

**AVALANCHE PROTECTION AND AVALANCHE  
RESEARCH IN AUSTRIA**

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Since about 100 years the Federal Service for Torrent and Avalanche Control is existing in Austria. The Service is responsible not only for designing and erecting avalanche defense systems but also for providing avalanche hazard maps (see below). Today snow bridges (Fig. 1) or snow fences are used for the most part to prevent avalanches in Austria (costs about 3 - 4 Mio AS per ha).

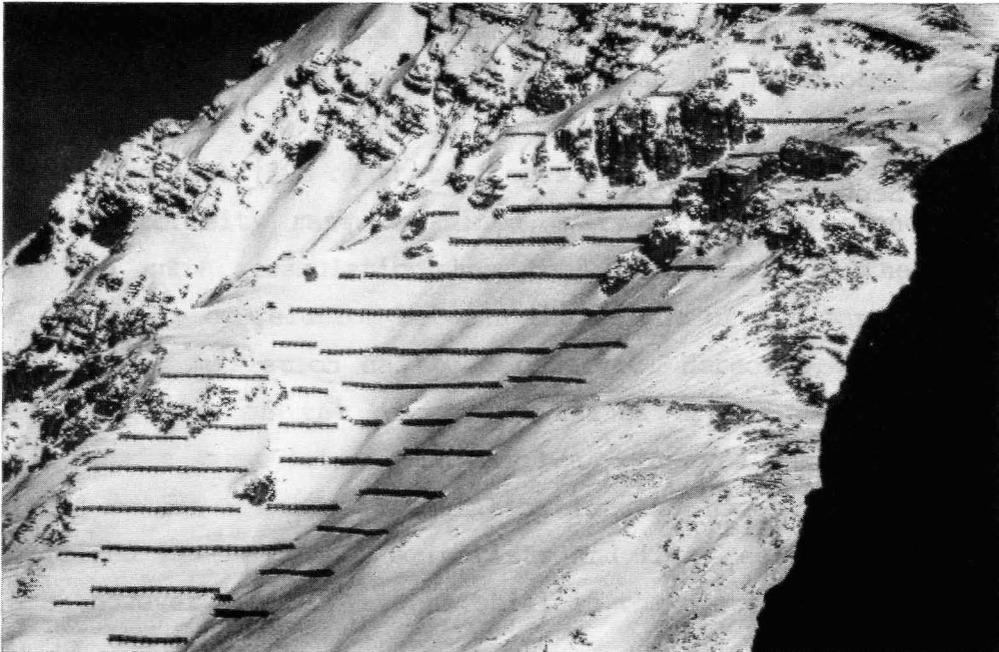


Fig. 1: Avalanche protection with snow bridges  
in the Axamer Lizum, Tyrol

To reduce these costs new methods were applied in the last years, especially the foundation by blast bolt (Dragosits, 1987). If supporting structures in the starting zones are still to expensi-

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ve defense systems are erected in the run-out-zones (avalanche breaking cones, deflecting walls, snow sheds ...).

In 1989 about 270 Mio AS were used for avalanche control systems (BMLF, 1990). Since 1945 319 projects were prepared (about 4,2 Mrd AS), 176 projects could be completed (BMLF, 1989). New investigations have shown that in the next years avalanche supporting structures at a cost of about 6,7 Mrd AS will be necessary (BMLF, 1989).

The Avalanche Control Service also has to manage the avalanche register; today 5800 avalanches are recorded. On basis of this register engineers of the Avalanche Control Service are able to prepare the avalanche hazard maps (embodied in the forest law of 1975).

The hazard zone map (1 : 5000) includes all hazard zones on basis of a return period of 150 years.

The following principles are determined by law (Republik Österreich, 1976):

The Red Zone includes areas which are endangered by avalanches to such an extent that their permanent utilization for settlements and traffic is not possible. Avalanche pressures of more than 25 kN/m<sup>2</sup> must be expected. Buildings and structures cannot be erected in this area.

The Yellow Zone covers areas with reduced avalanche danger. Therefore buildings and structures have to be protected by special architectural designing.

