



AVALANCHE COMMISSION REPORT

International Commission for Alpine Rescue

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The 2019 ICAR Convention was held in Zakopane, Poland and hosted and organized by Tatrzańskie Ochotnicze Pogotowie Ratunkowe (TOPR) – the Tatra Mountain Rescue Service. TOPR was officially recognized as a mountain rescue service in 1909, one of the first in the world, and this year marked their 110th anniversary. The theme for this year’s convention was “Teamwork”, and TOPR was able to demonstrate how an organization of rescuers cooperating and working together can host a very worthwhile convention. TOPR was coming off their busiest rescue period ever in 110 years, requiring the cooperation of many rescue agencies as they had to deal with several mass casualty events. In one month, they responded to a lightning storm that injured 160 people with several fatalities, a cable car failure that trapped 400 tourists, and a month-long cave rescue operation (in addition to the 100+ “ordinary missions.”) The Convention was well attended with 460 rescuers from 34 countries. The avalanche commission had 50 registered delegates.

[TOPR promotion video](#) [TOPR website](#)

We have collected and summarized important avalanche related take aways and lessons learned from the presentations and our participation at ICAR in the following pages. Please contact either of us should you have any questions about any of the below or ICAR in general. We hope that some of the learning shared will result in greater efficacy, quality, and safety of mountain rescue in the United States and will help our overall mission of saving lives through rescue and mountain safety education. A tremendous thank you to the MRA, our members and donors for your continued support allowing our continued participation in ICAR and the worldwide rescue community.

Oyvind Henningsen, MRA – Everett Mountain Rescue
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FIELD DAY

During the field day we were divided into groups that rotated through many stations demonstrating gear and mountain rescue techniques. We are sharing the learnings from the stations mostly applicable to winter and avalanche rescue.

TOPR demonstrated steep angle lowering and raising of a litter with 2 attendants, 1 operator, 1 backup belayer, and 1 controller/safety. They utilized low weight, low stretch aramid ropes for their two tensioned system and Munter hitches for their descent control. Due to the heat build up in the hitches they use steel carabiners in this position (picture). System seemed efficient and light and operated well by a 3-person team on top and two attendants on the litter. Winter and avalanche rescue often see fewer responders to missions thus requiring small team tactics, including reducing amount of gear and increasing efficiency of operations through techniques utilized. Critically examining systems and their applicability in different situations and training for different scenarios often lead to the safest and most efficient operations.





Eddy Cartaya (top) and **Tom Wood** (bottom) provided an excellent demonstration of small team techniques and gear. Their demonstration was focused on what one rescuer can do by utilizing techniques mostly developed in the cave rescue world and by using multipurpose mechanical devices. The motto was to do a lot with a little.

They demonstrated how you can remove a lot of friction in the system by setting up the haul below the edge and by using the weight of the subject to help raise in a travelling haul system. They demonstrated the efficiencies of a diminishing loop and talked about how mechanical devices are more reliable and efficient which is particularly useful in crevasse, winter and avalanche rescue involving ropework when the rope is icy and wet. For more details please see Spaect and Cartaya's 2019 SPAR Expedition and Small Party Rescue Manual.

Deftools/Neosoft and Tatra Mountain Rescue demonstrated their Neosoft search tool which is a device that localizes cellular phones by establishing a cellular network with a portable device. The portable device can be carried like a backpack or mounted on a vehicle or a helicopter.

The system allows for locating GSM phones with a range of 400 meters in the mountains, 1km on flat ground, and 3km from a helicopter. They claim that the device can be used to find cell phones with a precision of .1m, even under 1.6m of snow. TOPR have been exploring it's use in avalanche rescue, but due to the operating frequency of cell phones there are problems penetrating the snow.



There are strict regulations in Poland for these types of devices and currently use of this device for SAR work is illegal. TOPR and other organizations are working to legalize the device. Delegates were able to practice with the portable device.

The use of cell phones in the mountains is very widespread and mountain rescuers throughout the world should support development of methods and technologies used to search for and locate cell phones.



MANUFACTURERS

Manufacturers represented included Salewa, twICEme Identification, Lifeseeker, Patagonia, PMI, Harken, Recco, Rocksnake, Collins Aerospace, Breeze-Eastern, CMC, Arc'Teryx, TAS, Leonardo, Airwork, Kohlbrat & Bunz, BCA, Petzl, Exposure Lights, North Wall, Marmut, Ortovox, Montura, Paga Solutions, Tyromont, Pieps.

