

DEVELOPING OPERATIONAL GUIDELINES TO REDUCE WORKER RISK AT US AVALANCHE CENTERS

Simon A. Trautman^{1,2*} and Karl W. Birkeland¹

¹ USDA Forest Service National Avalanche Center, Bozeman, MT, USA

² Sawtooth National Forest Avalanche Center, Ketchum, ID, USA

ABSTRACT: Workplace avalanche accidents claimed the lives of 11 avalanche workers in the United States over the last five years. Though none of the victims worked at a backcountry avalanche center, each accident reminds us of the danger of working in avalanche terrain. In response to these accidents, and in particular to an accident involving a Utah Department of Transportation avalanche forecaster, the Forest Service National Avalanche Center started a dialogue between the U.S. avalanche centers aimed at improving worker safety and increasing consistency in safety procedures. Our discussion began with the practice of solo travel by avalanche workers, but quickly transitioned into a more comprehensive project. The result was the creation of guidelines designed to reduce risk during field work. The guidelines establish context for field operations, define worker safety philosophy and responsibility, and improve risk management by requiring documentation of procedures related to check-in/check-out, required safety equipment, working alone, and emergency response. One of the key components of the guidelines is a pre-field work checklist and critical thinking exercise. U.S. avalanche centers are unique and diverse operations, adding complexity to the project. In the end, reducing or preventing accidents requires a holistic approach to safety. This approach must address the fundamental questions of who we are as a professional group, to what extent are we willing to expose our workers to potential hazards, and what methods are at our disposal to mitigate “acceptable risk”.

KEYWORDS: (safety, risk, risk management, operations, planning, worker).

1. BACKGROUND

Avalanche centers in the United States operate independently. As a result, field safety practices vary. Most centers are operated by the United States Forest Service (USFS) and share responsibility and/or liability for worker related accidents. Currently, there are 41 avalanche center employees and hundreds of volunteers working within USFS operations. These employees and volunteers spend a significant amount of time in potentially adverse wintertime backcountry conditions.

In April 2013, a Utah Department of Transportation (UDOT) avalanche forecaster was killed in an avalanche. Though working alone, the circumstances of the avalanche makes it unlikely that a partner would have changed the outcome. Still, this tragic accident prompted immediate discussion and questioning of the defensibility of solo travel (while working) among snow and avalanche workers and the public.

* *Corresponding author address:*

Simon Trautman
USFS National Avalanche Center
Ketchum, ID 83340
tel: 208-922-0095
email: strautman@fs.fed.us

In the summer following this accident, the Forest Service National Avalanche Center initiated a formal discussion between US avalanche centers with the goal of achieving consensus on working alone in avalanche terrain. We quickly realized that while the question of working alone is important, it is only one piece of a multi-faceted workplace safety discussion (Figure 1). This expanded our focus to include documenting existing standards and practices pertaining to operational safety at US avalanche centers. We started with a broad survey and progressed to a smaller working group tasked with building commonality between the safety practices used by all our avalanche centers.

Our effort resulted in a series of templates designed to provide guidance, stimulate critical thought and discussion, and increase consistency in safety practices between avalanche centers. The project's ultimate goal is to improve worker safety by ensuring that centers define, document, and manage risk during field operations. Of course, our current results are not final. This effort is, and will continue to be, an ongoing and iterative process.

'Acceptable Risk'	Documentation	Training
PPE	Field Planning	Communications
Check-in / Check-out	Working Alone	Volunteers

Fig. 1: Workplace safety is multifaceted, and includes – at a minimum – all the above factors. Each of these topics affects the others, and if one is ignored then worker safety suffers.

2. PROJECT DESCRIPTION

2.1 US Avalanche Center Survey

We started by surveying existing operational safety practices at 13 USFS avalanche centers and the Colorado Avalanche Information Center (CAIC). Our survey consisted of 22 questions focused on safety related documentation, field practices, and the use and requirement of various types of personal protective equipment (PPE).

