
PART II

Why invest in a FUNITEL?  

Presented by Hans Burkhart

Squaw Valley Ski Corporation is a large California ski resort, operating on approximately 4,000 acres of private skiing terrain.

This unique mountain has distinct upper and lower mountain operations. The upper area, at el. 8200’, has 18 lifts, five restaurants, a swimming pool with spa, tennis courts, an Olympic-size ice rink, bungee tower, and more.
The High Camp complex operates year-round. It is served by our 120-passenger aerial tramway. The most desirable beginner and intermediate terrain is at the upper mountain, between the 8,000’ and 9,000’ elevations.

The quality of snow is superior at the higher elevations. In fact, we had many occasions where, with the snow line at 7,000’ elevation, only the upper mountain was skiable. Prior to 1998, the upper mountain was served by a six-passenger Gondola lift, our 120-passenger aerial tramway, and a detachable quad chairlift.

We all know that all three of the above transport systems are not operational when winds exceed 45 m.p.h., or 72 km.

Our winter operation averages 180 skiing days. Over the last four years, our upper mountain was closed approximately 40 days per ski season, due to high winds. Our customer base, which consists of 80% from the Sacramento, San Francisco Bay Area regions, will not ski Squaw Valley when the upper mountain is closed.
With future plans to develop additional facilities on the upper mountain, including hotels, lodges, and condominiums, we found ourselves in a situation where we had no choice but to find another system which would provide high-capacity transportation which is reliable, safe, and can operate in cross winds up to 75 miles per hour.

First, we checked out several funiculars in Europe.

The “funicular” is known as a wind-resistant, all-weather day and night transportation system running on a rail track. At first sight, it seemed to be the installation we wanted. During our investigations, however, more and more hurdles came up, and the rail-bound transportation system lost a bit of its attraction. What were the problems? Because of the mountain’s topography, the track line of the funicular had to be built about 2/3rds of the way through tunnels. We decided that riding through a tunnel, submarine-style, did not provide the true
mountain experience for our customers and guests. Also, the cost for tunnel
construction was not feasible for our Resort.

Another important factor was the hourly capacity. Our target capacity was in the
range of 3,500 persons per hour in one direction. As we found out, this capacity
was just not possible for such a jig back-type installation, with two cars and the
given length of the track line. The variable factors were the speed and size of the
cars.
The funicular was not a satisfactory solution.

The only other system available to-date, besides a mountain road, is a Funitel.
The Funitel would give is the capacity, the “mountain experience” for our guests,
and mainly and most important, stability in wind.

What is a Funitel? How does it work? And, why is it operational in cross winds
up to 75 m.p.h., or 120 km? All of these questions were just explained very well
by Mr. Egli, from Garaventa.

When we decided to build a Funitel, we found that it had to be on the present or
existing Gondola line. Since we cannot operate without the Gondola for an entire
winter season, we found that the Funitel had to be built in one summer, which is
a very compressed construction time period, with incredible challenges. The
drive, or lower terminal, was built just slightly downhill from the existing Gondola
building, while the Gondola was in operation.
One of the biggest challenges was the construction of an 85 foot counterweight pit and concrete shaft in solid granite rock. The entire upper terminal construction schedule depended on the counterweight construction, since that part of the building supports the main structure with all the tension forces.

The counterweight construction could not start before May 15, 1998, due to permit and grading ordinances, and also due to a very heavy winter and bad
weather conditions. When we started the excavation on May 15, we still had between four and five meters of snow. We had a very wet and stormy May and June, which turned into a construction nightmare.

Ten towers had to be built with very large and complicated footings.
Tower 3 is 152 feet high.

The tower crossarms and sheavetrains are in excess of 14,000 lbs., therefore a skycrane helicopter was out of question. All tower construction had to be done by crane.
In order to get our Funitel built for a scheduled December 19, 1998 opening, we had to work seven days per week, 16 hours per day. It’s also a great challenge dealing with subcontractors like roofers, glass people, and others on short notice within a short construction season.

This was definitely the largest construction job, with the shortest timeframe, and most extreme weather, that I have ever taken on. We poured over 4,000 yards of concrete between the terminals and towers and we pushed our staff to the absolute limit. The total price tag for equipment and construction is U.S.$19 million.

Our operating experience over the last five months has confirmed that we absolutely purchased the proper lift system for our needs. We have operated in 75 m.p.h. winds with no problems. Our customers like the comfort of the ride; they all love the seats in the cabins, and the capacity of over 4,000 people per hour eliminates any waiting in line.
We now have the best of the best -- a parking lot for over 5,000 cars; a Children’s World for 500 kids; a totally updated modern 120-passenger aerial tramway; and a Funitel, where you never wait in line, and which can operate in 75 m.p.h. winds.