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Human Factors and Group Communication

Including two-way radio protocols for the backcountry rider

If you're a backcountry rider, you know by now that you need to carry a beacon, shovel, probe, and airbag into the backcountry–and take an avalanche course. You've probably also learned that snow science is inexact: snow stability can be difficult to evaluate and decision-making is never black-and-white. The biggest variable in the field is often within your own group: humans.

Managing human factors is just as important in the backcountry as observing the snowpack. In fact, most avalanche fatalities are the direct result of mistakes in decision-making caused by human factors and communication. This is particularly prevalent in groups of well-educated, expert backcountry riders, including the well-publicized incident near Stevens Pass, Washington in February, 2012.

This pamphlet provides an introduction to the human factors that can often lead to poor decisions in the backcountry. We then focus on the process of promoting good planning, communication, and teamwork–and the use of important communication tools, including two-way radios.

What are "human factors?"

"We're all human." This is a common explanation when people make inconsequential mistakes that you wouldn't expect: a fender bender, losing your keys, or catching an edge on a groomed run. Even the most experienced snow safety professional is susceptible to making mistakes. In the avalanche setting, "human factors" are often used to explain decisions that are made based on psychological rather than objective criteria. Human factors have a tendency to cloud our judgment and cause us to ignore obvious signs of avalanche danger.

Researchers and educators have identified the following human factors as the most common in contributing to avalanche accidents[1, 2, 3].

Attitude
Pride, ego, and "summit fever" can all create pressures that override good decision making. When a group is intent on reaching a goal, this can lead to "tunnel vision," or a narrow focus on the goal without seriously weighing the hazards.

Familiarity/Complacency
"Been there done that." Familiarity with a location can often lead to a false sense of security. This can lead to riskier decision making.

Testosterone
Males tend to engage in riskier behavior than females—especially when there's a female to impress in the group.

Peer Pressure/Herding Instinct
This was the biggest factor in the Tunnel Creek incident. In large groups, peer pressure is more intense and individuals are less likely to voice their concerns than in smaller groups. The group often follows a *de facto* leader assumed to have more skills and knowledge, but who may not in reality. In a healthy group, members constantly challenge each others' assumptions.

Scarcity/First Tracks
There is a finite amount of terrain to ride–and often more demand than supply. This competition for fresh tracks is known to impact sound decision making.

"Blue Sky Syndrome"
Like familiarity, nice weather can also lead to a false sense of security. Many accidents occur on bluebird days immediately following a storm. Conversely, in bad weather, groups often rush decisions in their haste to "get back to the barn."

Poor Planning
Unrealistic assumptions and goals–with no backup plan–can lead to a stressful and dangerous "epic" in the mountains. Proactive tour planning is crucial to prevent situations that can result in hasty and drastic decisions.

Lack of Communication
Clear verbal communication within the party is critical in preventing accidents and is a common denominator in most accidents involving human error. Recently published research from Backcountry Access highlights numerous case studies in which communication gaps directly led to fatalities in avalanches and tree well incidents.[4] The second half of this pamphlet, "Two-way radio protocols for the backcountry rider," addresses the importance of two-way radios and how to use them to maximize both safety and powder-chasing enjoyment. These devices are essential tools for facilitating teamwork within your group.

