

POLAR CIRCUS AVALANCHE RESPONSE, FEBRUARY 5-11, 2015

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ABSTRACT: On the evening of February 5, 2015, two Canadian Military Search and Rescue Technicians (SAR Tech) on an official training exercise were descending after an ascent of Polar Circus, a 700m water ice climb located in Banff National Park in the Canadian Rockies. In deteriorating weather, one member of the team was swept away by an avalanche, un-roped, above an ice feature known as "The Pencil". His partner was left to descend alone and initiate a search. The climbers were not carrying avalanche safety equipment and the partner could not find any surface clues on his descent. Six days later, his body was recovered by Parks Canada SAR staff.

This paper will focus on how searchers conducted their risk assessments, an analysis of the exposure time to rescuers, and will advocate to encourage climbers to wear avalanche safety gear.

KEYWORDS: avalanche, mitigation, risk, exposure

1.0 Introduction

Polar Circus is a popular waterfall ice climb in the Canadian Rockies. It climbs at a moderate grade and sees almost daily ascents during the winter. Many consider it an "alpine climb" since it traverses large alpine slopes and is subject to hazards both on the climb as well as from overhead. The two SAR Tech's involved were climbing the route as part of a winter training exercise, and had been climbing in the area for numerous days leading up to this event.

1.1 Timeline

Feb. 5: A size 2 avalanche occurred midway up Polar Circus in the evening, sweeping one climber away. The climber was at an elevation of 2000m when the incident occurred. It had been snowing all day and the climbers were eager to descend quickly. They were un-roped on an exposed traverse, leading to the next rappel anchor above the hanging ice feature called The Pencil. The victim went around the corner, ahead of his partner and wasn't seen again. It is unknown if the avalanche was triggered naturally and hit the climber from above, or was triggered by the climber. The slide was un-witnessed by his partner, who searched for two hours but could not find any sign, and was worried about additional avalanches since it was snowing heavily, and

dark. Visitor Safety Specialists (VSS) in Banff were notified by phone at 23:30.

Feb. 6: An initial helicopter recce that morning by (VSS) from Banff could not locate any surface clues and the avalanche victim was deemed to be deceased. Stormy conditions prevented further search efforts. Rescue teams and an Incident Command Structure were formed. SAR Tech resources were put on standby to help if necessary.

Feb. 7 and 8: Helicopter avalanche control was conducted on and above the climb to size 3.

Feb. 9 and 10: Strike teams (groups of searchers) were inserted by helicopter long line into designated search segments on the climb.

Feb. 11: The body was recovered after a faint Recco signal was found 200m below the accident site, in a flat portion in between two ice pitches. The signal was found to be a reflection off of the circuitry in a Mammut headlamp. He was buried 2.8m down, with the initial burial being 1.2 m and a subsequent burial from avalanche control of an additional 1.6m.

1.2 Avalanche terrain

Polar Circus rises above the valley floor from 1550m to 2300m (Fig. 1). There is significant avalanche terrain on the climb itself that is capable of producing size 2.5-3 avalanches. Above the climb is an additional 800m of large alpine avalanche terrain from 2300m – 3100m capable of creating multiple size 3 avalanches and a climax

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avalanche to size 4. The likely burial sites of the victim were midway up the climb in technical terrain.

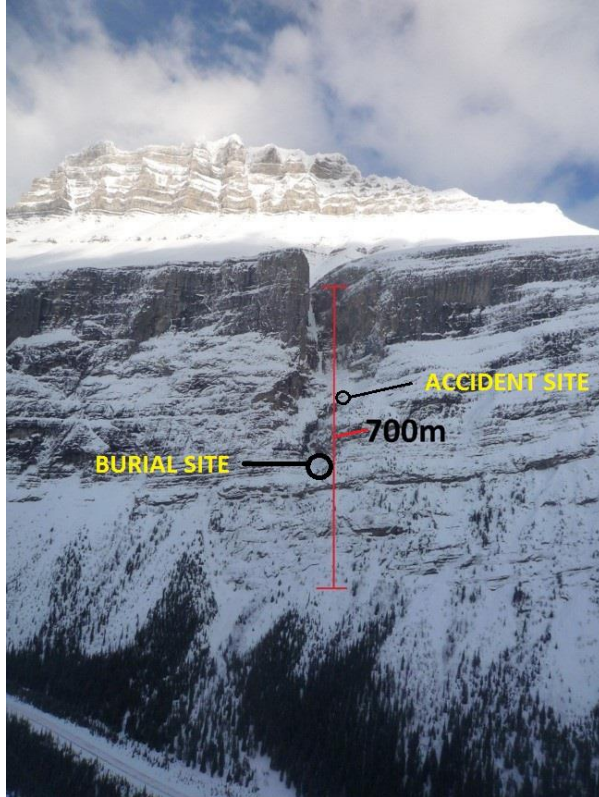


Fig.1: Overview of Polar Circus with key locations.

