

Part 3: Plan

Learning Outcomes:

- Plan for group travel in avalanche terrain, using the AIARE Trip Plan page.
- Build a complementary backcountry team.
- Describe the North American Public Avalanche Danger Scale, and how to use the rating and discussion when trip planning.
- Explain why teamwork in the planning process can mitigate some human factors.
- Incorporate terrain information from maps, photos and online resources into terrain choices.
- Relate how terrain options chosen during planning critically affect hazard management in the field.

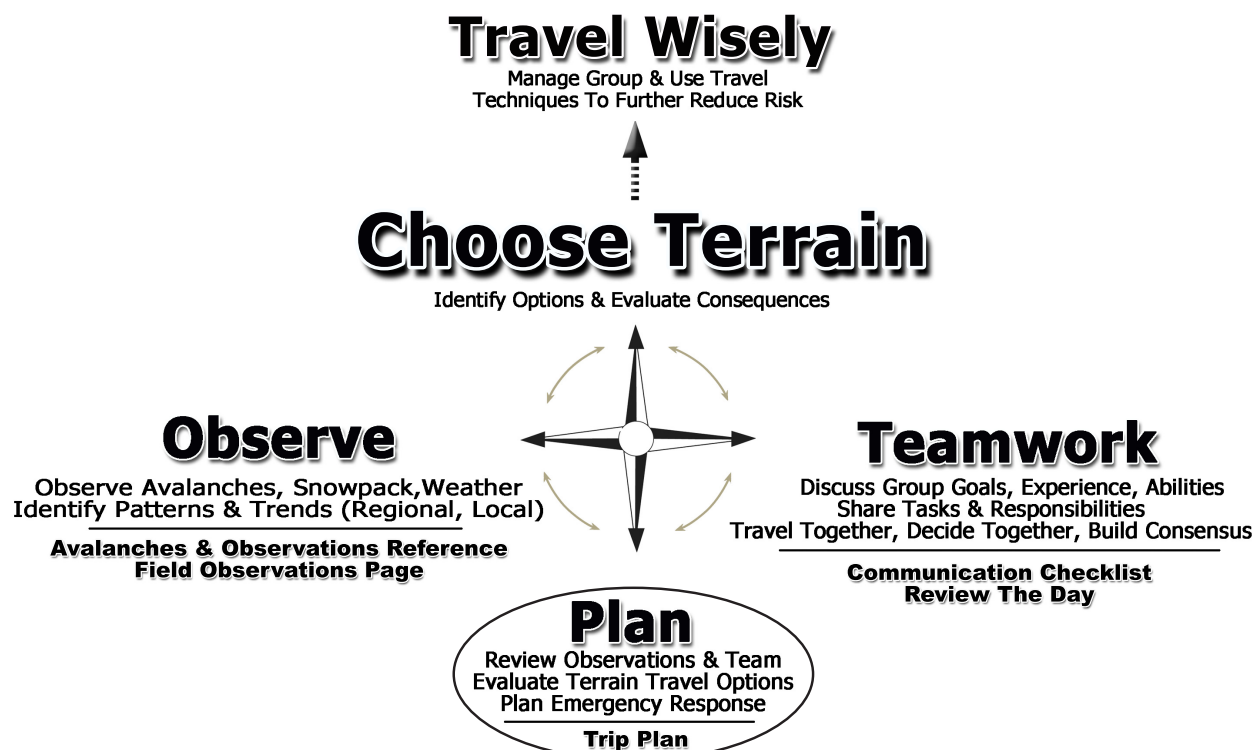
3.1 – Trip Planning

Trip Planning, prior to going into the backcountry, is essential for anticipating and properly managing risk. Backcountry adventures generally start with a desire to go into terrain. Sometimes the plan starts with the group members, other times a team is built around an objective. Rather than letting emotions and desires guide the plan, the process should begin with information gathering. “Who is coming along?” “What is happening out there?” “Where is the best snow right now?” “What is the current avalanche danger?” “What kind of avalanches are expected, and where in the terrain?” “Where shouldn’t we go?” Often specific desires and goals are incompatible with the day’s situation and one should alter them accordingly. An intelligent trip plan has factored in these variables and has options to accommodate changing opinions or unexpected circumstances.

Trip Planning sets the group up for making good decisions in the terrain. Experienced trip planners understand that some of the most critical decisions are made prior to the start of any trip and they tend to go through a ritual process before each trip.

Within the AIARE Decision Making Framework (DMF), the components of the Trip Planning process are:

- Gather the group and commit to a planning session; share tasks and responsibilities
- Gather and share observations, and evaluate and forecast conditions
- Choose terrain; eliminate hazardous options; develop a terrain use plan
- Plan for an emergency response



3.2 – The Trip Plan / AIARE Field Book

TRIP PLAN

DATE: _____ TIME: _____ FIELD LOCATION: _____

AVALANCHE DANGER: AVALANCHE ACTIVITY? • BULLETIN DANGER RATINGS?
"Where are avalanches likely to occur?" "Describe the problem?" "Specifically, which slopes will we avoid?"