Operational procedures and practices within the US Forest Service are regulated by our Health and Safety Code Handbook. A primary tool employed by the handbook is the Job Hazard Analysis (JHA). The JHA aims to be a systematic process that identifies hazards specific to a work project or activity and develops abatement actions for those hazards.

All USFS avalanche centers use JHAs, but the respective content varied widely. Additionally, 8 of the 14 respondents felt their JHAs needed improvement, or contained generic language that contradicted their field mission. For example, operations routinely utilize snowmobiles in avalanche terrain, but several generic JHAs stated that avalanche terrain must be avoided when snowmobiling.

As stated above, US avalanche centers operate independently under the direct supervision of their local Forests. As such, each has a somewhat different organizational structure and operational mandate. At the time of the survey:

- 8 of 14 maintain an operations manual specific to their center.
- 8 of 14 spend more than 75% of their time in the field, 3 spend more than 50%, and 3 spend more than 25%.
- 10 of 14 spend between 2 and 5 hours in avalanche terrain on a given day.
- 11 of 14 allow personnel to work alone; rules vary for solo work.
- 12 of 14 centers use check-in / check-out procedures; procedures vary between centers.
- 12 of 14 centers have a volunteer program.
- 11 of 14 take volunteers into avalanche terrain.

All avalanche center personnel carry a transceiver, shovel, and probe when working in the snow. Most operations also recommend a certain amount of 'survival' gear, but in general workers must be experts in winter travel and are given discretion about what they carry. We focused the survey on communication devices, the use of airbag packs, and backcountry helmet requirements (USFS personnel are required to wear helmets while skiing downhill in ski areas, or when snowmobiling). At the time of the survey:

- Required communication devices varied a great deal, partially due to geography and the availability of operational support such as designated dispatch centers. Most operations use a combination of radios, cell phones, and SPOT locator devices. Two centers were using 2-way inReach technology at the time of the survey.
- 4 of 14 centers require airbag packs
- In addition to the 4 that require them, 4 centers have personnel that use airbags
- 10 avalanche center directors said 'yes' when asked if airbags should be an industry standard.
- 3 of 14 centers require helmets in the backcountry.
- 8 of 14 avalanche center directors said 'yes' when asked if helmets should be required in the backcountry.

2.2 Background Literature

We reviewed safety related documents from the Colorado Avalanche Information Center, Banff National Park, Teton National Park, and Big Sky Resort. We also familiarized ourselves with ISO

31000, Risk management – Principles and Guidelines.

2.3 Working Group

We invited each avalanche center to participate in a working group convened to understand current safety practices and improve them. The group met several times and participated in numerous individual discussions during the summer of 2013. The group decided to work towards the following:

- Developing a JHA template for routine field work conducted by avalanche specialists.
- Designing an operational safety planning template for USFS Avalanche Centers.
- Creating a daily field planning/risk reduction template.

2.4 Templates

Job Hazard Analysis Template: Our JHA template – titled ‘Field Work – Avalanche and Snowpack Analysis’ – is similar to existing JHAs and is adaptable for individual organizations. The document is specific to avalanche work and combines winter driving, trailering and towing, winter backcountry travel / field work, and snowmobile operation. Operations can utilize the template as a starting point, and add information specific to their workplace. Like other JHAs, it identifies hazards and abatement actions. It also includes several unique attributes:

- It describes qualifications for avalanche specialists
- It describes the need for field work
- It refers the reader to an Operational Safety Plan

Operational Safety Plan Template and Example Plan (Fig:2): The Operational Safety Plan is important because it builds on the JHA by providing specific information. The plan must communicate the mission of the avalanche center, the necessity of field work, and the center’s worker safety philosophy. The plans provide critical analysis and documentation of work practices and procedures that reduce risk and increase safety. These living documents must be updated regularly/over time/as needed. When combined with on-the-job training, these plans increase the speed and effectiveness of safety understanding for both existing and new employees.

