# *NivoTest* : a pocket tool for avalanche risk assessing

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avalanche risk, avalanche education, decision support tool

## Abstract
*NivoTest* is dedicated to free riders (using skis, snowboards, snowmobiles, etc.) who feel concerned by avalanches. It is designed to help to assess avalanche risk for a given mountain route. It is a small card (3.3' x 5.9') with a revolving graduated disk. On the face of *NivoTest*, one can read some questions about weather, snow pack, past avalanches, topography and group competence. According to the answers, one has to turn the disk or not. The final position of the disk indicates the local avalanche risk level. Corresponding advise is written on verso.
*NivoTest* is based on classic risk theory and scoring techniques. It was developed from results of research about local avalanche forecasting as well as field experiments recorded into *NivoLog* databases.
The use of *NivoTest* is very easy and does not require any instrument. The skier only has to look around and observe snow and terrain to make a diagnosis, and then, his decision. Thus *NivoTest* is a pocket decision tool as well as a friendly teaching support.

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# 1. Presentation

On one side of the *NivoTest* there is a list of 25 questions regarding the main risk criteria. Depending on the answer a disk is turned or not. After answering all the questions one can simply flip the *NivoTest* over and read an estimation on avalanche risk and receive advise regarding the present conditions.


Rain during last 2 days ?
Snowfall > 20 cm during last 3 days ?
Snow drifting during last 5 days ?
Air temperature > 0°C ?
Low visibility (night, fog) ?
Deep snow (pedestrian sinking 20 to 40 cm) ?
Very deep snow (pedesrian sinking : 40 cm and more) ?
Wet snow ?
Irregular snow pack (thickness or structure) ?
Snow drift or cornices ?
Intern week layer ?
Avalanche happening today ?
Avalanche happening yesterday or day before ?
Snow pack with cracks ?
Route without any protected area ?
Dangerous route (cliff, crevasse, seracs) ?
Unusual route ?
Route with steep slope (30° et +) ?
Steep slope above the route ?
Convex steep slope ?
Member of the group with low technical level ?
Member of the group with bad physical training ?
Member without any transceiver and shovel ?
Group > 5 members or < 3 members ?
Group without rescue ability ?

***Fig.1*** *: NivoTest : face*


***Fig.2*** *: NivoTest : part of the back*

☹ The situation is dangerous. It is better not to go on the route at present time, except if you are an expert mountaineer.

😐 The situation is uncertain. Be very careful. Go one after the other, from safe places to safe places.

☺ The situation seems to be safe but beware to local instabilities. Watch over the evolution of the conditions. Stay watchful !

## 2. Goals of *NivoTest*

*NivoTest* is designed to :

1. inform
2. be a decision support
3. help to educate

**Information**

One can read on *NivoTest* a lot of safety instructions which are valuable every time : never ride alone, consult avalanche bulletin, never forget transceivers and check they work before each tour... Special places are designed to write emergency phone numbers as well as avalanche bulletins phone numbers. Thus, *NivoTest* is a "mini memo" about snow safety.

**Decision support**

*NivoTest* gives an avalanche risk assessment, according to local conditions from 25 field observations.

It can be used to :

- assess the risk for a given mountain road and group
- compare the risks for different routes
- compare the risk for different groups

**Education**

*NivoTest* is well suited for practical courses. Teenagers using *NivoTest* learn very quickly just because they play. Gather two mountaineers and give them a *NivoTest* : they will talk about snow and avalanches one hour long !

The "philosophy" of *NivoTest* lies into 3 main ideas :

- no certainty, only arguments : *NivoTest* is not a black box giving mysterious results, but a guide to observe and understand the snowy mountain.
- no interdiction, only advise : people can choose to use *NivoTest* or not, and if they do, they can choose to take the diagnosis into account or not.
- no exclusion : *NivoTest* is a complement to avalanche bulletins and local safety information.

## 3. Principles

*NivoTest* is based on the classic risk equation : $R_t = P_t \times D_t$

where :

$P_t$ is the avalanche probability during the time interval $t$ ($P \in [0,1]$)

$D_t$ is the damage that the event would cause if it occurs during the time interval $t$.

That means that *NivoTest* diagnosis depends on the avalanche probability as well as on the group vulnerability. *NivoTest* inputs are related to both (see fig. 1)

*NivoTest* establishes a score and then translates it into a signal (☺, 😐 or ☹). Score calculation is done by adding points (when rotating the disk). If the score is greater

than a first threshold then the situation is suspect ; if the score is greater than a second threshold then the situation is considered as dangerous.

This method (called scoring) is very simple but nevertheless efficient because :

- it is tolerant : an error on an input has no great influence on the diagnosis
- it is stable : a little variation on inputs cannot generate a big variation on output
- it is very reliable for comparative diagnosis.

The more the inputs are numerous, independent and equally weighted, the more the method gives good results. The *NivoTest* was designed consequently. It was then successfully tested on large databases (*NivoLog* data).

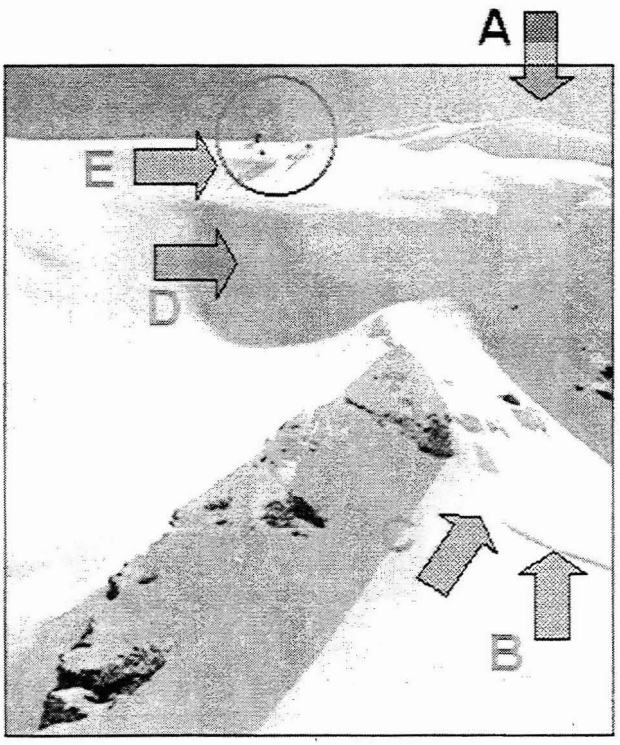
## 4. Practical use

**observation**

- recent snowfall
- recent snow drifting (A,B)
- deep snow (E)
- irregular snow pack (C)
- cornice (A)
- route without any protected area
- route with steep slope (D)
- convex steep slope (D)

**assomption**

skiers have transceivers, shovels, etc.




According to the observations, the *NivoTest* diagnosis is "☹", meaning that the situation may be dangerous (one minute later, an avalanche occurred...)

## Conclusion

*NivoTest* is not the ultimate solution but it may help a lot. A book titled "Attention avalanche !" (Ed. Nathan, Paris) and available in November 2000 in Europe will present detailed explanations about the *NivoTest* and local avalanche risk assessment. We hope that this will contribute to develop safe attitudes.

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