Lifeseeker showed a new smaller sized model that is deployable by a drone and can locate cell phones in areas without network coverage. The price is about \$100,000.



RECCO is continuing its development of rescue reflectors and have released a line of reflectors that can be purchased separately, and girth hitched to backpacks, stuck onto helmets, etc. This is to support their RECCO helicopter operated device to allow rescuers in quickly searching large areas for reflectors in a variety of terrain. With the increased incorporation of reflectors by many equipment and clothing manufacturers and the increased RECCO SAR coverage, RECCO has promise for being an efficient search tool not only in avalanche situations anymore. Austria announced that they have 4 RECCO SAR detectors and are able to cover the whole country with this search tool.



COUNTRY REPORTS

Norway

Last season saw a marked increase in avalanche fatalities in Norway with 13 people killed. At the same time the total number of reported accidents dropped. Speculation was that the increase in fatalities was related to the increased number of days with persistent weak layer and wind drifted fresh snow as avalanche problems as compared to the previous season. The recommendation for these situations was to recommend to the public that they read the entire avalanche report, not only with a focus on the degree of danger, but also to factor in the type of avalanche problem forecasted. In the last few years there has been an increasing trend of tourists being killed by avalanches and the forecasting services are increasing their communication efforts to this user group by posting information at airports and on the internet. Three people died (in separate incidents) when cornices (picture) they were walking on collapsed and efforts are being intensified to communicate the danger of cornices. In one fatality the victim was carried by the avalanche onto the snow-covered ice of a lake. The body was located and dug out, but the recovery effort was unable to be completed the same day. When rescuers arrived the following morning to recover the body, water had almost engulfed and frozen around the victim which complicated the rescue.



Vegard Olsen and Dr. Julia Fielder presented on an avalanche accident in the Tamok Valley in Troms in Northern Norway. The accident happened at 1:50pm on January 2nd. Four ski tourers triggered the avalanche while ascending. The avalanche danger forecast was considerable, with persistent weak layers - a layer of buried surface hoar and depth hoar near ground. A friend of the party got worried later in the day and headed out to look for them. He found avalanche debris and called the emergency services; he did a hasty beacon search that was unsuccessful and was advised to leave the area. SAR was called out 16:45. The weather was poor and there were no signs of the skiers during a flyover. With the poor weather and high avalanche risk, it quickly became apparent that minimizing risk to rescuers was of the highest priority. No ground personnel were allowed to deploy. 2 days after the accident they performed a search with Recco and transceiver from the helicopter and were able to confirm that the party was caught by an avalanche and the

operation shifted from a rescue to a recovery mission. Due to poor weather, snowfall, and increasing avalanche risk no further ground recovery attempts were made as they accepted zero risk to rescuers. After a couple of weeks, the weather cleared enough to launch a helicopter with a Daisy Bell to perform 25 shots with no results (avalanche triggering) and the armed forces dropped 100 kg of explosives also without results. Waiting for conditions to improve and reducing hang-fire by explosive control are valid risk mitigation tools for rescuers.

Fourteen days after the accident it was decided that the area was safe enough to search from the ground. Digital models were also used in order to predict avalanche danger.

The first day of ground operations one subject was located by transceiver and recovered before the weather moved in. Two more subjects were located with transceivers and recovered the second day. On January 19th the operation concluded with the last subject still missing. The last subject located when melting out on June 10th. An observation was that RECCO searching was made difficult by high metal content in rock – rescuers reported making it almost impossible. Another rescuer experienced a “ghost” signal and to date they have been unable to identify the reason. The signal was not close to the actual burials and all known ghosts signal problem devices had been eliminated. Dogs, radar, probe lines were also utilized in the search efforts. GPS watches with heart rate monitors revealed that all 4 skiers were caught at the same time and travelled about 400m vertically at a speed of 20-25 m/s. All were totally buried and most likely died shortly after the accident. All had recommended equipment; beacon, shovel, probe. One with airbag, not deployed.