1. Background
1.1. Context for field operations
1.2. Purpose and Scope of the Document
2. Field Work
2.1. Backcountry defined
2.2. Fieldwork premise and goals
3. Safety
3.1. Philosophy
3.2. Situational Awareness
3.3. Responsibility
3.4. Training
4. Field Work Hazard Analysis
4.1. Agency Requirements – JHA
5. Field Work Hazard and Risk Management
5.1. Avalanche Advisory
5.2. Pre-Field Work Planning and Communication
5.3. Operational Guidelines
5.3.1. Check-in / Check-out
5.3.2. Communications
5.3.3. PPE
5.3.4. Working Alone
5.3.5. Working with Volunteers
5.3.6. Travel on Snowmobiles
5.3.7. Travel with Professional Operations
5.3.8. SAR Response
5.3.9. Reporting Near Misses and Lessons Learned
6. Emergency Response Procedures
7. Organizational Support

Fig: 2 Example of the template used for operational safety planning.

Daily Field Planning/Risk Reduction Template: The most important component of this project is a field work planning template. Our template, which is adapted from a similar version used by the CAIC, gives avalanche workers a systematic method for assessing risk on a daily basis (Fig: 3). Since avalanche specialists are highly skilled, the template does not tell workers how and where to travel. Rather, it provides a structured method for thinking critically about the day’s safety concerns. The process is repeatable, documented, and creates accountability for managers and workers alike. This exercise doubles as the ‘tailgate safety’ discussion required by the US Forest Service and improves safety by making avalanche workers think critically about their day’s fieldwork.

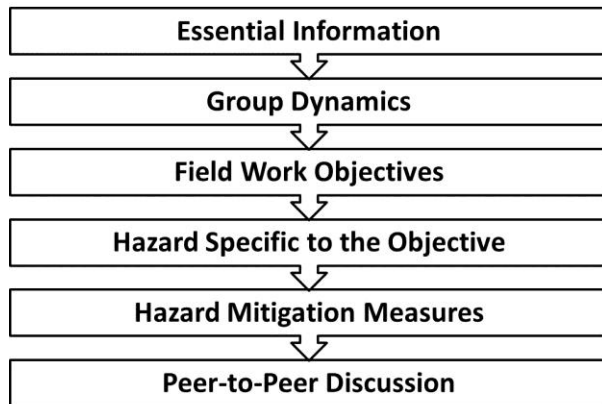


Fig. 3: The daily field planning template requires avalanche workers to think critically and discuss how they plan to mitigate hazards and reduce risk with a co-worker.

3. DISCUSSION

Safety protocols and procedures at US Avalanche Centers are heavily influenced by local Forest and Avalanche Center history, employees, and leadership. As such, we have an array of safety cultures at our avalanche centers. Bringing consistency to these cultures will improve employee safety and reduce potential liabilities across the Avalanche Center network.

The challenge in increasing consistency is doing it without reducing the effectiveness of individual operations and/or isolating operations that do not agree with certain practices. As such, our framework allows operational flexibility for utilizing mutual guidelines. A key step in our process is building and maintaining a document exchange that houses existing JHAs, Operational Safety Plans, and a collection of near misses provided by the group. The exchange will be a valuable resource for building new plans or updating and improving existing plans.

Recent research demonstrates that stability tests can be conducted in safe, low-angle terrain (Bair et al., 2012; Birkeland et al., 2010; Gauthier and Jamieson, 2008; Simenhois et al., 2012). However, at times, avalanche workers may need to enter avalanche terrain to produce accurate public avalanche forecasts. The authors believe that three fundamental questions must be considered when using this framework to develop a center's unique safety plan:

- Why do we work in the field?
- When should we expose ourselves to terrain and conditions that may be

hazardous?

- With regard to risk, what work we will accept, perform, and consider acceptable?

The goal of this project is not to make all avalanche centers adopt the same protocols; rather, it is for avalanche centers to follow the same process when establishing, using, and documenting safety procedures. Operations must critically assess their current procedures and implement appropriate steps to eliminate problems or inconsistencies.

As far as encouraging consistency within the group, we learned the following about our avalanche centers with regard to each of the categories shown in Figure 1.

3.1 *'Acceptable Risk'*

'Acceptable risk' means different things to different people. The USFS conducts a wide variety of 'risky' operations such as firefighting, aviation, and law enforcement. Each of these groups has extensive risk management and mitigation standards in place. It is important for avalanche centers to define the type of work necessary to achieve their goals, how to best manage/mitigate the risk associated with those goals, and to create and adhere to the practices and standards that result.

