

TIME TO CHANGE RESCUE ATTITUDES FOR A NEW GENERATION

Dale Atkins*
RECCO AB

ABSTRACT: Today's attitudes about organized avalanche rescue—too late and too slow—are based on circumstances more than 20 years old. This generational difference creates a serious problem because outdated attitudes guide and affect current avalanche rescue responses. The old attitudes offer no advantages to avalanche victims and rescuers, and in a few cases have likely harmed avalanche victims. Review of more than 40 years of US avalanche rescue records, historical and contemporary avalanche education materials, identifies four main conditions that have changed significantly and optimistically; however, attitudes toward organized rescue have become more pessimistic. A generation ago communication, travel, search technology, and emergency care were barriers to organized rescue and survival, but today these same conditions benefit greatly rescuers and victims. In parts of North America and Europe, the organized rescue response sometimes occurs simultaneously with companion rescue or even replaces companion rescue. The paper reviews the changes in the four main rescue conditions, quantifies changes (where possible), and challenges commonly held assumptions. Adopting new attitudes towards organized rescue that match the current circumstances of a new generation will better help rescuers and avalanche victims. .

KEYWORDS: avalanche rescue, attitudes, communication, travel, search technology, emergency care.

1. INTRODUCTION

On April 4, 2008, a remarkable situation transpired during an avalanche rescue in the Colorado mountains (USA). For the first known time, organized rescuers — after being notified of a backcountry (wilderness) accident — located, extricated, and transported an injured avalanche victim to a hospital before her companion could even access the avalanche debris.

This rescue response highlights the synergistic effect of technologies that until recently were viewed as barriers to organized rescue services to save lives.

No matter how remarkable this response, it is this author's opinion based on 30+ years of mountain rescue work that organized rescue services often hamper their own efforts by relying on outdated attitudes, knowledge, and technologies to tackle today's (and future) problems. This sentiment is not new. In 1970 — after seven years of effort — the International Foundation Vanni Eigenmann* wrote, "The Foundation could not depend upon obtaining

assistance from many of the alpine rescue organizations in the development of technical means, because they were far too bound by tradition and incapable of comprehending the unlimited imagination of modern technology."

Even today many rescue services remain slow to embrace new technologies and attitudes. This disinclination applies directly to organized avalanche rescue as avalanche rescue education, planning, and response are still guided by attitudes and experiences more than a generation old (20+ years). The prevailing attitude by many avalanche educators, rescuers, and recreationists is that organized rescue is too slow and too late to make a difference.

While the actions of avalanche victims have not really changed over the past several generations, the opportunities for rescuers to make a difference have changed dramatically, especially in recent years thanks to significant improvements in technologies. The problem for both the avalanche victim and the rescuer alike is that outdated attitudes about organized rescue guide and affect current avalanche rescue responses.

Over the last 10 years or so, the concepts of organized avalanche rescue have been taught less and less in avalanche courses. Nearly all educational focus has been on the importance of companion rescue at the expense of the

*Corresponding author address: Dale Atkins
RECCO AB; 952 Utica Circle, Boulder, CO
80304, USA; tel, 303-579-7292; e-mail:
dale.atkins@recco.com

* Established after the death of a wealthy Italian man the International Foundation Vanni Eigenmann was founded in 1963 to foster and fund the development of new avalanche rescue technologies. International in effort the foundation involved dedicated support by scientists and industrialist from Europe and North America, but for many years the support by the rescue community was lacking.

significance and benefits of organized rescue. This perspective — focusing on companion rescue while almost ignoring organized rescue — is outdated and worse, has harmed some avalanche victims. After such a claim, typically specific examples of known cases should be cited; however, doing so could be perceived as placing blame against specific rescue teams and leaders. Identification could open the door for legal actions which would distract the main intent of this review, which is to demonstrate the need for an new attitude towards organized rescue.

2. HISTORY

A review of English language avalanche rescue literature shows that the concept of companion rescue did not exist prior to the early to mid 1970s. The first English language avalanche text book *Forest Service Handbook on Snow Avalanches* (1952) states “If a human being is buried in an avalanche, prompt and organized rescue operations are the only hope of getting the victim out alive.” Though not explicitly stated, the implied meaning is clear: *organized rescue* means rescue teams. At that time successful avalanche rescues operations followed the concept of “immediate action” and “follow up” developed by WWI veteran Christian Jost who in 1927 founded the Parsennendienst, a Swiss ski patrol above Davos (Fraser, 1966).

