

WHITE RISK – INTERACTIVE AVALANCHE LEARNING CD

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ABSTRACT: The best way to reduce avalanche accidents, is good avalanche forecasting, warning and education. Avalanches are influenced by a large variety of different factors, that have to be taken into consideration. Understanding the cross linking between these factors is very important but not easy to explain in books or verbally. A CD-ROM provides an ideal and up-to date medium of presenting and illustrating the entire complexity of avalanche education in an attractive and interactive way. Therefore the SLF, in collaboration with the National Accident Insurance Company (SUVA), started a project to produce and publish an interactive CD-ROM about avalanche prevention, especially aimed at backcountry and off-piste skiers and boarders. This CD, called "WHITE RISK", should circulate avalanche knowledge gained through research, as well as from practical experience, in a way that is easily accessible to skiers and boarders. The CD provides an opportunity of learning by seeing and hearing or even better by interactive action from the user himself. The possibility of viewing moving pictures, considerably facilitates the transfer of knowledge from theory to practice. All these elements are presented in a didactical manner and designed professionally. Research results from avalanche release, snow metamorphism or energy transfer modelling on the snowcover for example, were transferred into interactive animations for the CD. Furthermore, a new rule based avalanche hazard model, called "Danger Analyser", has been developed specially for this project, giving the user an opportunity to combine several avalanche forming factors and to see how the chosen combination influences the avalanche danger. The user can conduct a calculation of the avalanche danger interactively.

"WHITE RISK" is widely distributed and attractive for many different groups of winter sport enthusiasts. It appeals to the young as well as the young at heart, to novices as well as to experts. It's also a very useful tool for avalanche education in schools or courses and merges theory and practice an ideal way.

KEYWORDS: avalanche education, risk, interactive CD, didactics, training, e-learning

1. INTRODUCTION

One of the main research areas of the SLF are snow and avalanches. The main goal of our research is to reduce the population's exposure to avalanche risk. While the avalanche risk in buildings and roads has steadily decreased, the overwhelming majority of avalanche accidents occur in the off-piste and backcountry ski terrain. The best way to reduce avalanche accidents is good avalanche forecasting, warning and education. Many research results could have supported prevention if they had made their way out of scientific papers into the hands of practitioners. In an effort to accelerate this transfer, the SLF initialised a

project in collaboration with the National Accident Insurance Company (SUVA), to produce and publish an interactive CD-ROM about avalanche prevention especially aimed at backcountry and off-piste skiers or boarders. The CD-ROM, called "WHITE RISK", is a continuative product of the avalanche education video, describing the five avalanche danger levels (Harvey, 2002).

2. OBJECTIVES

The goal of this project was to design an interactive CD ROM comprising the up-to-date standard of practical avalanche knowledge and education. The CD "WHITE RISK", should circulate avalanche knowledge gained through research as well as practical experience in a way that is easily accessible to different user groups. It should be self-educating and appeal to the young as well as the young at heart winter sport enthusiasts, to beginners as well as to professionals. Essentially, we intended to struc-

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ture the content in a way that builds up from simple to complicated knowledge. The CD should be designed in a modern multimedia-based way with interactive elements, commented movies and animations as well as exercises to test personal avalanche knowledge.

3. METHODOLOGY AND DIDACTICS

Avalanches are influenced by a large variety of different factors, that have to be combined and taken into consideration for a good judgement. For example new snow and wind are well known unfavourable factors. They can cause slab avalanches. To avoid being caught by a slab avalanche, we have to prepare ourselves correctly, using all kinds of sources of information and maps. This is where the avalanche bulletin gives useful advice. In avalanche terrain we have to behave sensible and avoid steep slopes. Slope steepness is again an important avalanche forming factor.