3.2 *Documentation*

In general, people don't like paperwork. However, paperwork can be useful if it is not overwhelming and it has a clear purpose. Using the templates will improve consistency in how and what we document and creates a way to compare avalanche center safety plans.

Requirements vs Recommendations: People tend to ignore recommendations. If certain measures will make the workplace safer, they must be required to be broadly adopted.

3.3 *Training*

Having adequately trained workers is fundamental. However, training requirements for avalanche specialists and volunteers varies dramatically between operations. Worker safety starts with hiring individuals with demonstrated mountain and avalanche experience. This is critically important, and provides a necessary platform for operations based training on all of the issues listed in Figure 1.

3.4 Personal Protective Equipment (PPE)

PPE is any equipment worn to minimize the impact of a known hazard. The goal is to never use PPE as a life saving measure. However, when other systems fail, it may be the only line of defense preventing a serious injury or fatality. Thus, employers – including the USFS – must provide adequate PPE to their employees.

Clothing, rescue gear, airbag packs, releasable bindings, and helmets are considered PPE. Currently, all US avalanche centers require workers to carry a transceiver, shovel and probe while working. Opinions and recommendations/requirements on other forms of PPE are highly variable, and are contradictory in some cases. For example, many centers that do not recommend/require certain PPE (helmets, airbags, releasable bindings) answered ‘yes’ when asked if these tools should be standard for avalanche specialists working in avalanche terrain.

3.5 Field Planning

Field planning improves worker safety. Structured field work planning takes just 5-10 minutes and provides a systematic method for assessing and mitigating the risk faced by workers in the field. The tool does not tell workers how and where to travel, but combines essential information, group dynamics, field work objectives, a summary of hazards, and peer-to-peer discussion. Eleven of 14 centers report that adding the daily field planning process is an important step towards improving their field safety.

3.6 Communications

Solid communication reduces field worker risk. Avalanche centers utilize radio, cellular, and satellite coverage based upon availability. Most avalanche centers work without two way communications in certain areas without radio or cellular coverage. New technologies such as ‘inReach’ allow two way communication in those areas, and should be seriously considered.

3.7 Check-in / Check-out

Knowing where workers are is fundamentally important. Although most avalanche centers have check-in / check-out procedures in place, the nature of the procedures is highly variable due to the range of resources and support available to each center. In 2014 the USFS issued new mandatory guidelines for checking in and out during field operations.

3.8 Working Alone

Working alone offers little margin for error. Though it is common for patrollers, guides, and forecasters to work alone, it is uncommon for these same individuals to work alone in hazardous conditions. During our survey, 11 of 14 Avalanche Centers allowed employees to work alone under certain conditions. The conditions under which working alone is acceptable and the procedures followed in these situations must be clearly explained within each avalanche center’s Operational Safety Plan. In time, this will (hopefully) allow our avalanche centers to reach a consensus about when working alone is acceptable.

4. CONCLUSION

We distributed the documents created during this project to USFS Avalanche Centers at the start of the 2013/2014 season. Interested parties should email strauman@fs.fed.us for current templates or example plans. To date:

- 10 of 14 centers have adopted the JHA template (with changes specific to each organization)
- 7 of 14 centers used the Operational Safety Plan Template to update or create plans
- 8 of 14 centers have adopted the field planning sheet as a daily procedure
- 3 of 14 centers plan to assess the templates and possibly implement changes this season

One of the most repeated questions during the project was: “As a group, are we as safe as we think we are?” The short answer is “Maybe!” Overall, US avalanche centers have a good safety record, and we want to continue that trend. Although we cannot definitively show that this project has increased the safety margin of our avalanche center workers, the project has provided a platform for critical thought, discussion, and documentation. Defining who we are, what we do, and how we do it, improves our safety culture and provides accountability for workers, managers, and the peer group at large. Furthermore, it provides a tool for assessing and comparing procedures used within the group.

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