The Avalanche Warning Service in Austria is organized at the provincial level. Each province is responsible for their own territory. In the winter period the avalanche bulletin is elaborated every morning and sent out by broadcasting and telephone service. In addition to this task the Warning Service also is responsible for planning temporary provisions such as avalanche control ropeways (bomb trains).

The Institute for Avalanche Research was established in 1985 and is situated in Innsbruck. At the moment the institute is working on three projects (Schaffhauser, Rammer, Höller, 1988; BMLF,

1990, FBVA, 1990).

The first is about avalanche control ropeways (Fig. 2). The purpose of this study is to find out, if it is possible to use avalanche blasting ropeways instead of snow bridges in local zones of skiing areas. The investigations are still going on and will be completed in three of four years.



Fig. 2: Avalanche control ropeway at the Seegrube, near Innsbruck, Tyrol

Another study deals with the problem on avalanche dynamics. Especially elaborating of hazard maps needs fundamentals about avalanche motion (velocity, pressure, run out zones).

To determine these parameters a measuring equipment was installed at the Große Gröberlawine (Western Tyrol). This avalanche path is crossed by a "tube brige" (Fig. 3).

To measure dynamic pressure and velocity of snow air mixture of powder avalanches we mounted a pressure plate and two Prandtl tubes, one at the top and one at the bottom of the bridge. The first results are expected for this winter.



Fig. 3: "Tube bridge" at the "Große Gröberlawine", Tyrol

The third project concerns with the problem of avalanche formation in mountain forests. To find out if it is possible that new avalanche paths will arise in forest stands with open crown closure our institute started this study in 1986. In 1987 a test field was established in the near of Neustift (Stubaital) at about 1850 m, inside a larch stand with different openings. Investigations about snow gliding and formation of depth- and surface hoar were done in the years since 1987 but the very little precipitation of the last three winters stopped the measurements almost completely.

#### REFERENCES

- Bundesministerium für Land- und Forstwirtschaft (1989) "Lawinen in Österreich"
- Bundesministerium für Land- und Forstwirtschaft (1990) "Forschungsbericht 1989"

- Bundesministerium für Land- und Forstwirtschaft (1990) "Jahresbericht über die Forstwirtschaft 1989"
- Dragosits, F. (1987) "Die Praxis der Sprengfundierung". Mittlg. des EISLF 43, 29-35
- Forstliche Bundesversuchsanstalt (1990) "Jahresbericht 1989"
- Republik Österreich (1975) "Forstgesetz 1975". Bundesgesetzblatt 440/75
- Republik Österreich (1976) "Verordnung über die Gefahrenzonenpläne". Bundesgesetzblatt 436/76
- Republik Österreich (1979) "Verordnung über den Aufgabenbereich der Wildbach- und Lawinenverbauung". Bundesgesetzblatt 507/79
- Schaffhauser, H., Rammer, L., Höller, P. (1988) "Anmerkungen zu den Beiträgen des Institutes X - Lawinenkunde im Rahmen der Postersession Interpraevent 1988. Band 5 zu Interpraevent 1988, 199-211

AUSTRIAN INSTITUTIONS WHICH ARE CONCERNED WITH AVALANCHE PROBLEMS

| MINISTRY OF AGRICULTURE                               |   | MINISTRY OF SCIENCE  | PROVINCIAL GOUVERNMENTS   |
|---|---|--|---|
| Federal Service for Torrent and Avalanche Control     | Forest Research Station<br><br>Institute for Avalanche Research | Univers. of Agriculture<br><br>Institute for Torrent and Avalanche Control | Avalanche Warning Service   |
| + Designing and erecting of avalanche defense systems | + Research<br><br>+ Information                                 | + Research<br><br>+ Science  | + Avalanche bulletin<br><br>+ Designing of avalanche control ropeways |
| + Providing of avalanche hazard maps                  | + Statistics of avalanche accidents                             | + Expert opinions  | + Expert opinions   |
| + Afforestation projects                              | + Expert opinions   |  |   |
| + Expert opinions                                     |   |  |   |