The 5 Step Checklist System
- A proven method for Avalanche Forecasting, Loss Prevention and Safety

Presented By: Mike Wiegele
Our mandate:
Risk Management Plan for Loss Prevention
Reduction of human factors:

• Using the 5 step checklist for avalanche forecasting and for safe travel in the mountains
  – It is a systematic method for stability rating
  – Reduces the human factors in making errors
  – Prevents missing any items that have an effect on the snowpack stability

• 45 years experience, over 30,000 snow profiles, ~ 1000 annually
The 5 Step Checklist

Forecasting snow stability rating

1. Daily weather data
2. Graphs
3. Snow Profile observations
4. Field observations
5. Ski test and stability ratings

Ski terrain choice & use of guiding procedures
Figure 1.1. A model of the weather and climate machine illustrating its complex and intricate feedback mechanisms. The influence of several of the feedback processes are comparable in magnitude but opposite in direction. It is clear that variations in the energy input parameter at the top left may affect several of the meteorological parameters within the machine. From Kellogg and Schneider (1974).
Our Professional Ski Guides Organization

CSGA (Canadian Ski Guide Association) & CIMS (Canadian Institute for Mountain Safety)
Step 1 Daily Weather Data
Step 2: Graphs

CSR (high cycle)

Humidity

Temperature

Load
The 3 Major Contributory Factors for Stability Rating

Step 2

Humidity (H) - Temperature (T) - Cosmic Solar Radiation (CSR)

INTERACTIONS
Cosmic Solar Radiation (CSR)

• Inflow of cosmic and solar radiation occurs in the high cycle related to the tidal chart/date/time.

• The universal system works in a well-organized and perfect manner.

• Cosmic rays are a stream of penetrating high speed atomic nuclei that enters the Earth’s atmosphere.

• Energy is transmitted as electronic fields of waves of moving particles and is invisible.
A snow layer may lift during atmospheric pressure during high cycle. Snowpack is now saturated with water vapor causing downward tension.

The water vapor then returns to the surface, deteriorating the strength of the snow layers and ice, causing tension and creeping of snowpack - more so in high cycles - increasing the probability of snow pack failure and for natural of skier interference avalanches.
Observations

We have observed worldwide that most avalanches, ice falls and fatalities occur during high cycle. Not using CSR cycle is a missing link for accurate forecasting!
Step 3  Snow Pack Profiles

“If you don’t dig, you don’t know”

Shovel Shear Test
Most reliable and effective method for measuring stability and ratings
- Substantiate your findings with 3 to 5 tests

Looking for a gliding layer
Major Gliding Layers

- 1. Depth hoar (Λ)
- 2. Surface hoar (V)
- 3. Facets (☐)
- 4. Ice ( - )
- 5. New snow crystals (+) (powder)
Step 4 Field Observations

Natural avalanche observations

override

snow profile tests
Field Observations

Natural avalanches alert us to changes taking place in the snowpack to very poor stability.

This avalanche occurred at the exact time of the CSR-cycle.

Ski tracks are from the day prior.
Step 5

Stability Rating and Ski Tests

Every turn is a ski test
Stability Rating
All elevations and exposures

Terrain choice and guiding procedures are applied accordingly.
### Stability Rating Values

#### 7 Stage Stability Rating Compared to 5 Stage

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- **Fair ratings** are commonly used in the industry and are misleading and have created a false sense of security = tragic
- **Too much room for human error**
- Divide **Fair** into 3 sections
- Must be upgraded to 7 stage stability rating

- Better assists us in **terrain** selection and **guiding** procedure
If snow stability is the problem terrain choice is the answer.
The most dangerous terrain features

• Glacier Icefalls & Crevasses
  • Cliffs
  • Trees
  • Gullies
• Unsupported Slopes
Route Selection
GPS tracking of runs skied during various stability ratings

Green Line is 6-7 (good Very good stability) Red is 1-2 (Poor or very poor stability)

Research Project conducted and developed with Dr. Pascal Haegeli and Dr. Scott Thumlert Mike Wiegele Helicopter Skiing & Helicat Canada sponsored research since 1989
Terrain analysis based on snow stability for safe route selection

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Arial view of “Not yet” mountain
Terrain analysis based on snow stability for safe route selection

Avalanche terrain on “Not yet” mountain

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Runs skied on “Not yet” mountain according to snow stability

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Guiding Procedures – **MUST DO**

prior to entering potential avalanche slope

1. Field book – data
2. Snow profile and stability rating
3. Gliding layer – look for weaknesses and hot spots
4. Load – what is the load on top of gliding layer?
5. Shear – Rating 1-2-3-4-5-6-7 classification with shovel test only
6. Natural observations
7. Ski cut test results
8. Exposure - Elevation
9. Contributory factors
10. Communicate and compare notes with other guides
Terrain selection and guiding procedures

- Recognize mountain hazards on descending route
- Avoid and limit exposure to hazards
- Be alert and move swiftly
- Select safe areas for regrouping
- One skier exposed to hazard only
- Appropriate spacing between skiers – 5 turns
- Partner skiing in trees
- Guests follow directions from hazard prevention awareness folder

Precise ski guiding procedures for loss prevention & fun skiing
Recommendations for Avalanche Forecasting

Industry should adopt the following best practices:

A measured system reduces human error:

1. Use the 5 Step Checklist
2. Use Shovel Shear Test for stability rating only
3. Cosmic Solar Radiation – CSR-cycle
4. InfoEx report must exceed current safety standards
Recommendations continued

5. Worldwide standards are not meeting the requirements for backcountry skiing safety.

6. Research, education, training and certification curriculum must adopt professional industry standards

This will sustain and grow hospitality and tourism economy.
A Measured system overrides intuition and human factors

Thank you
Have fun, be safe, do diligent work

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Research Projects conducted and developed with
Dr. Bruce Jamieson, University of Calgary,
Dr. Pascal Haegeli and Dr. Scott Thumlert, Simon Fraser University,
Onno Werringer from Alta ski area