SNOWPACK DISCUSSION: NEW / STORM SNOW? • WARMING? • WEAK LAYER(S) TYPE / DEPTH / PERSISTENCE?
"Where is the best snow?" "What field observations needed?" "Do we have experience w/ these conditions?"

WEATHER FORECAST: SKY / VISIBILITY • PRECIPITATION • WINDS / BLOWING SNOW • TEMPERATURES • TRENDS
"How will forecast affect snow conditions?" "...affect our observations? communication? decision-making?"

TRAVEL PLAN: OBJECTIVE • OPTIONS • ANTICIPATED HAZARDS • OBSERVATION PTS • DECISION PTS • GROUP MGMT
"Is plan appropriate for our goals, experience, abilities?" "Everyone included in discussion, w/ consensus?"

EMERGENCY RESPONSE: LEADERSHIP • GEAR ASSIGNMENTS • COMM. PLAN • EVAC ROUTE • EMERGENCY #'S
"Are we prepared & practiced?" "Outside help realistic?" "All concerns voiced re: dangers, risk, response?"

Review Observations & Team

Evaluate Terrain Travel Options

Plan Emergency Response

"The group plan and hazard forecast in action."

ABOUT CHECKLISTS AND DOCUMENTATION

Use of checklists in complex decision making environments is beneficial and highly recommended. Professional avalanche operations (ski patrol, guiding, highways and others) rely on checklists for forecasting and for field work. They use waterproof field books in the mountain environment to document field observations and decisions. Checklists ensure the process is organized and transparent. Checklists help the decision maker remain objective and free from bias. Importantly for pros and recreationists alike, checklists ensure the human tendency to take shortcuts is mitigated.

Documenting prevents a reliance on guesswork and memory. The human memory is notoriously unreliable, especially when distracted by fatigue, workload, time pressures, or even a fantastic ski run! Documentation either written or graphic allows for daily or weekly comparison and can illustrate important patterns and trends. Documentation allows for post trip reflection and promotes the value of lessons learned from experience.

The trip planning checklist used in this course is conveniently called the **Trip Plan** located in the **AIARE Field Book**. This checklist considers factors critical to an effective trip plan and helps to anticipate and forecast conditions and plan for safe terrain use. The AIARE Trip Plan is the essential pre-trip hazard forecast checklist for daily use. The **AIARE Field Book** makes it easy to bring the morning thought process into the field and to update and continue the decision making process, applying this information during critical junctures and decision making points during the day. The **Communication Checklist**, located at the front of the Field Book, is an important tool that helps to facilitate field decisions and anticipate and pre-empt the human factors that so often play into errors and unfortunate decisions.

PRESENTATION NOTES:








UNDERSTANDING AVALANCHE DANGER

Before beginning the Trip Plan it is good to have an understanding of the concept of avalanche risk and avalanche danger (also referred to as hazard). Avalanche risk can be simplified to a backcountry traveler as the probability of harm occurring as a result of the existing avalanche danger.

The North American Public Avalanche Danger Scale (Statham et al., 2010) describes the avalanche hazard to backcountry recreationists in local public bulletins issued for mountain regions. The incremental level of avalanche danger is determined by a combination of:

- The **likelihood** of an avalanche to be triggered
- The destructive **size** of the avalanche and **distribution and extent** of the avalanche problem across the terrain

These factors and the descriptions that accompany the ratings help to illustrate the avalanche character and problem. As the level of danger is determined in part by the terrain on which the snowpack lies, the public bulletin issues travel advice with the caveat *“Safe backcountry travel requires training and experience. You control your own risk by choosing where, when and how you travel.”*

North American Public Avalanche Danger Scale				
Avalanche danger is determined by the likelihood, size and distribution of avalanches.				
Danger Level		Travel Advice	Likelihood of Avalanches	Avalanche Size and Distribution
5 Extreme		Avoid all avalanche terrain.	Natural and human-triggered avalanches certain.	Large to very large avalanches in many areas.
4 High		Very dangerous avalanche conditions. Travel in avalanche terrain <u>not</u> recommended.	Natural avalanches likely; human-triggered avalanches very likely.	Large avalanches in many areas; or very large avalanches in specific areas.
3 Considerable		Dangerous avalanche conditions. Careful snowpack evaluation, cautious route-finding and conservative decision-making essential.	Natural avalanches possible; human-triggered avalanches likely.	Small avalanches in many areas; or large avalanches in specific areas; or very large avalanches in isolated areas.
2 Moderate		Heightened avalanche conditions on specific terrain features. Evaluate snow and terrain carefully; identify features of concern.	Natural avalanches unlikely; human-triggered avalanches possible.	Small avalanches in specific areas; or large avalanches in isolated areas.
1 Low		Generally safe avalanche conditions. Watch for unstable snow on isolated terrain features.	Natural and human-triggered avalanches unlikely.	Small avalanches in isolated areas or extreme terrain.
Safe backcountry travel requires training and experience. You control your own risk by choosing where, when and how you travel.				