The rescue mission presented many difficulties to the rescuers, including difficult avalanche conditions with high hazard to rescuers. The county is the most avalanche accident prone in Norway. A predominantly maritime snow climate with many layers making danger difficult to assess for locals and an increasing number of ski tourists. The local police lead and coordinates all the resources for an avalanche rescue in Norway. Most rescues involve several different entities, and this rescue involved 14 different organizations. They learned:

- Teamwork comes with challenges that everyone needs to be aware of
- Resources should make pre-plans, develop methods and have a system of coordination
- Risk assessment should be systemized and standardized
- Everyone wants coordination, nobody wants to be a coordinator

Communicating with different parties including subject families, media, and the local community was also very important. A communication division was created that organized “press conferences” with panels of rescuers, police, doctors etc. to share information about the rescue and educate the media and the general population about the danger that the rescuers were facing.

A recommendation was made that mountain rescue units and individuals involved in mountain safety education (avalanche education) should educate backcountry travelers about the limitations of mountain rescue, that at times it might not be possible or too dangerous to attempt a rescue. Ski tourers should evaluate the probability of rescue for every ski tour and take this into consideration when making their trip plan.

Canada

Canada had an average year in terms of fatalities (snowmobiling 4, backcountry skiing 3, mountaineering 3, ice climbing 1, snowshoeing 1) in 9 separate events. There is a belief that since 2004 the trend is generally on the decrease. The Canadian presentation discussed a rescue where they located a subject that had been pushed into a lake by an avalanche. They utilized a technique of sitting in the door of a helicopter and searching with a handheld transceiver as they did not have immediate access to an external transceiver that is utilized by hanging having an antenna under a helicopter hanging from a line and a transceiver in the helicopter hooked into the communications system. They also had a very high-profile rescue involving 3 North Face athletes. Due to high danger and unable to control the site by using explosives they searched with a K9 and handler

attached to the longline of a helicopter. The K9 located a subject (without a transceiver) after 23 minutes of searching under the rotor wash. A remarkable technique that yielded very good search results.

USA

In the USA last season, we had about average precipitation in terms of SWE coupled with some extreme events. The Sierras had above normal snowfall, but 0 fatalities. The Rocky Mountains had above normal snowfall, with 22 fatalities. A total of 25 people died (backcountry touring 12, snowmobiling 8, residents 2, inbounds skiing 2, mechanized guiding 1). This is right at the 30-year average, below the 10-year average of 28, but above the 5-year average of 20. That decline comes as populations across the West are growing rapidly. So are the number of skiers, snowboarders, snowmobilers, and climbers venturing into the backcountry. Who knows the reasons, but with such small numbers any big or small year drastically influences numbers and averages.

19 of 25 fatalities involved a persistent weak layer (F, SH, DH). Having a high number of fatalities in years with a high occurrence of PWL is a continuing trend, why? Over the many years I have spent in the “avalanche industry” as a backcountry and mechanized ski guide, avalanche educator, and mountain rescuer it is becoming clearer and clearer to me that if we truly want to reduce avalanche fatalities we need to get a better handle on dealing with persistent weak layers. What can we point a finger at?



Why are Persistent Weak Layers deadly?

- Education
- Understanding
- Communication
- Human brain

- Avalanche education is not focusing on the difficulty of this problem?
- Backcountry users are over estimating their ability to manage this problem?
- Avalanche centers are not clearly communicating the dangers with this problem?
- Or is the reason the human brain? We are not good or not even capable of dealing with high degrees of uncertainty, a high quantity of variables and variations, a long time span of uncertainty – we forget about the buried weak layer, triggering potential, tracking layers over time and space, and we tend to either forget about it, think that it does not apply or will not happen to us, or ignore it on purpose?

Organized rescue took part in the search efforts of 12 of the 23 separate avalanche accidents with fatalities and in all the recoveries. SAR is extremely important in avalanche search, rescue, and recovery.

Examining the avalanche accidents last year a few take aways stand out for us as rescuers. These are lessons learned that we should incorporate in our training:

- Practice for multi-agency deployment – practice all your rescue and recovery techniques. Practice with all your equipment and make sure it is in a ready state.
- Use avalanche mitigation and control and delayed response as risk to rescuer mitigation tools.
- Involve your local avalanche center for assessment, investigation, and documentation.