[1] McCammon, I., "Heuristic Traps in Recreational Avalanche Accidents: Evidence and Implications.
  Avalanche News: No. 68, spring 2004.
[2] Atkins, D., Human Factors In Avalanche Accidents, 2000
[3] Fredston, J., Fesler, D., and Tremper, B., "The Human Factor - Lessons For Avalanche Education," ISSW 1994
[4] Edgerly, B, "Talking the Talk: Human Factors, Communication, and the Next Frontier in Snow Safety."
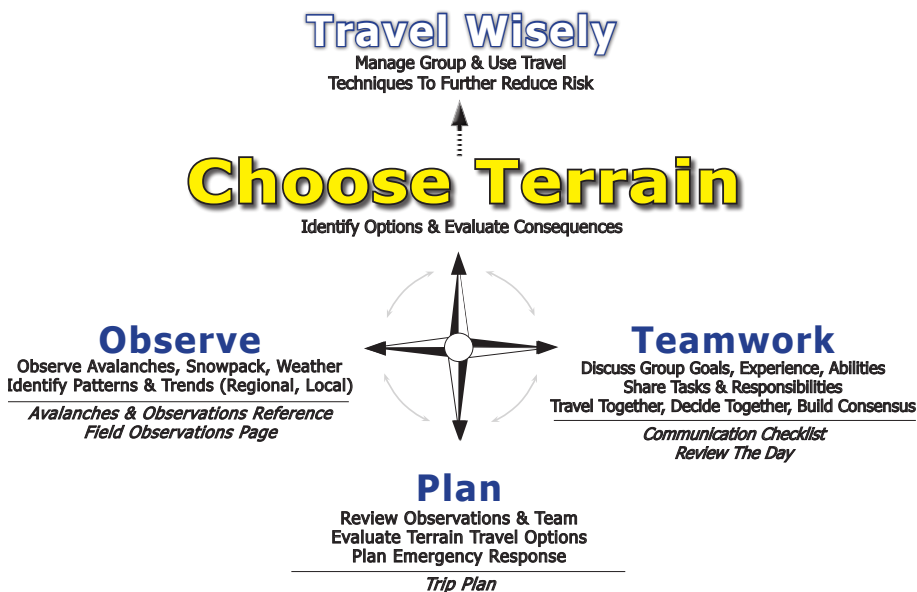 *ISSW Proceedings,* 2012.

Establishing a risk-management process

While human error is inevitable and often inconsequential, in avalanche terrain it can result in tragedy. There's a process of communicating and managing risk that you don't see behind the scenes in the ski and snowboard films. Professional guides and athletes know that to stay alive they need to have a process.

There are many formal processes that are have been developed by avalanche professionals to facilitate good decision making:

AIARE Decision Making Framework
Developed by the American Institute of Avalanche Research and Education (AIARE), this tool provides an overview of the decision making process necessary to manage risk in the backcountry. A team traveling into avalanche terrain works to implement the decision making process through planning, observing and communicating:

Travel Wisely
Manage Group & Use Travel Techniques To Further Reduce Risk

Choose Terrain
Identify Options & Evaluate Consequences

Observe
**Observe Avalanches, Snowpack, Weather
Identify Patterns & Trends (Regional, Local)**

*Avalanches & Observations Reference
Field Observations Page*

Teamwork
**Discuss Group Goals, Experience, Abilities
Share Tasks & Responsibilities
Travel Together, Decide Together, Build Consensus**

*Communication Checklist
Review The Day*

Plan
**Review Observations & Team
Evaluate Terrain Travel Options
Plan Emergency Response**

Trip Plan

As subsets of its Decision Making Framework, AIARE has developed a Trip Plan and Communication Checklist to help identify avalanche problems and discuss them among the group. These skills are best learned in a Level 1 AIARE avalanche course. They can also be found in BCA's new Backcountry Assessor iPhone app.

Avalanche Hazard Evaluation Checklist
Developed by Alaskan rescue specialists Jill Fredston and Doug Fesler,[5] this has been the gold standard in backcountry decision making for over 25 years. The user evaluates a concise menu of parameters related to the four key variables in avalanche hazard evaluation: weather, terrain, snowpack, and human factors. By assigning red, green or yellow-light status to each, the user is likely to make more objective "Go/No Go" decisions.

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[5] Fredston, J. and Fesler, D., Snow Sense: A Guide to Evaluating Snow Avalanche Hazard. Alaska Mountain Safety Center, 2011.