(ADFAR: Statham, G., et.al 2010)

Danger ratings alone are not necessarily enough to be useful as a risk management tool. Consider that a significant number of fatal accidents occur when the danger is rated as *Moderate* and *Considerable*, as well as *High*. (Greene et al., 2006). This suggests that one's level of "risk" of being caught in an avalanche does not directly correspond to the level of avalanche danger in the mountains. Even with a Moderate danger rating visualizing the consequence of an avalanche involvement is critical to managing one's risk level. When avalanche danger is Considerable, the stability of the slope is more unpredictable and people become more uncertain. Some professionals have stated that when risk takers face uncertainty they are more likely to make risky decisions (see Part 5: Choose Terrain and Travel Wisely) as opposed to increasing the margin of safety. Risk management here equates to "uncertainty management" in a high-stakes environment.

Manage uncertainty by understanding the danger ratings - and importantly - by applying the critical information in the bulletin discussion to daily terrain choices. These comments from the forecasters contain details about weather, properties of the snowpack, the nature of the avalanche danger, avalanche characteristics, and in what types of terrain or times of day the danger may be elevated. They generally include terrain travel recommendations. Don't leave this valuable information on the computer screen; use the Trip Plan each day to consolidate this information and bring it into the field.

MAKING THE AVALANCHE ADVISORY RELEVANT

The Trip Plan prompts you to compile and organize relevant information from the avalanche advisory and to include your opinion! Relevant information refers to avalanche danger ratings and discussion, recent avalanche activity, snowpack (strength and structure), and weather (past, current, and forecast). Through analysis and discussion of observations you can identify patterns and trends.

TRIP PLAN

Avalanche Rose

An aspect and elevation diagram of where avalanche problems are expected.

DATE: 20130419	TIME: 0730	FIELD LOCATION: Up Gold Glade, down Green Glade or Blue Bowl
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AVALANCHE DANGER: AVALANCHE ACTIVITY? • BULLETIN DANGER RATINGS?

"Where are avalanches likely to occur?" "Describe the problem?" "Specifically, which slopes will we avoid?"

Loose Dry ☒ Steep & sheltered

Loose Wet ☐

Wet Slab ☐

Storm Slab ☐ Above Treeline

Wind Slab ☒ on NE to S.

Persist. Slab ☐

Deep Slab ☐

Cornice ☐

- Danger rating: MODERATE near and above treeline, LOW below treeline.
- Expecting touchy wind slabs.
- Yesterday, size 2 wind slab, E aspect, @ 12,000' on Red Ridge.
- Will avoid any wind slabs in upper Blue Bowl (N) by descending to Green Glade (NW).

SNOWPACK DISCUSSION: NEW / STORM SNOW? • WARMING? • WEAK LAYER(S) TYPE / DEPTH / PERSISTENCE?

"Where is the best snow?" "What field observations needed?" "Do we have experience w/ these conditions?"

25cm storm snow fell two days ago on a stable spring snowpack. Storm began w/ SW wind, ending w/ NW wind. No significant warming trend since storm. Wind slabs expected on Ely slopes and below ridgelines. Sheltered slopes still hold nice powder.

Obs to take: plan route to view avalanche activity; track storm snow depth w/ probing & hand tests; check wind slab depth/stiffness; ski tests on small safe slopes.

WEATHER FORECAST: SKY / VISIBILITY • PRECIPITATION • WINDS / BLOWING SNOW • TEMPERATURES • TRENDS

"How will forecast affect snow conditions?" "...affect our observations? communication? decision-making?"