A few takeaways for us as mountain safety and avalanche educators – keep this in your messages to your audience in your avalanche classes and outreach efforts:

- Avoid terrain with Persistent Weak Layers
- Don't go alone
- Use “safer” travel techniques – avoid terrain traps, travel one at a time, stop in safer areas, etc.
- Carry personal and team rescue gear. Carry communication tools. Practice with all the gear.

Slovakia

Slovakia had an above average snow year, lower number of total accidents, but slightly above average number of fatalities at 4 (snowboarder 1, ascending climber 1, tourists 2 – activity not known).



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They have built a prototype weather station that is being used for avalanche forecasting. Mountain rescuers and avalanche forecasters are part of the same group and work and train often and well together. One accident killed a very experienced snowboarder (picture), national team member and avalanche specialist. It was a huge loss to the local community. The accident happened near a ski resort that is open only 2 months each season that experienced above normal snowfalls after many years of low snow. It was speculated that the heuristic trap of familiarity played a role in the accident. Another accident claimed the lives of two tourists that were following a summer trail and had zero knowledge of the avalanche danger. A video was shown of a ski area triggered (explosives) avalanche that ran into the ski area with damaging effect on structures and vegetation. Digital models used prior to the control did not support such a large avalanche that was triggered, and this was quite the surprise to the ski area. Sometimes digital models are wrong was the takeaway.

Switzerland

Switzerland keeps very good records of avalanche activity. Last year there were 160 avalanches with material (picture) damage or search operations. There were 132 avalanches with 217 people caught which in about average. These avalanches resulted in 21 fatalities which is lower than the 20-year moving average of 23.



Poland

In Poland there were several avalanche accidents, but no fatalities. Most people caught in avalanches still do not carry avalanche rescue gear (beacon, shovel, probe). In [one accident](#) on Mt. Rysy, five people in a party of six climbers were caught and carried several hundred meters, sustaining severe head injuries and broken limbs. Two of the people in the party were elite climbers and among some climbers there is an opinion that basic rescue gear is optional. One person in the party wrote a big social media post about how they did not do anything wrong and there was a big Facebook debate and media got involved. What TOPR mountain rescue learned: the media doesn't know about avalanche safety and they need to provide more avalanche education to climbers. TOPR was also dispatched to an accident involving a French woman wearing a transceiver. This was the first time an avalanche mission involved a victim actually wearing a transceiver!

Italy

The season started early in Italy, at the end of October and there were big snowfalls in February and April. Snow cover below 2000m was poor, with a big difference of coverage between north and south aspects. There were many strong wind events and unexpected spring like wet avalanche cycles in the middle of winter. In the NE of Italy, they had a storm on the 27 to 29th of October that dropped record levels of SWE of 800mm in 72 hours with wind gusts of up to 200 km/h. The storm destroyed acres of protective forests and created new possible avalanche paths exposing villages and roads (picture)



The season was relatively stable with short lived moments of higher danger. Almost half the time the danger level was moderate with long periods of low danger in the middle of winter. There were forty-two avalanche accidents reported, with a total of 73 people caught. Twelve fatal accidents resulted in 15 fatalities, 6 of the victims were tourists. An average avalanche year in Italy brings 20 fatalities. Most of the accidents occurred during considerable (20/42) and moderate (11/42) danger level ratings.



52% skitouring (55% uphill, 45% downhill)



24% off piste



24% alpinism

Many of the accidents involved wind slabs. On average backcountry skiers were well equipped and there was good companion rescue, but many of the victims caught were killed by trauma. In one accident a ski tourer deployed his airbag, but was completely buried under 1 m of snow. He was located after 15 minutes by spot brobing by

his companions. He did not have a transceiver. Several accidents showed how off-piste skiers are unaware of the dangers they are facing when skiing in uncontrolled areas just a short distance from the ski slope.

There was also an accident that claimed the life of a SAR member in Italy. The victim was ski touring alone and most likely booting up when he was caught. He was located the following day by a K9.

On April 21st a person hiking a steep S facing couloir was caught and killed in a wet avalanche. His wife had called the emergency number and reported her husband overdue. Local firefighters responded to the site and were caught by a second avalanche before mountain rescuers were deployed. This created a bit of controversy between firefighters and mountain rescuers with the latter claiming the former were ignorant of the conditions and not prepared to respond to such missions.