AVALANCHE HAZARD EVALUATION CHECKLIST

Critical Data		Hazard Rating*		
PARAMETERS: **KEY INFORMATION**		**G**	**Y**	**R**
TERRAIN: *Is the terrain capable of producing an avalanche?*				
-Slope Angle (steep enough to slide? prime time?)		[]	[]	[]
-Slope Aspect (leeward, shadowed, or extremely sunny?)		[]	[]	[]
-Slope Configuration (anchoring? shape?)		[]	[]	[]
Overall Terrain Rating:		[]	[]	[]
SNOWPACK: *Could the snow fail?*				
-Slab Configuration (slab? depth and distribution?)		[]	[]	[]
-Bonding Ability (weak layer? tender spots?)		[]	[]	[]
-Sensitivity (how much force to fail? shear tests? clues?)		[]	[]	[]
Overall Snowpack Rating:		[]	[]	[]
WEATHER: *Is the weather contributing to instability?*				
-Precipitation (type, amount, intensity? added weight?)		[]	[]	[]
-Wind (snow transport? amount and rate of deposition?)		[]	[]	[]
-Temperature (storm trends? effects on snowpack?)		[]	[]	[]
Overall Weather Rating:		[]	[]	[]
HUMAN: *What are your alternatives and their possible consequences?*				
-Attitude (toward life? risk? goals? assumptions?)		[]	[]	[]
-Technical Skill Level (travelling? evaluating aval. hazard?)		[]	[]	[]
-Strength/Equipment (strength? prepared for the worst?)		[]	[]	[]
Overall Human Rating:		[]	[]	[]

DECISION/ACTION:

Overall Hazard Rating/Go or no go?   GO [] or NO GO []

* HAZARD LEVEL SYMBOLS: R = Red light (stop/dangerous), G = Green light (go/OK), Y= Yellow light (caution/potentially dangerous).

Avaluator™

Canadian professionals recommend using a Canadian Avalanche Centre tool called the Avaluator™ Trip Planner. Users correlate the avalanche danger rating for the day with a pre-determined terrain rating for the tour they are planning. This facilitates the evaluation of red/green/yellow-light conditions. Of course, it's up to the user to determine which of these levels fall within their risk tolerance "comfort zone."
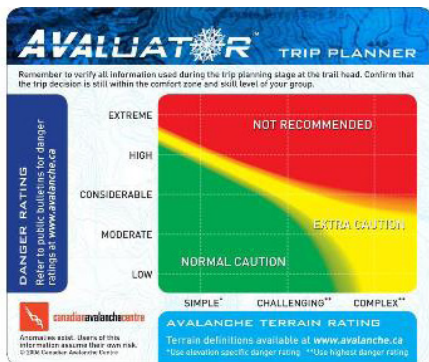
Maintaining Contact

Good decision making is the result not only of good planning, but good group communication. Team members should be assertive and involve everyone in decision making while respecting individual veto power. To do this, you must always maintain voice and sight contact. If this is lost–and regrouping points are not respected–there's a good chance the group will get spread out and unable to share observations.

If both sight and voice contact are lost, then two-way radio communication is essential. Do not rely on cell phones: cell coverage is unreliable in the backcountry. They are also limited to one-on-one communication–versus true group communication. Two-way radios provide real-time, group-accessible communication not available by cell or text.

The following section provides information on how to most effectively use your two-way radios to facilitate group communication and, in the worst case, rescue operations.

Two-way radio protocols for the backcountry rider

The advent of radios designed for backcountry skiers, boarders, and snowmobilers has given touring parties a new tool that not only allows them to reduce risk, but also enhance their experience by sharing run quality information. While these radios can be very useful, team members need to exercise some discipline in their use so they remain as useful tools. This guide is designed to help users learn when and how to use these radios in the backcountry. Two-way radios serve three important functions in the backcountry:

1. **Allow team members to share information on the best conditions;**
2. **Allow team members to warn of hazards and dangers;**
3. **Facilitate more efficient rescue operations.**

BC Link from
Backcountry Access

Non-Emergency two-way radio uses for the backcountry:

Good

- Share information on where the best conditions are.
- Guide fellow team members to the best parts of a run.
- Guide fellow team members to areas of safety.
- Warn fellow team members about hazards on a run.
- Guide fellow team members to avoid hazards on a run.