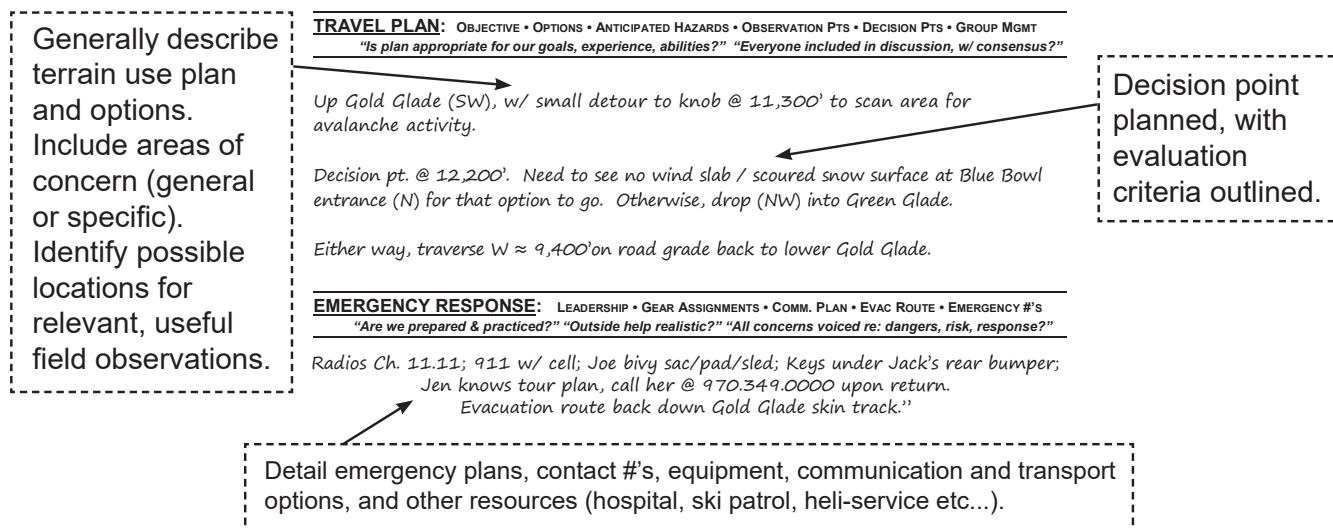
Forecast @ 10,500': Clear sky, NO precipitation, L NW winds, High -2.5°C. Expecting great visibility / gentle weather -easy visual observations and no weather stress. Watch temps today, but expecting dry snow during intended descent. Snow surfaces may get wet at the valley floors by PM and on steep southerly aspects.

Synopsis of the group's discussion, including information from the bulletin and other sources.

Integrating the public avalanche advisory into your own hazard forecast process is like having an expert with a lot of experience and resources as an advisor to your group! Realize that public bulletins are designed for all recreational backcountry users over a large area. While the bulletins provide an opinion written by an expert(s), they summarize point observations and expert interpretation from the forecast area. Some zones have fewer observers and fewer point observations. Expect localized variations from the regional analysis, and make it a goal to find out what the differences are. Use the **Trip Plan** to synthesize critical factors into a daily plan. Bring it in the field to help target field observations, identify the avalanche problem, encourage the gathering of key information to fill gaps in knowledge, and to support and facilitate key terrain decisions.

ANTICIPATING HUMAN FACTORS WHILE TRIP PLANNING - TEAMWORK

The second important factor for Trip Planning is interacting with the proposed group. Use the prompts in the Trip Plan as a template to open communication on the day's decisions.



Every fatal avalanche accident involves a poor decision made by a fellow human. Pre-conditioned bias and the human tendency to default to behavior patterns is termed *human factors*. They can lead us to make poor decisions in the backcountry. "We have met the enemy and he is us," said Walt Kelly, the animator of Pogo! Human factors may influence us without awareness of their effects and without conscious intervention. Working as a team includes knowing your group and anticipating motivation, interaction, bias, skills, strengths, and challenges. Be aware of common human factor traps and how to address them using teamwork solutions that may help to mitigate these biases. This could be the most important skill learned in this course!

Working as a team begins in the trip planning process and continues throughout the day in the field and concludes with a review of the day. To start, take a critical look at the group synergy. Look specifically at:

- Objectives/motivation: Who is the team? Do they get along? Do they share ambitions and objectives? Are the objectives of the tour within the capabilities of group members? Will the group need to reach its objective at all costs? How will these various issues affect decision making?
- Experience: What is the level of familiarity with the terrain? Who is the most familiar with the season's snowpack and avalanche events? Is this person willing to share this with the group? How will the awareness or lack of awareness of the snowpack history/terrain affect decision making?
- Skill/Fitness: How often do members of the party travel in the backcountry? What is the group's avalanche training and how will that affect group decisions and risk? What is the level of technical skill and fitness and how will that affect decision making?
- Share Tasks/Responsibilities: Is the leadership shared or is one person willing to step into this role? Are tasks well facilitated? Does the group have a "team mentality" sharing, monitoring observations? Is the group communicative, asking questions and challenging opinions? Do they understand that the backcountry is risky and operating in a hazardous environment will required them to manage their risk?
- Team Commitment: Is the group committed to traveling together and regrouping at pre-determined locations? Is the group committed to making the decisions together? Has the group agreed to the principle of empowering the least-experienced member, ensuring and requesting that everyone has a voice and each individual has a veto to any field decision? Is the group committed to making decisions unanimously, achieving consensus rather than a majority?
- Trip Factors: What is the difficulty level? Is the terrain complex and challenging? How will the terrain, difficulty and commitment level of the trip affect group decisions and risk acceptance?

- **Environmental Factors:** What are the weather and snow conditions? Excellent weather and snow? Blue sky syndrome? How will these factors affect the decision making process?
- Any other factors you can identify?