For the next quarter of a century the advice did not change. In 1961 the second version of the *Forest Service Avalanche Handbook* restated the same message of the 1952 version.

Interestingly, a short but critical message from those first two versions was forgotten: “Due to special circumstances which prolong the life of the victim—he may be in an air pocket—rescue operations must not be abandoned for 24 hours at least (FS, 1952, 1961).

By the end of the 1960s the Forest Service recognized the increasing need for a new publication on avalanche rescue because of “new techniques, equipment, policies, and growth in the winter sports industry. (Perla, 1968). The result was the publication of Forest Service Snow Safety Guide No. 1, *Modern Avalanche Rescue* (Perla 1968). This outstanding treatment of avalanche

rescue soon became the basis of all organized avalanche rescue responses in North America. While this book was written in response to changes in situations, the attitude that organized rescue was only way to save a life remained firmly frozen in time. Mellor (1968) advised eyewitnesses to immediately send off one or two to seek help while a few stayed behind to conduct a hasty search. The best action a group could do was to immediately go for help.

Conventional wisdom up until the mid 1970s held the best way to save a life was with *organized rescue*. The concept of *companion rescue* did not really exist in English language texts until the invention of the avalanche rescue transceiver.[†]

Prior to the transceiver there was no tool that allowed a companion to search quickly and thoroughly avalanche debris. There was the avalanche cord developed in the early 1900s by a Bavarian mountaineer named Eugen Oertel (Fraser, 1966). While the idea that some of the cord would remain the snow surface was sound, it’s reliability remained unproven for nearly 70 years. Research in the early 1970s by the Swiss Federal Institute found the avalanche cord “not reliable” (Shield, 1975). In fact in testing and real-life deployments showed the cord was more often buried in the snow than visible on the surface. In the United States it took at least another 10 years for the recommendation of avalanche cords to disappear.

By the mid 1970s the realization of the transceiver’s potential to save lives resulted in a paradigm shift resulting in the development of *companion rescue*. First mentioned in the completely rewritten *Avalanche Handbook* (Perla and Martinelli, 1976, 1978), companion rescue—using transceivers—offered the first real opportunity for the victim’s friend to quickly find their buried friend and potentially save a life. Over the next three decades emphasis and attitudes toward *companion rescue* only strengthened because the reality was *organized rescue* was too slow and too late to save lives. However, the conditions that dictated this conclusion began to change significantly in the past decade.

Before continuing it is important to note that rescue responses require an accurate risk / benefit assessment.

[†] There were some who felt otherwise. Notably Swiss Dr. Rudolf Campell — a founding organizer and first president of the International Commission for Alpine Rescue was one of the earliest champions of *companion rescue* who urged skiers as early as the 1930s to rely on their companions, but even so, he still advised a survivor to seek help after 15 minutes or even 30 minutes (Campell, 1975).

3. METHODS

To examine how organized rescue has changed over the decades information on 375 US organized avalanche rescue responses collected by the Colorado Avalanche Information Center and the author from 1980 to 2008 were reviewed using both subjective and objective criteria.

Backcountry rescue operations in the contiguous United States[‡] were reviewed subjectively on seven categories:

- leadership
- personnel
- management scheme
- notification (communications)
- travel
- search technology
- emergency care

Considerable differences in some of the above categories became apparent when comparing accidents by decade, especially between the 1980s and the 2000s. The 1990s seemed to be a transition period showing traits of both decades.

Information about rescues was segregated into two periods—1980s and 2000s—and analyzed subjectively for changes in trends. Where possible the changes in trends were measured objectively.

Unfortunately, the information on rescue responses came from accident reports that generally contain little rescue data, so the objective study is based on relatively small sample sizes (table 3).

4. RESULTS

Subjective review of 375 organized rescue responses (1980s, N=66; 1990s, N=131, 2000s, N=178) showed considerable trend change in some conditions but not others (table 1). No obvious trend changes were spotted in the categories of leadership and personnel. In these matters rescue responses in the 1980s are similar to the 2000s. Generally, knowledgeable and trained leaders managed knowledgeable and trained rescuers. If anything, what has changed for some rescuers and organizations is their level of

experience. Rescue responses are more frequent today than a generation ago.