1.3 Avalanche danger

This incident coincided with a major storm that dropped over 1meter of snow during the period (Fig. 2) with a subsequent rise in the avalanche danger from LOW to HIGH. The primary weak layer in the snowpack was a persistent basal layer of depth hoar formed in the early winter.

2.0 Risk Assessment

On Feb 7, Jasper VSS conducted helicopter avalanche control on the many avalanche paths (Including Polar Circus) that affect the Icefields Parkway, a major road between Lake Louise and Jasper, Alberta. They produced avalanches to size 3 on Polar Circus, which hit the possible burial sites numerous times.

Risk assessments were required before any searchers accessed the site. An “Incident Action

Plan” (IAP) was also created, which is a document describing certain aspects of that risk assessment, the previous day’s work, the current objectives, and other logistical details.

The steps for the initial risk assessment were as follows:

Step 1: On site hazards were identified:

- Avalanches (including cornices and solar input)
- Rockfall
- Tripping/falling
- Searchers and search dogs in steep terrain
- Falling overhead ice daggers
- Difficult egress
- Additional weather inputs
- Helicopter operations

Step 2: Determine the acceptable thresholds based upon those hazards in order to access the site:

- LOW avalanche hazard at all elevations.
 - Unlikely natural and human triggered avalanches to 0.5 on the climb, and to size 1.5 above the climb (would not reach over the top).
- Stable weather pattern with no significant snow input to maintain the avalanche hazard rating and reduce risk from other hazards such as rockfall.
- Access the site only when the snow surface was frozen, likely in the AM. The climb is affected by solar radiation as it faces S/SW.
- Egress options in place in case of emergencies.

Step 3: Analyze current conditions: (Fig.2)

- 100cm of new snow by the end of Feb. 7.
- Warming temperatures (close to or above freezing).
- Increased winds distributing new snow.
- Public avalanche danger rating at HIGH through that period.