The above solutions are summarized in three easy to remember steps on the Decision Making Framework (DMF):

1. Discuss group goals, experience, abilities
2. Share Tasks and Responsibilities
3. Travel Together, Decide Together & Build Consensus

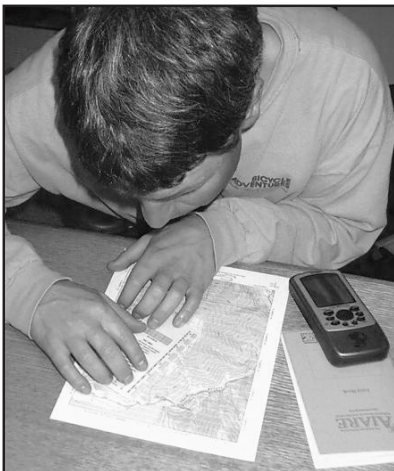
Write down critical group factors that may affect decisions in your trip plan!

Refer to Part 5: Choose Terrain and Travel Wisely to review how the above factors are applied to field decisions. In that chapter the *Communication Checklist* is introduced as an important field decision making support tool. The checklist asks the group to commit to a process, to build consensus and uses straightforward questions to play the role of the devil's advocate. The Communication Checklist goes one step further and asks the team where are you going, why are you going there, what will happen if you do, and are you prepared for the result? Refer also to the Part 7: Epilogue that provides a supplementary list of common human factor traps that affect decisions. Play the game of matching any traps applicable to your past trip and review the provided teamwork solutions that apply. Human factors are a consideration that may profoundly affect where we go (the group's terrain choices) and how we go—the group management and travel techniques employed to minimize the encountered risks.

CREATING TERRAIN TRAVEL OPTIONS

Next in the trip planning process is choosing terrain options. Carefully evaluate the hazard and choose terrain prior to departure as this may prevent an unfortunate and impulsive decision on the summit of the ridge, minutes before the descent! Manage risk by matching options to conditions and then consider the group skill level. Plan to travel where there are several options available. Avoid “go or no go” terrain.

Terrain that provides several options allows the group to consider and respond to new information or changing conditions. Consider uncertainty. Verbalize what isn't known about terrain or conditions! The greater the uncertainty or the greater the consequence, the more important it is to go with well known lower risk terrain. Uncertainty is easier to verbalize and consider during the planning stages than in the field where peer and time pressures and communication challenges affect the group dynamic.



Photos: T. Murphy

Terrain Information

Terrain information is available through a variety of sources. The following list is not specific or complete but provides a starting point for obtaining information at a variety of levels.

- Guidebooks with photos and illustrations
- Periodicals (articles, newsletters)
- Websites: trip info, trip forums
- Google Earth
- Topographical maps
- Aerial and personal terrain photos
- Local guiding companies suggested trips
- Locals information exchange
- Historical account