The whole avalanche theory and practice is very networked, which means we have to way up and combine a lot of factors. So why not learn it in the same way? Here a CD provides an ideal and up-to-date possibility of presenting and illustrating the entire complexity of avalanches in an attractive and illustrative way. It allows us to switch between chapters with related content. A CD provides an opportunity of learning by seeing and hearing or even better by interactive action from the user for example when conducting self-assessment tests or trying navigational tools. The possibility of viewing moving pictures, considerably aids the transfer of knowledge into the real environment. All these elements are worked up in a didactical way and are designed by a professional company. To enhance the learning process, the following points were crucial:

- Explorative way of learning: There is no rigid structure, the user has to follow in the CD. On the one hand he can start where he wants on the other, he can go his own way by exploring. His curiosity will activate and enhance the learning process.
- Learning by doing: Of course the best way of learning, is going out into avalanche terrain. However, the exercises on the CD give the user the opportunity to practice and detect gaps in his or her knowledge. Interaction is an effective way of learning.

- Examples: We learn a lot from mistakes. Unfortunately avalanche terrain does not allow us to do many mistakes. Therefore examples of avalanche accidents give us the opportunity to learn from prior incidents.

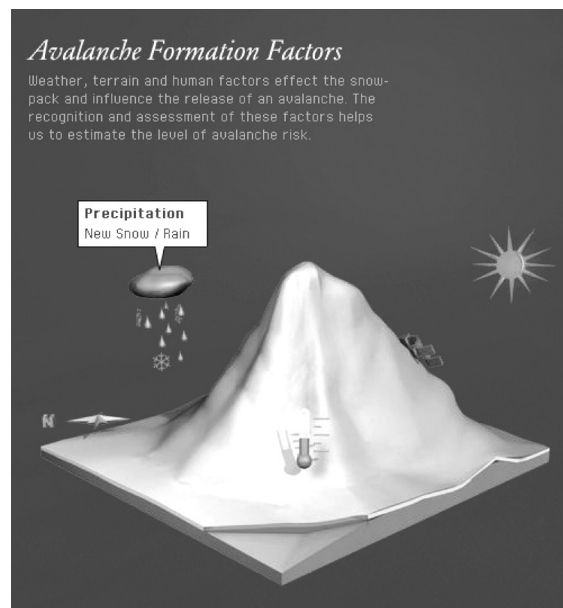


Figure 1: One of the interactive elements are turnable mountains, where the user can explore the content of a chapter and navigate through it (in this case, avalanche formation factors). On the one hand the orange icons display brief information and on the other, they act as buttons for navigation.

4. STRUCTURE

The content is structured and designed in several levels in order for the user to learn in the entire range from easy overviews to complex interdependences. The first level of a chapter not only gives some basic information but also acts as a platform to navigate through the chapter. By clicking on a specific theme, a little window opens up the next layer, where easily understandable avalanche knowledge is located. In the background the user still can see the first level to which he can switch back very easily (Fig. 4). If the user wants to know more, he can navigate to the third and deepest layer to delve into a lot of details, which are located on a new page (Fig. 5). In order to gain a better overview, the contents is sometimes split up into sub-layers. The third levels give the user the opportunity to utilise cross links to related topics in all the chapters of the CD. These links present an entire avalanche network to the user. The

buttons on the very left always show the user, in which main chapter he is situated. They also give the user an additional opportunity to navigate among the main chapters.

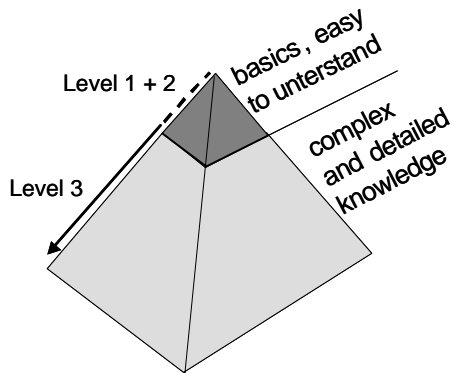


Figure 2: Like the tip of an iceberg in each main chapter, basic and easy understandable knowledge is available at the beginning in an illustrative way. Moving further on into "Level 3" a lot of detailed and complex content appears, which also offers links to related topics and chapters.