A slight change was detected in the management scheme of avalanche rescues, but a significant change is to be expected in the next few years. Since the end of the 1960s US rescue teams have utilized the 3-Stage Rescue plan. While this plan has been incorrectly interpreted[§] for nearly 40 years as a management plan it did help guide rescuers with common leadership roles, duties, and terminology. In the US a slight change is slowly occurring to avalanche rescue management because of Presidential Homeland Security Directive 5 that resulted in the creation of the National Incident Management System (NIMS) and required the use of the Incident Management System (ICS) for the management all domestic incidents managed by federal, state, local government sectors as well as by private and nongovernmental sectors (Bush 2003).

In the last few years rescue teams are finally starting adopt ICS as the management scheme to conduct avalanche rescue operations. The change to ICS should become stronger and occur faster as rescue teams and law enforcement realize that adoption of ICS is required for alignment to meet Federal law.

<i>categories</i>	<i>trend</i>
leadership	unchanged
personnel	unchanged
management scheme	slight
notification (communications)	changed
travel	changed
search technology	changed
emergency medical care	changed

Table 1. A subjective review of trend changes for 375 organized rescue responses.

Continued review of rescues revealed four main components of avalanche rescue that changed notably over the past generation.

[‡] Rescue operations in Alaska were not included because of extreme values caused by the remoteness of numerous accidents.

[§] The 3-Stage Rescue Plan is a strategic and functional plan that neatly divides avalanche rescue into three sequential and functional stages but does not address organizational management which includes *all* jobs and addresses the exchange and flow of information.

<i>rescue components</i>	<i>1980–89</i>	<i>2000–08</i>
notification (communications)	–	+
travel	–	+
search technology	–	+
emergency medical care	–	+

Table 2. A subjective rating of rescue components as to their advantage (+) or disadvantage (–).

The first three components presented in table 2 were further analyzed quantitatively to measure the changes (table 3).

A generation ago communication, travel, search technology, and emergency care were barriers to organized rescue and survival, but today these same conditions benefit greatly rescuers and victims (table 2).

	<i>1960–75 *</i>	<i>1980–89</i>	<i>2000–08</i>
<i>N</i>	65	26	38
notification	5.25	1.83	0.75
travel	4.75	2.77	1.88
search	28.00	6.89	5.42
total	38.00	11.49	8.05

Table 3. The mean times for key components of organized rescue responses for backcountry/wilderness avalanche accidents in the contiguous US (not including Alaska and Hawaii) * Statistics from 1960–75 (Williams, 1977).

4.1 *Notification (Communications)*

For decades the time to notify rescuers has always been a delay that rescue teams could do nothing about; however, this situation has changed dramatically in the last 10 years. Dramatically improved mobile (cell) telephone coverage and use means many emergency calls are made within minutes of an accident.

Table 1 shows that since the 1980s the average time to notify rescuers has dropped 59% ($P_{M-W} = 0.0001$). It is interesting to note that while the mean time to notification in the 2000s has dropped to 45 minutes, the median time dropped 78% from 90 minutes in the 1980s to 20 minutes in the 2000s. In the 1980s no calls for help were made with mobile phones, though 2 calls were made via two-way radio. In the last few years it appears that nearly three-quarters of calls come from mobile telephones.

While the mobile telephone has aided victims and rescuers alike, the coverage in the mountains is not always complete. In the past two years satellite phones have also been used to notify rescuers.

In the last year a new and very promising technology—SPOT—a satellite messaging system was used to notify rescuers within minutes of an accident in the Snowy Range of Wyoming. In 1985 an avalanche accident occurred nearby. Then the time to notification was 3.5 hours.

4.2 *Travel*

A generation ago (20 years) and earlier slow travel by rescuers both in accessing and evacuating were obvious barriers to saving lives. In the 1980s and earlier most victims of avalanches reached their ill-fated spot on foot, usually traveling by skis. Rescuers generally had to travel the same way to reach the accident site. Table 2 shows how the travel time has decreased over the decades. While the changes in time may seem dramatic the changes in time from the 1980s to the 2000s were not statistically significant (T -test $P_{M-W} = 0.242$).

While the time savings of nearly one hour was not statistically significant, the time savings is important to rescuers and victims. Snowmobiles and helicopters have cut the response time. In the 1980s only 2 of the 26 (8%) sampled rescues involved helicopters. In the 2000s the 21 of the 38 (55%) utilized helicopters. Today mechanized support from snowmobiles, snowcats, and helicopters benefits rescuers and victims.