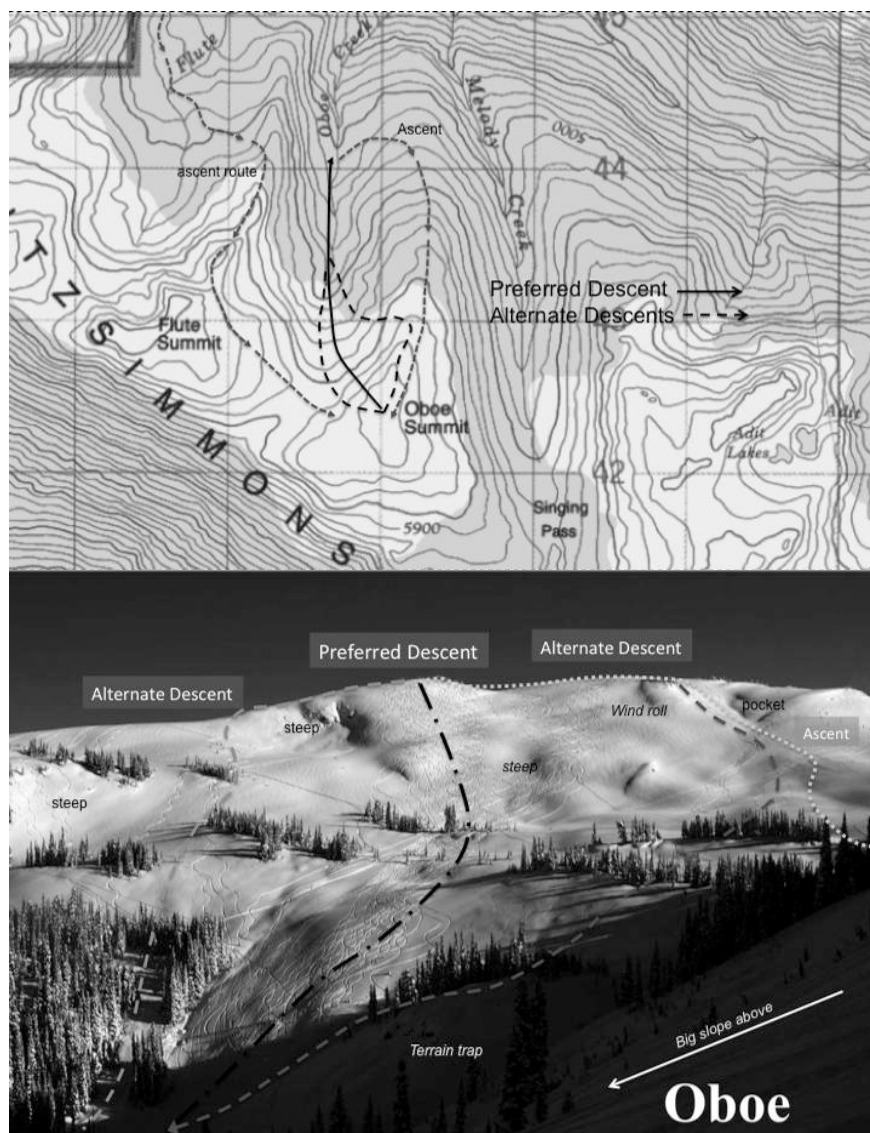
Identify Terrain to Avoid

Using the field book Trip Plan page that you used to compile information about conditions and the group, describe specific terrain features that the group will definitely avoid on this trip. Consider drawing this terrain out of bounds on a printed map or terrain photo to ensure everyone agrees this terrain is avoided today. Next, create options that seem appropriate given the described conditions.

Create Options in a Tour Plan

- **Preferred:** The first choice determined to be appropriate for the group and the conditions.
- **Alternate:** The alternative choice of travel/ascent/descent in the area with decreased exposure to avalanche danger. Suitable for travel if level of risk and/or degree of uncertainty are greater than anticipated.
- **Exit/Evacuation Option:** The safest route(s) in the area that avoids anticipated danger(s). Suitable for use when the conditions or group factors become incompatible with travel in avalanche terrain. Good possible route option for error correction and/or emergency evacuation.

It is recommended to plan route options on a topographical map; and draw on a photo preferred routes and alternative options to take into the field.



Planning route options on the spot is more difficult than doing it pre-trip. The weather may complicate dealing with the map, and the environment may not be so comfortable. Without pre-planned options, a group may be more likely to force the original plan through. During planning, consider what information or situation might trigger changing options. The more you have planned terrain options in advance, the quicker and easier it will be to adjust plans in the field.

Sample of what might be considered a more “formal” tour plan.

Tour Plan						Tour Plan	
Leg#	Start/End Elev.	Elevation Difference	Distance of of leg	Time Estimated	Time Actual	Navigation Strategies (handrail, bearing, UTM, etc.) Comments	
1	11,260'/ 11,800'	+540'	0.7km	:35 min	:30 min	Bearing out; 174 13S,340769,4318770 Use tree line/last trees to take bearing.	
2	11,800'/ 12,165'	+365'	0.6km	:26 min	:20 min	Bearing out; 106 13S,340708,4318109 Easy cruise up - make even switchbacks.	
3	12,165'/ 12,200'	-116'/ +178/ +35 net	0.9km	↓:05 min ↑:17 min	:25 min	Bearing out; 150 13S,341256,4317820 Pop over 1st ridge; watch altimeter.	
4	12,200'/ 12,570'	+370'	0.8km	:29 min	:25 min	Bearing out; 158 13S,341527,4316951 Reach next ridge handrail but keep good distance; travel techniques!	
5	12,570'/ 12,683'	+113	0.4km	:11 min	:20 min	Bearing out; 96 13S,341666,4316176 Steady traverse up to Pearl Pass - chop steps? Travel techniques!	
6	12,683'/ 12,000'	-683	1.3km	:20 min	:15 min	Bearing out; 114 13S,342015,4316078 Reassess stability. Glide left and avoid gul-lies.	
7	12,000'/ 11,405'	-600	1.0km	:17 min	:13 min	Bearing out; 160 13S,343063,4314299 Hut in trees on small knoll. Use Star Col back bearing if needed.	

Time Plans

Determine at what time the group needs to be at a given location. Generally, add extra time when it is critical (i.e., before dark, or when avoiding time-related hazards).

One can estimate time in many different ways. Accurate time estimation takes practice with many different groups, in different types of terrain, in various snow conditions, and with other variables. Provide a margin of error for unforeseen factors. Generally it is best to break the trip into legs and waypoints. Waypoints are the points on the map where legs begin and end. Legs are the travel sections between waypoints. It is best to calculate time estimates for each leg for easier monitoring and adjustment in the field.

Estimating Time for each Leg

- Estimate ~1-3 mph average horizontal speed.
- Estimate ~1000 vertical feet per hour – ascent.
- Estimate ~3000-4000 vertical feet per hour – descent.

Total Trip Time

- Add up each of the legs to get a total travel time.
- Estimate ~10-15 minutes per hour for breaks and add the total break time.
- Sum the total travel and total break time to find the total trip time.