Bad

- Telling your friends how great your line was.
- Cheering your buddy on DURING a run.
- Extended non-critical communication.
- Communication not related to backcountry travel.

Emergency two-way radio uses for the backcountry:

- Warn a user of an ongoing event. *"AVALANCHE, GO RIGHT"*
- Coordinate rescue efforts including:
  - Guide rescuers to last seen point.
  - Guide rescuers to victim's location.
  - Coordinate searcher position and spacing.

- Relay communication for outside rescue resources to another party member with a cell phone. *Requires pre-planning so that you have one party member in a known location with BOTH cell service and radio reception.*

Keep in mind that reception with a two-way radio usually requires line-of-sight between units. While the range on an FRS radio can be up to five miles distance, it is severely degraded if there are obstacles, especially ridgelines.

Selecting an open channel:

The BC Link™ and other two-way radios use the publicly available FRS and GMRS frequencies designated by the Federal Communications Commission. As these are public frequencies, all users must "share" the available frequencies. When you turn on your radios at the touring location, listen for at least 30 seconds to determine the channel is vacant. The informal rule is "first come, first served" so if someone is using a channel, find a vacant channel. If you cannot find a vacant channel and have to share, use the protocols below and be very brief to respect other users.

General two-way radio communication protocols:

When talking on two-way radios, the following protocols will ensure your team members have the best chance of effective emergency and non-emergency communications.

- Remember that everything you say is public.
- Think of what you want to say BEFORE using the radio.
- Hold the transmit button down for one second before speaking into the mic.
- Speak clearly and be brief.
- NEVER transmit anything to a moving skier/boarder/snowmobiler UNLESS it is an emergency! *"STEVE…AVALANCHE…GO RIGHT, GO RIGHT!!!!"*
- The single exception to never transmitting to a moving skier/boarder/snowmobiler is when the person in motion has pre-arranged with another party member to help guide him on his line. Use ONE party member for guiding by radio ONLY!
  "Karen…traverse right, rocks below" or "Karen…traverse left for the best snow"
- When giving directions like this, always state where TO go, not where NOT to go.
- Keep your mouth one to two inches away from the mic. Holding your mouth against the mic often results in distorted or garbled communications. Try speaking across the mic (at 90 degrees) if your communications are garbled.
- Slow down your speech and talk in a steady voice. In a stressful situations most people tend to talk too fast. Think first, then talk.
- Clearly identify the intended recipient to get their attention, identify yourself. Then wait for their response so you know they are listening. *"Jane, this is Dan"……… "Dan, go for Jane"*
- Break up long messages into several shorter communications. This gives other team members a chance to contribute, add additional information, or request you to repeat the message.
- If due to an emergency you need to interrupt general communications, use the word "break." *"BREAK, BREAK, BREAK...AVALANCHE! All eyes on slope!!!"* The word, "break," is sometimes also used to separate portions of a very long message.

- When you finish communicating a message, say "over" to let the group know you are done. *"Dave to the whole crew, The avalanche has stopped, I have a last scene point, standby…over."* If your radio sends and automatic "Roger beep" at the end of each transmission, this may be unnecessary.
- When you receive a message AND understand it, reply with 'Roger' and repeat the key points to ensure your message was heard correctly. *"Roger Dave, this is Kim…the avalanche has stopped, you have a last seen points, standing by for further instructions."*
  - If you do not understand a message, ask for it to be repeated. *"Dave this is Bob…please say again!...over"*
  - To keep communications to a minimum, it is sometimes best to confirm a message by saying "copy." *"Jane, this is Scott…copy."*
  - Use the term "relay" when you are transferring a message through someone. Typically it is best not to relay UNLESS you are asked to. *"Dan, this Jane…relay to Scott…victim is conscious and has a broken leg…over."* (in this example Scott may be at a position where he has cell phone service to a search-and-rescue team.)
  - Constantly monitor how effective communications are. Do not speak if it does not add new information. Try not to talk over other users; be patient and wait to transmit.
  - Watch your language: profanity is not only illegal, but may be offensive to other users.