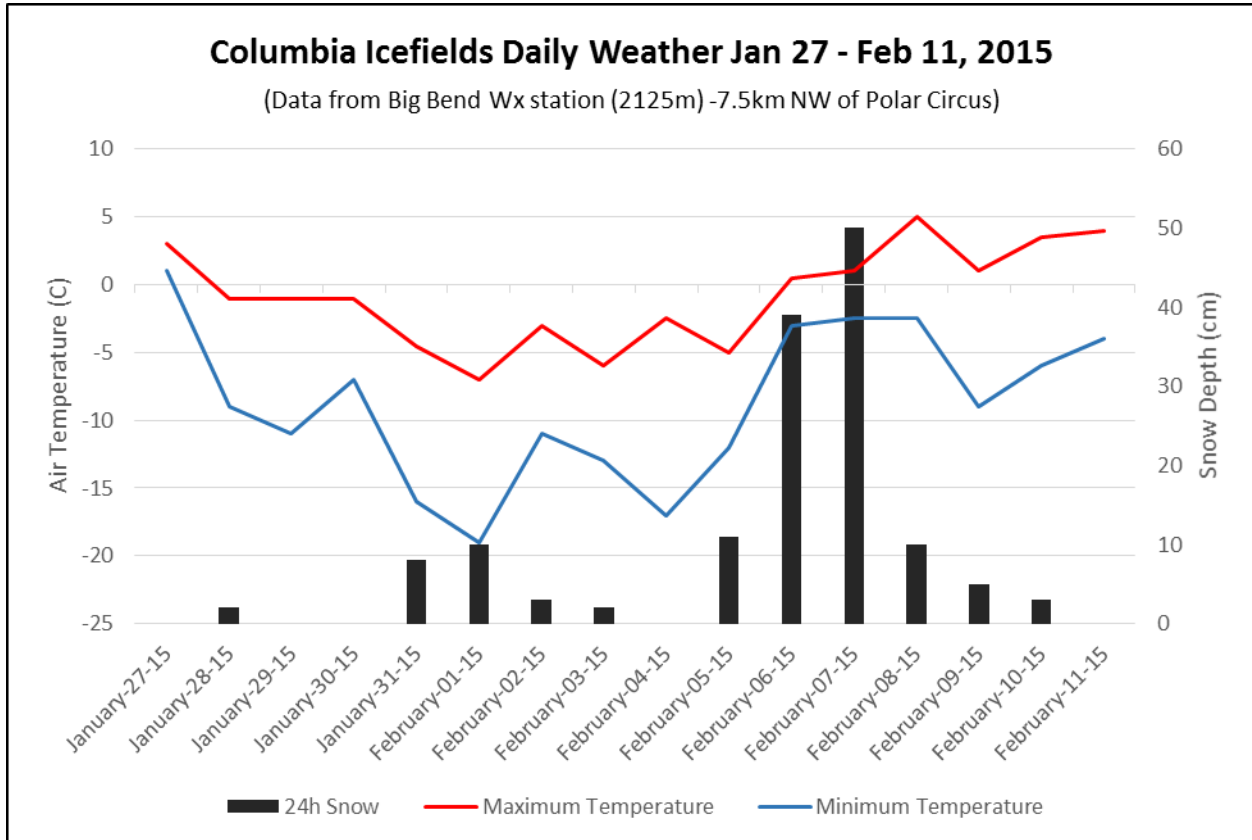


Fig. 2: Snow depth and temperature chart for the period. Note that the accident occurred on the evening of Feb. 5.

- Basal weak layer of depth hoar on slopes that had not previously slid.

Based on the results of the three steps listed above, extensive helicopter avalanche control was conducted on Feb 8. In total (Feb. 7 and 8), 43 charges were dropped. Only one explosive did not trigger an avalanche and the accident site was buried 14 times by avalanches sized 2-3.

Step 4: Once these acceptable thresholds were attained, only then were strike teams inserted into search segments by heli slinging on Feb 9. (Fig. 3)

Step 5: Safety measures were then implemented to maintain our acceptable thresholds:

- Ground egress
 - Check descent anchors, put in bolts as needed, descent gear carried by every strike team.
- Air Egress
 - Helicopter on site during entire operation for rapid egress.

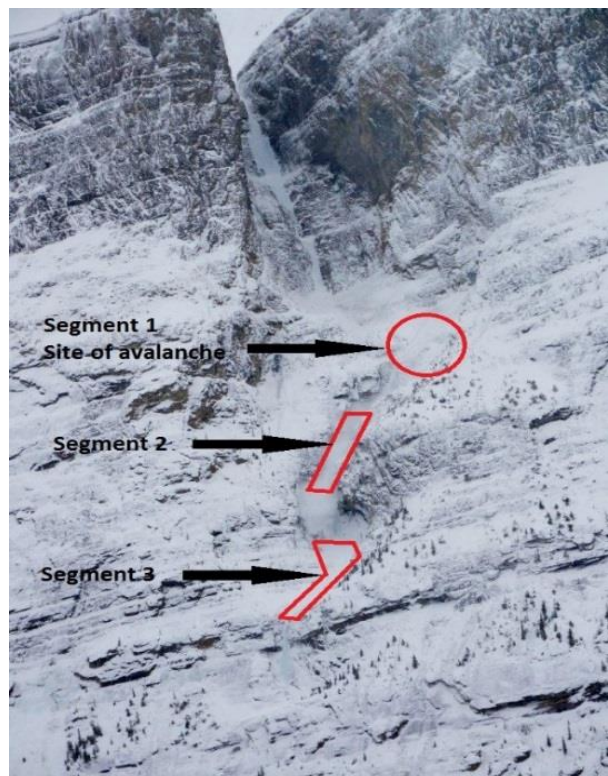


Fig. 3: Overview of primary search segments on Polar Circus.

- Strike teams
 - Minimum of two searchers per team, fully equipped for self-rescue.
- Operations Chief
 - Maintain communications and regular check-ins with strike teams via radio.
 - Monitor weather at road level or in helicopter .
 - Keep contact with our Banff Dispatch center and update the Incident Commander in the Banff office.
 - Act as backup if there was an incident on site.