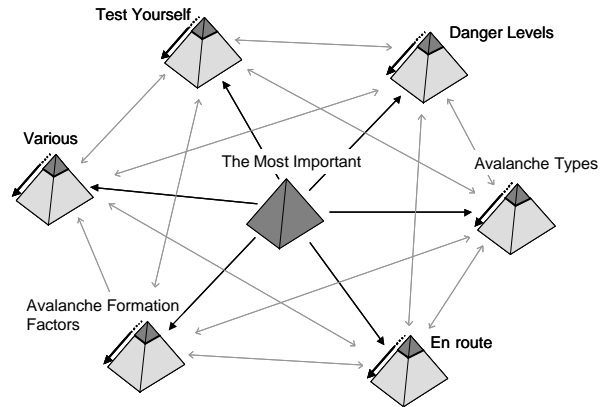


Figure 3: All the chapters in the CD are linked together and built up in the same way. When entering a new chapter, the user always gets brief and easy understandable knowledge first, which is symbolised by the dark shading.

Figure 4: User interface of the first two levels. A click on the precipitation cloud opens a small window on the right and provides basic knowledge with two animations about new snow and rain. Through the button "More", the user can navigate into "Level 3", filled with comprehensive detail.

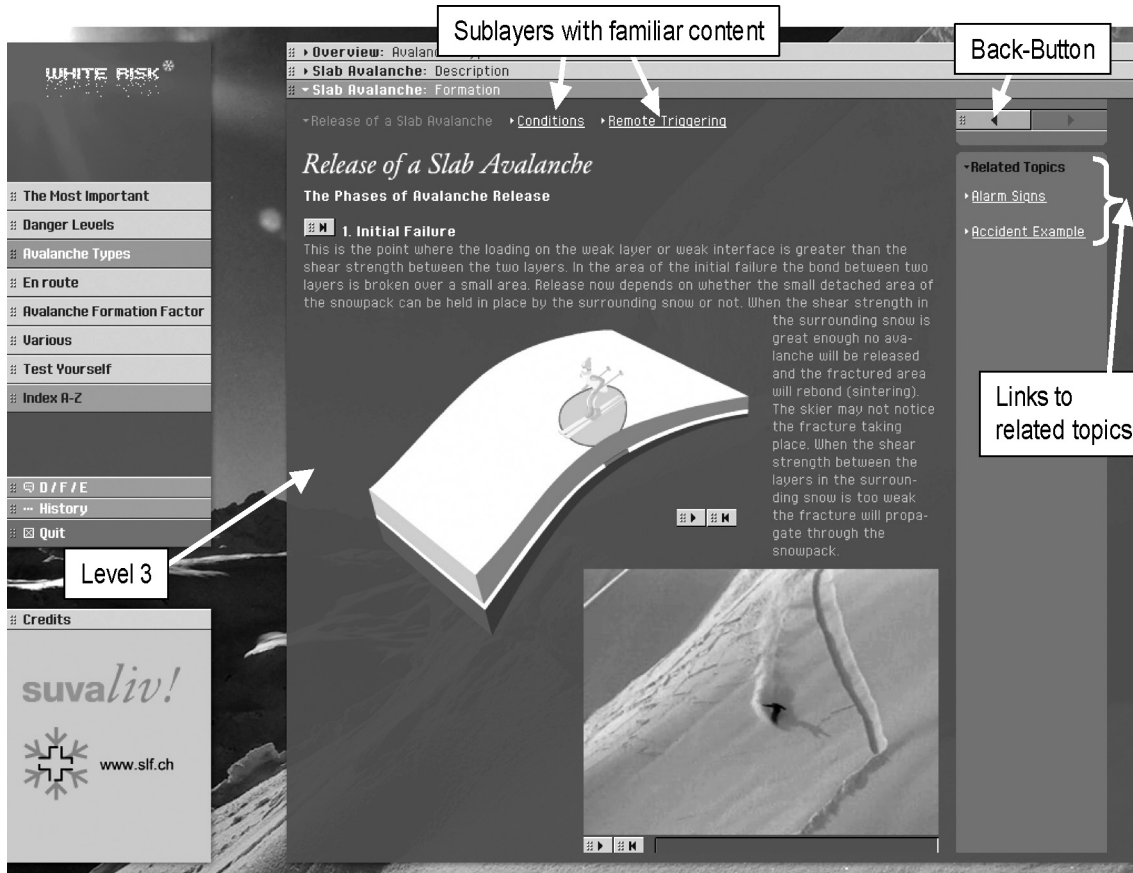


Figure 5: Level 3 explains the formation of slab avalanches with an animation and a movie. These kind of levels are characterised by containing more text and a lot of details and complexity. Sublayers occasionally structure the content into different themes. These kind of levels offer the opportunity to switch to links with familiar topics.

5. CONTENTS

The CD contains seven main chapters, which cover all necessary educational avalanche knowledge. The first chapter summarises the most important knowledge, with links to special chapters on the CD. It offers an opportunity to start exploring the content. Further chapters like “Avalanche Types”, “Danger Levels” or “Avalanche Forming Factors” provide a comprehensive theoretical background, whereas the chapter “En Route” puts theory into practice. Self-assessment tests help to evaluate the personal avalanche knowledge. Practical tools illustrate how to prepare trips and how to make good decisions.

All chapters appear as navigation button during the whole session on the left of the application.

The content of the CD is organised into the following chapters:

5.1 *The Most Important*

Gives a brief overview of the most important topics a recreationist should know about. These themes are also an ideal introduction and entry to the entire content.



Figure 6: Start page with buttons which link directly to the most important content.