Calculate Start Time

To calculate a start time, work backwards through your timed legs from a critical time juncture (often it is when the group needs to get home). The result is your latest start time! For example, the ideal return time is 5 p.m. Total travel time is 6 hours, and you figure you need 1 hour of total break time for a trip time of 7 hours. By subtracting 7 hours from 5 p.m. your latest start time should be 10 a.m.

Determine whether any hazards on the trip are time related. For example, if the plan marks the crossing of a steep south-facing slope on a spring day—and the group voices a concern regarding sun warming—then plan to cross that slope early in the day. Adjust your start time to reduce your risk.

Navigation Planning

Accurate navigation using a map, compass, GPS, altimeter and watch requires knowledge and practice. It is beyond the scope of the AIARE 1 course. It is important that all travelers in backcountry terrain know how to navigate and know how to error correct. Navigation plans should be factored into tour plans whenever there is the possibility of losing clear visibility or making a navigation error. Use the weather forecast, local knowledge and terrain choices to simplify the task. Navigation plans are generally done both on a map and in a field book for quick reference in the field.



Navigating in a whiteout

Photo: T. Murphy

EMERGENCY RESPONSE PLAN

Be prepared for an incident or accident. Initiate a group discussion to ensure that the group is comfortable with the level of preparedness for the day and increase safety measures as necessary. Visualize and verbalize what could go wrong and ensure the group has the resources to facilitate self rescue.

Ensure the group has practiced companion rescue, a member has a current first aid certificate, and that in the case of an emergency a leader will step forward to help organize a response. Ensure the group has practiced with the evacuation sled, the improvised splints etc. The winter emergency, where onset of shock and hypothermia occurs in minutes, is no place to learn skills!

Write down who is carrying important group equipment in your Trip Plan.

1. Companion Rescue equipment is carried by each person and is checked at the trailhead to be in good working condition. Response plan in field book:
 - a. Probe, shovel, transceiver required
 - b. Avalanche airbag system or Avalung optional
 - c. Spares in the car: skins, batteries, extra map, extra transceiver
2. Group gear has been checked prior to departure.
 - a. First Aid including splints, bleeds.
 - b. Repair kit.
 - c. Survival gear: bivy sac, extra cloths and XL warm down parka, extra food, thermos, extra gloves, hat, glasses.
 - d. Evacuation kit: ski toboggan, haul rope etc...
 - e. Navigation gear: GPS, altimeter, watch, map, compass, guidebooks.
3. Communication between field groups and from the field to the outside world has been established.
 - a. Emergency numbers/frequencies are in each group member field book.
 - b. Sat phone or SPOT if no cell or VHF radio.
 - c. Research the available resources that can provide assistance. What is the response time?
4. The safest evacuation route has been predetermined.
5. Vehicles used in car shuttles have keys in known locations (maps in vehicle to nearest hospital).

Medical Profiles

Developing a medical profile for each team member is recommended. The following information for each participant should be gathered:

- Name and emergency contact information
- Medical insurance provider, if applicable
- Food or drug allergies
- Current or recent injuries
- Current or recent medical conditions or procedures
- Prescription medications
- Other relevant physical or mental condition or limitation

Having the above personal medical information documented makes a significant difference to medical caregivers should an emergency arise that requires medical care or hospitalization.

Summary

The Trip Plan should be done with all members of the group prior to the trip. This will allow everyone to exchange and share all information used to plan terrain options and prepare for an emergency. The process of doing this as a group assists in enacting solutions to human factors that will improve the quality and objectivity of your decision making. It will also create an important reference for making observations and decisions in the field. The next chapter will discuss more about the art and science of making useful field observations.

QUESTIONS TO TEST UNDERSTANDING:

1. What is meant by “size and distribution” of avalanches when discussing the Avalanche Problem in a public bulletin?
2. How does bringing the Trip Plan into the field with you help your terrain decisions in the field?
3. Why is gathering and recording information still SO IMPORTANT when the bulletin rating is Moderate and Considerable and not just doing so when the rating is High?
4. Describe the three human factor solutions that help facilitate teamwork during the trip planning stages.