France

In France they had one of the least dramatic years since 1971. Ninety-two people were caught, 13 fatalities (average of 30) in 12 accidents. The victims were 7 off piste skiers, 5 ski tourers, and one ski patroller.

Explanations for the few accidents were suggested as few periods of unstable conditions, few weak layers in the snowpack, and poor weather



conditions during weekends and many holidays. There were no big accidents with multiple fatalities and there were no fatalities during the summer (alpinism). There has been an increasing effort to communicate the importance of skiing one by one and spreading out which might have contributed to the reduction in multiple fatality accidents. The number of buried ski tourers wearing transceivers have slowly increased over time and the last 5-year period (2013-2018) 85.3% were found to be wearing transceivers. This is an indication that the continued educational efforts highlighting the importance of wearing transceivers is working.

On December 26, 2018 a 10-year-old child was found alive by K9 after he was buried for 1 hour after being caught in a large avalanche (picture)

while skiing off piste. He had an air pocket and sustained no injuries. Additionally, two French ski patrollers were killed by trauma from explosives while they were performing avalanche control at the Morillon Ski Resort.

Greece

Greece? Snow? You bet. Please see picture of mountains in Greece in their winter glory. Some challenges they are currently facing in the avalanche world in Greece

- No standard training program for mountain rescuers
- Staff with insufficient knowledge and experience
- Very untrained recreationists – taking high risks
- Public services not on standby and not trained for avalanche response
- No formal avalanche bulletin / avalanche forecast



Greece has been developing their avalanche training program in close cooperation with ANENA of France. They are working on a 4-factor avalanche danger system which they claim is simple but communicates danger well. They are looking for training and cooperating with other mountain rescue units. If there are any MRA units interested in this type of cooperating, please let us know. They are currently building a more formal system for mountain rescue training.

The Avalanche Commission

The Avalanche commission is in a rebuilding phase and working groups were created to establish priorities, directions, and long and short-term goals. Working groups were formed to focus on four specific topics:

- Avalanche Commission Recommendations and Goals
- Prevention: Strategies, Statistics and Trends
- Industry Partnerships and Collaboration
- Research, Design and Science

A new collaboration platform will be introduced to help delegates collaborate on projects during the year. Stephanie Thomas from Teton County SAR was appointed vice president of the avalanche commission. A new president of the commission will be elected next year. One theme that came up multiple times was how can we better focus on sharing experiences and lessons learned from rescues in other countries?

Beyond partner rescue – better planning for organized response - Michael Finger

There is plenty of information on avalanche rescue skills publicly available: transceiver techniques, strategic shoveling, using a RECCO, slalom probing, etc. But as mountain rescuers working in a team, we face different types of challenges: how do you fit it all together to come up with a comprehensive rescue plan? What do you do after the hasty search? How do you plan for the next operational period? Michael talked about how you can come up with a backcountry avalanche incident plan for your rescue organization and all the different things you need to consider making up its different components.

Michael asked the pertinent question ‘How do we get better at avalanche rescue?’ He inquired from the delegates what data different countries were collecting regarding professional avalanche rescue. How many people were involved, what search techniques were used? What technique was used to find the victim?

Teamwork in the Tetons – Cody Lockhart

Cody described the response to an avalanche accident in the sickle couloir on Mt Moran in Grand Teton National Park. A party of 4 backcountry ski mountaineers were caught by a small crown avalanche as they were ascending. They were knocked off their feet and dragged over cliff bands. A 911 call was placed at 0933 on May 17 and it was reported there was one fatality, one critically injured patient, a patient with a leg injury, and one uninjured. Challenges to the response were described as:

- Complex rescue with multiple victims
- Remote location
- Poor weather
- Familiarity of victims to rescuers

The mission was completed successfully largely due to the unified interagency response by Jenny Lake Rangers and Teton County Search and Rescue. Together they have built a strong integrated group of resources. The accident, mission, and subsequent reflection lead to the start of the [backcountryzero](#) vision and community initiative to reduce fatalities in the Tetons. Avalanches are destructive to communities and this had an impact not only on the families where 5 children lost their fathers and 2 wives lost their husbands, but on the larger close-knit community of Jackson Hole.