5.2 Danger Levels

In this chapter the user becomes familiar with the European avalanche danger scale. He learns the characteristics of each danger level and gets to know about the accordant consequences and recommendations for recreationists outside the controlled ski area. All avalanche warning and forecasting products like the avalanche bulletin of the Swiss Avalanche Warning Service are presented with examples and detailed information.

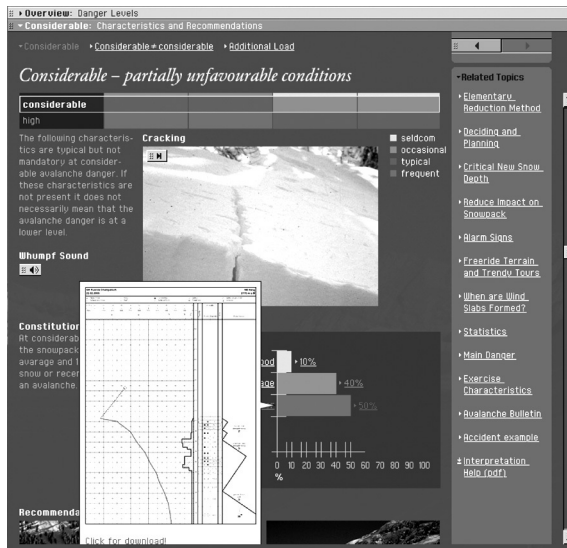


Figure 7: Characteristics and recommendations for considerable avalanche danger. With clicking on the speaker button, a “whumpf” sound is heard. When dragging the mouse over underlined words, texts or images pop up (like the snow profile in this example).

5.3 Avalanche Types

The main avalanche types like loose snow avalanche, wet snow avalanche, powder avalanche and slab avalanche are illustrated and described. The description and formation of slab avalanches is explained in detail. Spoken animations and films help to show the different phases of a slab avalanche release (Fig. 5). The explanation of the necessary conditions for a slab avalanche is also included.



Figure 8: Sublayer, explaining the necessary conditions for a slab avalanche to release.

5.4 En Route

This practical chapter shows how to handle the way from the preparations at home to the decision making in avalanche terrain. This complicated process is based on the “3x3” grid method (Munter, 2003), which helps us to do the right things at the right time. For example the user learns how to pick up information concerning the snowpack and how to weight up and combine the key factors in order to make a good decision. The use of the elementary reduction method (Munter, 2003 and Schweizer et al., 2003) is also explained and illustrated interactively. Of course advice on the necessary equipment and on how to handle a worst case scenario, an avalanche accident, is not missing. Strategies and search methods with transceivers are explained too.