mountain hub

YOUR REAL-TIME NETWORK FOR THE OUTDOORS

New Snow



D2 Avalanche



Snowpack Test



Trip Report



Discover

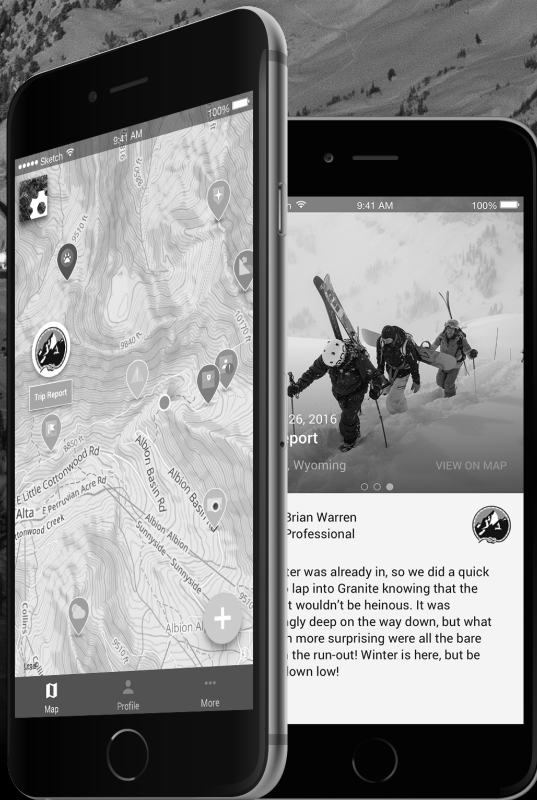
Research real-time observations
and plan your routes.

Experience

Understand the risks in real-time,
and stick to a plan.

Share

Contribute your trip reports,
observations, and routes.



Avatech is now Mountain Hub. Learn more at www.mountainhub.com.



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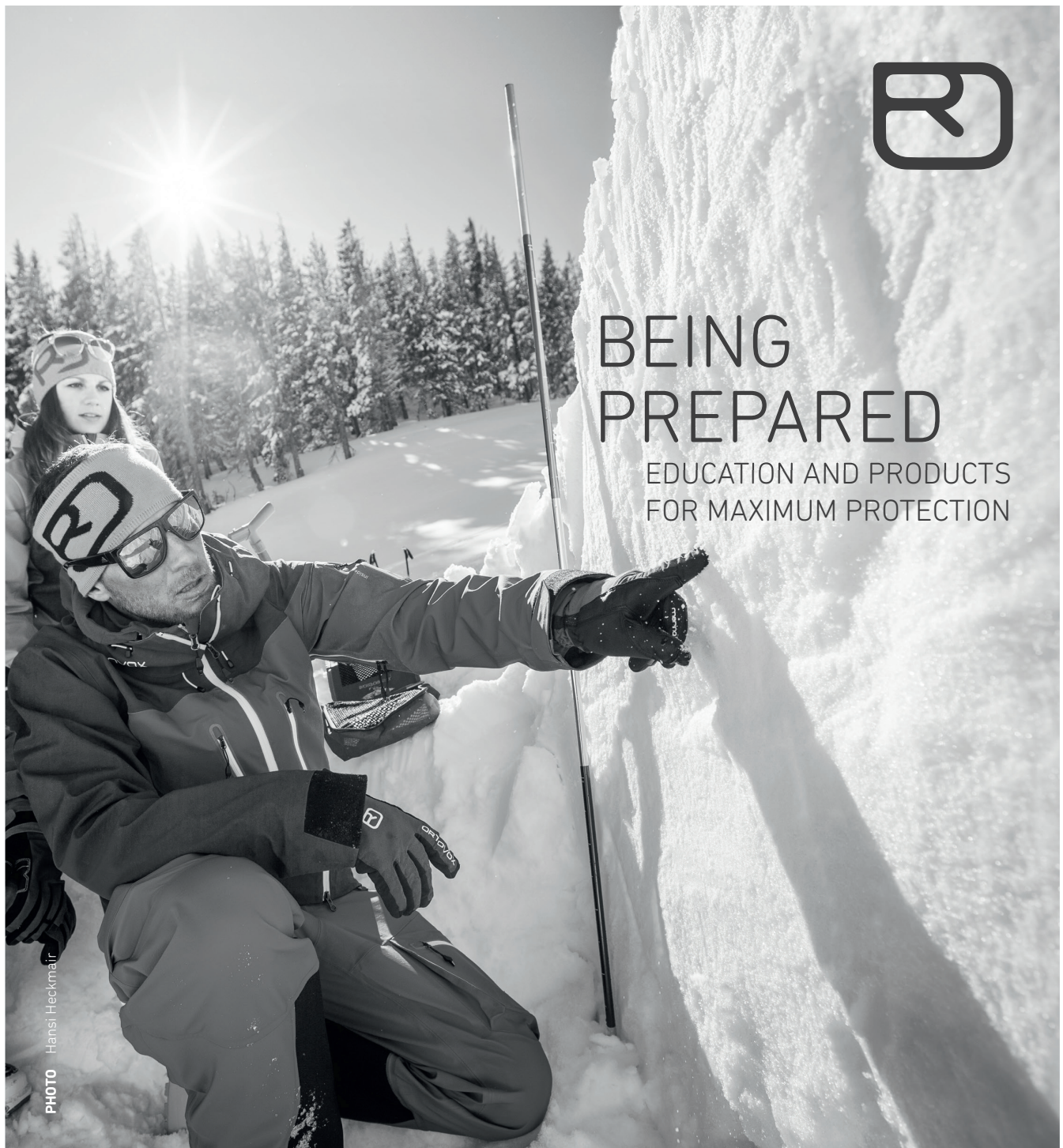


PHOTO Hansi Heckmaier

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