The accident also led to the creation of the Teton Interagency Peer Support group which provides mental health support to first responders from peers. The accident left many of the responders with mental health

challenges. The teams realized that there was something missing in their training and their support system as they were not spending a lot of time on the mental part of health. Now they have a psychological program that provides support and proactive outreach to make sure that everyone on the team is mentally healthy.

The Canadian delegate commented that in Canada they have a robust program of psychological support, and now they are working on preventative measures and training to build mental health resiliency among the responders. They have a monthly training – with a resiliency tip/focus of the month.



Drones

There has been an increasing use of drones for avalanche control and forecasting purposes throughout the world. It was suggested that drones could be utilized to assess danger to rescue teams, as avalanche “lookouts”, or to mitigate danger to teams by explosive control of slopes. Drones are currently experimented with to deliver AED’s in several cities and could be used similarly in avalanche accidents for delivering ventilation equipment, first aid and rewarming gear, etc. Dr. Will Smith from Teton SAR commented that they are currently working on this in the Tetons. It is not a question of if, but of when regarding the use of drones in many fields of mountain rescue.

Lego used for tabletop avalanche rescue exercises - TOPR

TOPR demonstrated how they teach avalanche rescue by running tabletop exercises using Legos. Scenarios have been developed that rescuers act out in different roles and settings. Rescue response plans are developed as a result of running through these exercises. The Lego demonstration was exciting and created enthused involvement.



Forging a better chain of survival in avalanche terrain - Heiko Stopsack

Following an avalanche accident, it is important to render appropriate first aid as quickly as possible to a subject. Stopsack asked what can we do to improve the survival chances for the people we rescue? Is the recreational user fully prepared for responding to the accidents that can happen in avalanche terrain? Can we forge a stronger link in the avalanche chain of survival? We have provided gear, we have taught travel and companion rescue skills, so what is next? He thinks we are missing an opportunity to teach good quality CPR to companion rescuers. He suggests that maybe we should treat avalanche rescue like an urban cardiac arrest

event? He recommends that we incorporate high quality CPR into avalanche rescue courses because it might make a difference and provide a higher survival rate for avalanche subjects. The medical commission was happy with the suggestion, and strongly support following this recommendation. Most avalanche victims die from asphyxia, so being able to clear an airway and perform high quality CPR is very important.

Should Airbags be Mandatory Avalanche Safety Equipment - Christopher Van Tilburg

Dr. Van Tilburg presented on avalanche airbag history and the current ICAR recommendation on airbags: “The efficiency of the transceiver in combination with probe and shovel, and of airbag systems has been proven”. Other organizations such as the Wilderness Medical Society have endorsed airbag use in their guidelines: “Travelers entering avalanche terrain should consider using an avalanche airbag.” Dr. Van Tilburg presented that a study by Haegeli, et al showed that airbags worked in reducing morbidity and mortality by about 11%.

Dr. Van Tilburg stated that there are still questions and research to be done regarding airbags such as:

- which inflation method is best?
- what is the optimum size of the airbag?
- does the shape of the balloon prevent trauma?
- does the balloon create an air pocket or protect the airway for asphyxia prevention once buried?
- should an industry standard for canisters be developed?
- Should airbags be used with air diverters?

He outlined several barriers for universal use of airbags:

- Size and weight
- Cost
- Training burden
- Possible exclusion of coverage if mandatory recommendation not followed
- Lack of authority recommendation

He ended his presentation asking the audience if ICAR has a duty to make a stronger position on airbag use as an organization? The question enlisted quite a few comments from the audience both in support and against.

Media

Topograph Media, Rick and Matt Lorenz did a fantastic job documenting the Congress – their videos from all the ICAR Congress’ can be located here - <https://vimeo.com/topographmedia>

Next year

The ICAR Congress will be held October 13-18, 2020 in Thessaloniki, Greece. Mountain rescue in Greece is cared for by the Hellenic Rescue Team established in 1994. They are an all-volunteer organization with 31 branches and 3000 volunteers. They cover 6000 islands of which 277 are inhabited. They have 300 mountains higher than 2000m and 80% of the mainland is above 500m. They have very diverse mountains including ski areas and one of the largest (bolted) climbing areas in the world (Leonidio). Next year’s theme is risk assessment in mountain rescue. Your MRA avalanche delegates are looking forward to making a presentation in the avalanche commission on this topic.