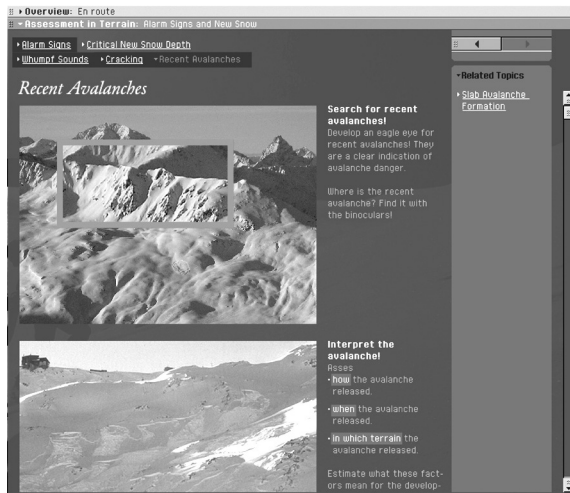


Figure 9: Interactive illustration of alarm signs. The user has to look for recent avalanches with the “binoculars”.

5.5 *Avalanche Formation Factors*

This large chapter gives the necessary theoretical background on how parameters like new snow, rain, wind, temperature and radiation effect the snowpack and avalanche formation. For example snow metamorphism or energy transfer in the snowcover are moulded into interactive animations. Furthermore the influence and handling of terrain factors like slope angle and aspects are explained. Several links to familiar topics give the user a chance to see how these avalanche forming parameters are linked. This whole network can be experienced with a novel mathematical avalanche hazard model, called “Danger Analyser”. This rule based model has been developed specially for this CD-project. It gives the user an opportunity to combine several avalanche forming factors and to experience how the chosen combination influences the avalanche danger. The user can conduct a calculation of avalanche danger interactively. This pragmatic avalanche hazard model is based on practical expert rules.

Besides the influence of the snowpack, weather and terrain, human factors are highlighted as a central theme. This complex topic has been poorly discussed in avalanche literature up till now. In the project „WHITE RISK“ we made the present, rather disperse knowledge about heuristic and perception traps (McCammon, 2004), readiness or communication available in a illustrative and complete way.

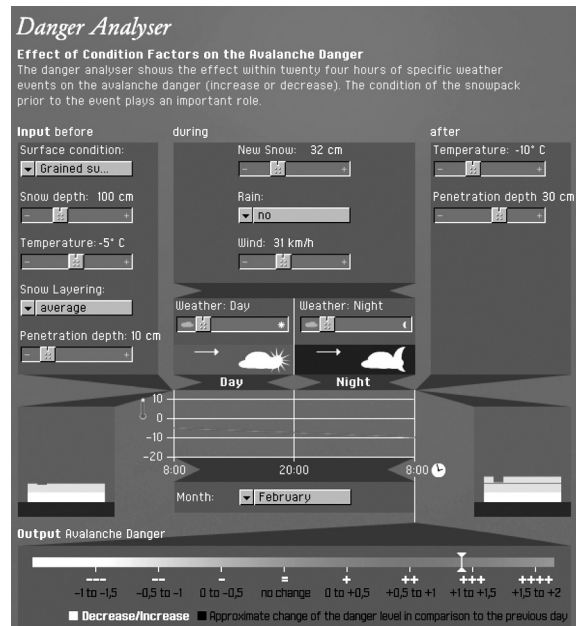


Figure 10: Danger Analyser. A rule based hazard model, to see the effect of combined avalanche forming factors on the avalanche danger.

5.6 *Various*

Twelve examples of avalanche accidents which have occurred under different circumstances for example new snow situation, wind slab situation, human factor, wet snow situation or old snow situation with critical layers, are described in detail. The circumstances of the accidents and the rescue work are explained. Photos and maps give orientation and also a description of the weather and avalanche situation is included. The twelve examples are extracted from the annual reports of avalanche accidents in the Swiss alps (see e.g. Harvey, 2003 or Zweifel, 2005).