3.0 Analysis

Informal risk assessments by VSS are conducted for every rescue operation. These are typically verbalized by the team before an operation, with changes as the situation unfolds. Most rescue responses in the Mountain National Parks have a short timeline (1-3 hours) where a small team of VSS and a helicopter responds. It is infrequent to have responses last multiple days.

This response was notable. Our group felt we needed to document a formal risk assessment due to the length of the response, hazardous

3.1 Exposure time

Table 1 breaks down the person hours for rescuers on Polar Circus in three different scenarios. It is important to note that two of these scenarios are hypothetical, but are realistic based on previous rescue events and the conditions encountered on this incident.

Scenario 1 (hypothetical): If the group had avalanche gear and the deceased had been dug up by the partner and left in place, the total operational exposure time could have been minimal. Assuming the victim was on the surface when rescuers arrived, one rescuer could have heli slung onto the site and simply attached the victims harness to the line and flown away. This would have only required a pilot and one rescuer, but would only be possible if avalanche mitigation was not deemed necessary for that amount of exposure time.

Scenario 2 (hypothetical): If the victim had avalanche gear but was not self-rescued by the partner, their beacon would be located from the helicopter, avalanche mitigation would have taken place, and a team of diggers would be inserted via helicopter to remove the victim. This would have likely required two rescuers and one pilot for

	<i>1) Group with avalanche gear /self-rescue by partner (hypothetical)</i>	<i>2) Group with avalanche gear /no self-rescue (hypothetical)</i>	<i>3) No avalanche gear (actual event)</i>
Avalanche Control	0	6	6
Searching/digging	0	8	71.5
Total person hours	0.2	14	77.5

Tbl. 1: Breakdown of person hours in three scenarios.

environment and number of staff involved. The only other time we would document a formal risk assessment would be for larger searches spanning multiple days, but these are often in non-technical or less complex terrain.

Another operational difference is that on many past avalanche incidents the residual hazard was no longer present as the slopes had previously slid, or the terrain was simple enough that residual hazard could be eliminated by means of explosives. On Polar Circus we were all aware that it was not feasible to eliminate all the different hazards listed in the risk assessment.

avalanche mitigation, and four shovelers to retrieve the victim.

Scenario 3 (Actual event): 15 search and rescue staff were used over the six day recovery effort. This included rescue pilots from Alpine Helicopters conducting Class D (longline) and explosive work, two dog handlers, VSS from Banff and Jasper National Parks, as well as Kananaskis Public Safety Specialists (Fig. 5). Many more staff were used in the Incident Command System at the rescue base for tasks such as logistics and media, but were not associated with on-site rescue work.



Fig. 5: Searchers from different agencies at burial site on Polar Circus, Feb. 11.

When comparing the rescuer exposure at the rescue site for the three scenarios, we find that the actual exposure time was 5.5 to 387.5 times that of a scenario where victim was wearing an avalanche beacon.

3.3 Avalanche Safety Gear for Climbers

The above comparison highlights two points not typically considered by climbing parties who do not carry avalanche safety gear.

The first is the increased exposure to rescuers if required to assist on an incident. This point is difficult to portray to recreational climbing parties since it is a low-likelihood and rather ominous concept, but should certainly be the de facto standard for professionals.

The second point is how the climbing world has been slow to embrace avalanche safety gear for self-rescue even in a professional capacity. There has been progress by professional guiding associations and rescue agencies both in training guides and workers on how to make decisions around avalanche safety gear, and providing decision-making tools for recreationalists. However, this cultural shift is still in its infancy, and there is messaging to both the public and professionals which will take time to change.

Avalanche safety gear for climbers isn't the cultural norm, and there exists a lack of product development and marketing around this subject by backcountry gear manufacturers.

4.0 Conclusion

This incident occurred in a dynamic environment requiring the utmost attention to maintaining rescuer safety. By choosing to conduct a formal risk assessment and distribute an IAP, rescue crews had parameters to guide decision making in the field, and to inform the many searchers, management and assisting agencies of efforts being made. It is our intention that this case study can provide some ideas for structuring a risk assessment when dealing with complex rescue problems.

Since this incident involved professionals training at work, it has sparked discussion and helped solidify both SAR Tech and Parks Canada guidelines in the use of avalanche safety gear while climbing in avalanche terrain. This is not only important for self-rescue purposes, but also to reduce the risk to those rescuers who respond if an unfortunate accident occurs. It is our intention this case study will help shift the culture around climbers and avalanche safety gear, and to challenge the climbing manufacturing industry to help with this change.