Interestingly, when the average times for notification and travel are combined the difference between the 1980s (4.60 hours) and 2000s (2.63 hours) is significant ($P_{M-W} = 0.0076$).

4.3 *Search technology*

The very long search time encountered for the 1960–75 period in table 3 seems to be an anomaly. Search strategies and tactics changed very little from the 1960s through the 1980s, so there must be some other reason or reasons for the huge difference in search times. Most likely the anomaly was the result of record keeping methods. The search time seems to have involved a running clock from once rescuers arrived on site to when the victim was uncovered including the time searching and the time not searching, say between first and second, or third day operational periods. The average—28 hours—also may include several rescues where the operation was initially suspended for a day or two because of hazards and or weather. This use of running time rather than strictly search time likely explains the lengthy search time. The 1960–75 search time was disregarded for this study.

From the 1980s to the 2000s the search time decreased 21%. This decrease is not

statistically significant ($P_{M-W} = 0.395$), but to a rescuer or buried victim the nearly 1.5-hour decrease is considerable.

It is likely that avalanche rescue dogs and the occasional victim equipped with a transceiver have accounted for the time savings. (Nearly every year or two organized rescue teams find victims equipped with transceivers, usually because the companions did not carry transceivers.)

In conversations with rescuers around the world it seems that about one-half of victims buried and killed in avalanches were equipped with transceivers. This implies organized rescue teams are needed to respond to about one-half of avalanche burials.

Today many organized rescue teams benefit from *communication* and *travel* technologies, but when searching for buried victims they rely on technologies that are centuries old. Table 4 presents the search rates of the different technologies.

<i>technology/technique</i>	<i>search rate</i> m ² / hour	<i>hours for 1</i> <i>searcher to</i> <i>search 1</i> <i>hectare</i>
probe pole – fine, 20x30cm (1 pass)	25	400
probe pole – coarse, 70x75cm (3 pass)	28	360
probe pole – 3 hps, 50x50cm (2 pass)	87	115
dog – fine	5,000	2
dog – coarse	10,000	1
transceiver	60,000	0.17
recco*	60,000	0.17

Table 4. Search rates for various search technologies normalized to a probability of detection of 98%. All rates but Recco calculated from known rates. Recco rate is based on the opinion of experienced operators that Recco is as fast as a transceiver.

The first description of organized probe lines goes back to the Swiss Alps in 1742 (Fraser, 1978). It is likely that probe lines were used long before as the first mention of a probe pole goes back over 2000 years ago (Fraser, 1966, 1978). Probe lines are effective to find bodies, but are not efficient to save lives. In the US from 1997/98 to 2006/07 organized probe lines found only 1 of 46 buried victims alive (Atkins, 2007). In addition to the probe pole, avalanche rescue dogs are another “old” technology.

It is well known the first rescue dogs can be attributed to the St. Bernard Hospice in Switzerland, and Fraser (1966) defines the time to the “later half of the 17th century.” Dogs have been used in the US for more than 100 years. In 1899,

10 Italian miners were buried and killed in Colorado. Their friends and relatives used dogs to search, and the Italian embassy offered to bring additional rescue dogs from Italy (Silver Standard, 1899). The first formal avalanche rescue dog program was established by the Swiss in 1938 (Fraser, 1966, 1978).

Since 1950, in the US avalanche rescue dogs have saved only saved 6 lives. In the 10 years from 1997/98 to 2006/07, rescue dogs had only saved 1 life but found 30 dead bodies. The reason for this lack of success is because trained dogs are still few and far between.

The situation with Recco is similar to that of avalanche dogs; detectors are relatively few and far between. However, there is another component affecting Recco that ties directly to the need for rescuers to change attitudes.

Certainly more rescue teams should be equipped with Recco and more recreationists should be equipped with reflectors; however, rescuers—if concerned about making their job easier, faster, and safer—should encourage recreationists to utilize Recco reflectors. This attitude has not been accepted; however, it follows the same analogy as transceivers that rescuers promote universally.

To date Recco is the only readily available advanced rescue technology for organized rescue teams. Other technologies have been tried but have met only with limited success. Notably ground penetrating radar has shown to work in studies and in a few actual cases, but it's tremendous expense and (often) its size make it impractical for nearly all rescue teams.

No one rescue technology or device meets the complete needs of the rescuer and victim alike. The application of combined technologies—both old and new—best prepares teams to find buried victims in time. For rescue teams to become more effective the teams must embrace and promote most efficient technologies: transceivers, dogs, and Recco.