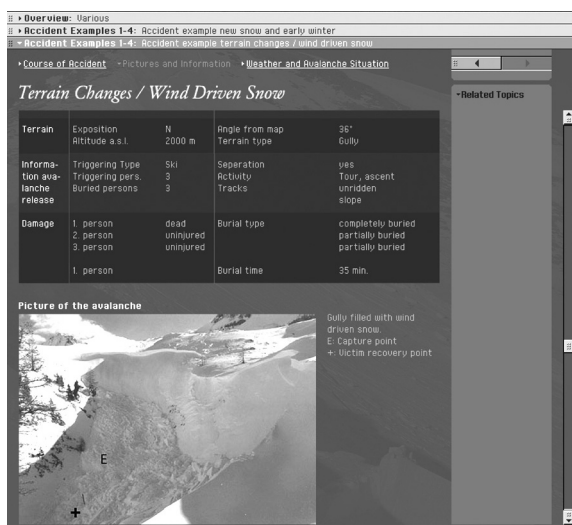


Figure 11: Description of a wind slab avalanche accident causing a fatality as one of the twelve examples on the CD.

5.7 Test Yourself

20 interactive exercises give the user the possibility to test his or her own avalanche knowledge. For example, the ideal route in terrain has to be drawn into photos; slope angles and aspects have to be estimated from pictures; pictures of terrain and extracts of maps have to be combined or the user has to find out the most important avalanche forming factors of a given situation, combine them and make a good decision. The tests appeal to different educational levels. Each test is linked to the according topic in the CD, so that everyone may find information to gaps in their knowledge.

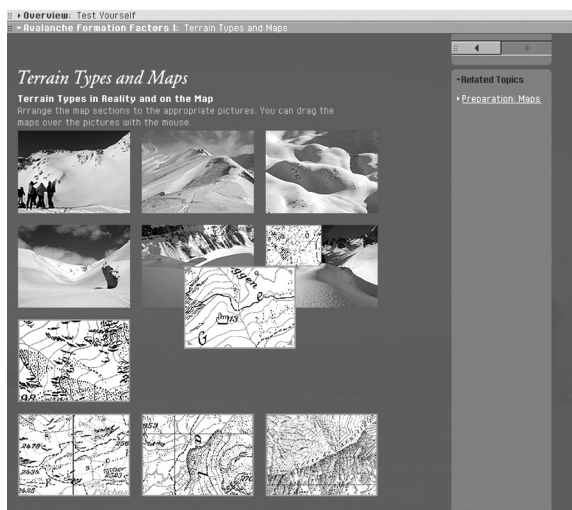


Figure 12: In one of the 20 interactive exercises the user has to arrange map sections to match

the according pictures. He practices to picture the terrain using maps.

5.8 Index A-Z

350 avalanche terms can be searched for in alphabetical order. Each term is directly linked to one or more topics of the complex and detailed “Level 3” in the CD (Fig. 3). This index offers a possibility especially for professionals, to easily get to the desired topic on the CD.

6. CONCLUSION

The CD “WHITE RISK” is a comprehensive e-learning product for avalanche knowledge and practical decision making in avalanche terrain. The content is structured and designed in several layers in a way that the user can learn the entire range from easy overviews to complex interdependences.

“WHITE RISK” has been successfully distributed in Switzerland and it is attractive for many different groups of winter sport enthusiasts. It appeals to the young as well as to the young at heart, to beginners as well as to professionals. It’s also a very useful tool for avalanche education in schools or courses. With “WHITE RISK” many people, particularly youngsters are animated to learn a lot about the danger of avalanches and prevention, in a self-educative manner. The CD has been available since January 2006. In the first two months, 10’000 copies were distributed in Switzerland. It is available in German, French and soon also in English and perhaps soon even in Italian.

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