Strategies for using two-way radios in an avalanche emergency:

Hopefully by using two-way radios in your team you have managed to AVOID an emergency situation; sharing of information and real-time guiding through the radio can significantly reduce the chance of mishap. But if you do find yourself in an emergency, two-way radios can help coordinate the rescue process in the following ways:

1. **Organize and direct self-rescue efforts within your touring party.**
2. **Relay to another party member who has a cell phone connection to a search-and-rescue team.**
3. **Communicate to other users on the same or other channels.**
   There is no guarantee you can contact another group of two-way radio users, especially in the backcountry.

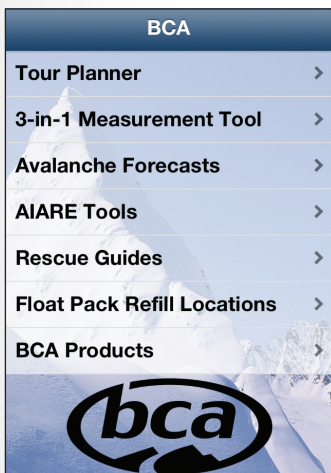## Some things to consider when using two-way radios during a touring party's self-rescue operation:

Consider the big picture. Even if a touring party self-rescues a victim(s), serious backcountry accidents typically require the assistance of a search-and-rescue team for treatment and/or evacuation. Touring parties need to be aware of their communications' link to outside rescue resources–typically by cell phone. Before dropping into a line, check and see if you have cell service (reception is typically better on ridges than in valleys or gullies). If there is an emergency, the two-way radios can be used to "relay" critical information to a team member who has cell service and can contact a search-and-rescue team.

NOTE: When searching with an avalanche beacon, always keep it a minimum of 16" (40 cm) away from electronic devices, including radios.

Download the BCA iPhone app

BCA has developed an iPhone app that can be used to plan tours, identify avalanche problems, and facilitate group communication. Available from the iTunes Apps Store, it provides the following tools:

• **Tour Planner:** Locate your touring destination on the topo map, then plot each leg by double-clicking on each waypoint. The Tour Planner provides the mileage and vertical feet (or meters) for each leg, and a total time estimate for the complete tour. You can move, add waypoints and update the data with actual measurements once in the field. Store variations of each tour plan, in case conditions change. These tour plans, with accompanying notes, can be saved for future reference.

BCA	
Tour Planner	›
3-in-1 Measurement Tool	›
Avalanche Forecasts	›
AIARE Tools	›
Rescue Guides	›
Float Pack Refill Locations	›
BCA Products	›

• **3-in-1 Measuring Tool:** Measure aspect, elevation, and slope angle, then store and directly compare them to the avalanche forecast in your chosen region.

• **Avalanche Forecasts:** Updates the avalanche forecast each time the app is turned on, so they can be viewed even in areas with no cell reception. Pre-select forecasts from a menu of avalanche centers worldwide.

• **AIARE Tools:** A menu of risk-management tools including the AIARE Decision Making Framework, AIARE Communication Checklist, and AIARE Observation Reference.

• **Rescue Guides:** Bulleted summaries of how to perform an avalanche rescue, including videos of proper beacon searching and shoveling technique. A section on "Calling for Help" provides a list of information to gather at the scene of an accident. It auto-populates the GPS coordinates, then allows the user to store all the recorded information for transmission to emergency personnel.

• **Float Pack Refill Locations:** Locates BCA retailers and refill centers for BCA's Float avalanche airbags.

• **BCA Products:** Links to BCA's website for researching and ordering BCA products.

We look forward to your feedback. Please send comments to:
appfeedback@backcountryaccess.com