4.4 Emergency medical care

The quality of medical care both in the field and in the hospital has risen dramatically in the past generation. In the 1960s and 70s field treatment for an avalanche victim was limited to rudimentary first aid. Even in the hospital setting the knowledge of cold injuries and treatment of avalanche victims was relatively simple. It seems that avalanche victims who survived a burial would likely survive in the hospital, but not because of advanced medical care.

In the 1980s emergency medical care in the US started to provide more sophisticated field

care. Some rescuers became certified as Emergency Medical Technicians, and late in the 1980s the National Ski Patrol's Outdoor Emergency Care program started training numerous technicians at almost the EMT level. However, nearly all of these technicians were limited to basic life support care. Other than being able to offer a few more airway tools, they could still only offer a similar level of care as an experienced first aider. Paramedics and physicians working in the field were relatively rare.

By the 1990s wilderness emergency medicine was becoming a discipline rather than just an interest or hobby. The first Wilderness Congress was held in 1991 where North American health workers — volunteer and paid — mixed with professionals from Europe. Cooperative alliances were formed with international groups such as the International Commission for Alpine Rescue and the International Society of Mountain Medicine. By the late 1990s the Wilderness Medical Society's journal was accepted and indexed into major medical databases. The stage was finally set for advanced wilderness care to benefit the rescuer and victim.

In the 2000s the combination of credentialed wilderness-care instruction was available to the EMTs, paramedics, nurses, and physicians; and the growing numbers of paramedics and physicians interested in wilderness care finally converged with search and rescue. In recent years course work and fellowships (post doctoral certification) in wilderness medicine are now being offered by medical schools including Stanford, Utah, and Harvard (2008).

In the 2000s many rescue teams started to provide advanced life support, a service that most could not offer a decade before. Not only has the level of care increased in the field, the knowledge, skills, and techniques in the hospital setting are also much greater than a decade ago. While the type and quality of medical care has increased dramatically, the attitude to take advantage of the care lags behind.

In 1999 the Medical Commission of the International Commission for Alpine Rescue stated "An avalanche accident is a medical emergency" (Brugger and Durrer, 1999). This perspective and attitude is virtually nonexistent in the US. Sentiment stateside by avalanche professionals and educators is that an avalanche accident is only a medical emergency once the victim has been found and assessed. This delay in seeking advanced medical care has harmed some avalanche victims.

To treat an avalanche accident as a medical emergency means activating and

involving organized rescuers immediately upon a quick situation assessment. This is the same course of action expected with other medical emergencies, such as heart attacks and strokes where rescuers call for help straightaway after a quick assessment. Avalanche educators should alert the public to call immediately and not wait until after they have dug out their friend.

It is far better for the avalanche victim when a companion takes a minute and summons help. If advanced medical care is needed it will already be on the way. Worse is to wait until a friend is found and then decided he needs advanced care. Now the critically patient must wait for an additional period of time for the help to arrive. The experienced rescuer prefers to be called immediately and not needed, then to be called too late.

5. RECOMMENDATIONS

It is time—once again—to change attitudes and actions so that organized rescue can be utilized as a complement to companion rescue. This change can be achieved by encouraging people who work and play in avalanche terrain to:

- Carry mobile (or satellite) telephones.
- Carry personal satellite message messenger devices like SPOT.
- Call for help immediately when an accident occurs.
- Carry transceiver, probe, and shovel.
- Be equipped with RECCO reflectors.
- Get emergency medical care training.

6. CONCLUSIONS

In less than a decade events and actions that were once barriers to organized rescue teams have now become benefits; however, the attitudes and actions of organized rescue teams are still driven by events and actions that are 20–30 plus years old. This paper does not say or imply organized rescue is an alternative to companion rescue, but rather to show that organized rescue can *complement* companion rescue. The new and recent changes in actions for organized rescue signify it is time for today's avalanche professionals, educators, and rescuers adopt a new attitude that organized rescue can make a difference for avalanche victims.

7. REFERENCES

- Armstrong, B, Williams, K., and R. Armstrong. 1986, *The Avalanche Book*. Fulcrum. Golden, CO. 231 pp.

International Snow Science Workshop

- Armstrong, B, Williams, K., and R. Armstrong. 1992. *The Avalanche Book*, 2 ed. Fulcrum. Golden, CO. 240 pp.
- Atkins, D. 2007. 10 years of avalanche accidents in the US: 1997/98 to 2006/07. Preprints, *National Avalanche School*, Oct. 22–25, 2007.
- Bush, G. 2003. Homeland Security Presidential Directive/HSPD-5, *White House, Office of the Press Secretary*. Feb. 28, <<http://www.whitehouse.gov/news/releases/2003/02/20030228-9.html>>
- Brugger, H. and B. Durrer, 1999. On site treatment of avalanche victims. *Recommendation REC M 0013 of the Commission for Mountain Emergency Medicine of 1999*. <<http://www.ikar-cisa.org/eXtraEngine3/WebObjects/eXtraEngine3.woa/wa/menu?id=303&lang=en>>
- Campell, R. 1978. Correct behavior in case of avalanche accidents. *Proceedings of the International Foundation Vanni Eigenmann, Avalanches: Protection, Location, Rescue, 1975*. Sulden, IT. 1975. Foundation Internationale Vanni Eigenmann, Milano, IT. 37–40.
- Daffern, T. 1983. *Avalanche Safety for Skiers and Climbers*. Rocky Mountain Books, 192 pp.
- Daffern, T. 1992. *Avalanche Safety for Skiers and Climbers*, 2 ed., Cloud Cap, 192 pp.
- Fraser, C., 1966. *The Avalanche Enigma*. Rand McNally & Company. New York. 301 pp.
- Fraser, C., 1978. *Avalanches and Snow Safety*, John Murray Ltd., London, 269 pp.
- Forest Service, 1952. *Avalanche Handbook*. United States Forest Service. Department of Agriculture, Washington DC, 87–97.
- Forest Service, 1961. *Snow Avalanches: A handbook of forecasting and control measures*. Agriculture Handbook No. 194. Department of Agriculture, Washington DC, 74–79.
- Ireland, C. 2008. HMS offers wilderness fellowship. *Harvard University Gazette Online*. May 29. <<http://www.news.harvard.edu/gazette/2008/05.29/09-wilderness.html>>
- International Foundation Vanni Eigenmann, 1970. *Report of the activities, January 1963 – June 1970*. Trans. John Lawton. Milan, IT. 27 pp.
- Hotchkiss, W., Atkins, D., and Linda Ballard, 1996. *Avalanche Rescue Fundamentals*. National Ski Patrol System Inc., Lakewood CO, 51 pp.
- Kurzeder, T. and H. Feist. 2003. *Powderguide: Managing avalanche risk*. Trans. Stefan Österreicher. Mountain Sports Press, Boulder, CO. 192 pp.
- McClung, D. and P. Schaerer, 1993. *Avalanche Handbook*, 2 ed., The Mountaineers. Seattle, WA, 271 pp.
- McClung, D. and P. Schaerer, 2007. *Avalanche Handbook*, 3 ed., The Mountaineers. Seattle, WA, 342 pp.
- Mellor, M. 1968. *Avalanches. Cold Regions Science and Engineering, Part III: Engineering, Section A3: Snow Technology*. US Army Material Command, Cold Regions Research & Engineering Laboratory, Hanover, New Hampshire, 162 pp.
- Perla, R. and M. Martinelli, Jr., 1976. *Avalanche Handbook*. US Department of Agriculture, Forest Service, Agriculture Handbook 489, 254 pp.
- Perla, R. and M. Martinelli, Jr., 1978. *Avalanche Handbook (revised)*, US Department of Agriculture, Forest Service, Agriculture Handbook 489, 254 pp.
- Roch, A. 1978. Avalanche danger. *Proceedings of the International Foundation Vanni Eigenmann, Avalanches: Protection, Location, Rescue, 1975*. Sulden, IT. 1975. Foundation Internationale Vanni Eigenmann, Milano, IT. 9–17.
- Schild, M. 1978. Previous experience in the field of avalanche rescue practice. *Proceedings of the International Foundation Vanni Eigenmann, Avalanches: Protection, Location, Rescue, 1975*. Sulden, IT. 1975. 51–75.
- Silver Standard, 1899. *Avalanche—10 Italians*. February 18. 2-3
- Tremper, B. 2001. *Staying Alive in Avalanche Terrain*. The Mountaineers Books, Seattle, WA. 284 pp.
- Williams, K. 1977. Portrait of an avalanche victim. *Off Belay No 36*. Renton, Washington.

8. POTENTIAL CONFLICT OF INTEREST DISCLOSURE

I, Dale Atkins, provide services to and receive compensation from RECCO AB.