HELI-SKI GUIDE TRACKING FOR INSTITUTIONAL MEMORY AND AUDITING

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ABSTRACT: Heli-skiing is a growing industry in many parts of the world, with new operations starting in Canada, Alaska, Greenland, Iceland and elsewhere in recent years. With a growing industry and the use of new, or more demanding terrain, high consequence decision making in avalanche terrain is ever present. Heli-ski operations provide a unique setting in which to examine the decision making of terrain usage of highly experienced professionals as they balance terrain, changing hazard ratings, group expertise and, a variety of other factors. Furthermore, fatalities in recent years in the heli-ski industry means that there is a strong desire to better understand, and quantify practices in this industry, both for institutional memory purposes as well as for internal and external auditing.

Our work presents a method to achieve both improved tracking of, and documentation for operational institutional memory, and the generation of terrain based metrics for internal and external auditing. We present example results to highlight the various ways in which our metrics can be used and interpreted. We also highlight the need for careful interpretation of any derived values from terrain use, as there are multiple factors that can influence these final metrics. We propose that real-time tracking and reporting of terrain based metrics, if used appropriately, could be a useful methodology if operationalized in real-time for operational self-checking, transfer of institutional knowledge, and external auditing.

KEYWORDS: Heli-skiing, GPS tracking, Decision making, Avalanche terrain, Management

1. INTRODUCTION & BACKGROUND

Heli-skiing has been an increasingly popular activity since its inception in the 1960s with operators now established in most alpine countries around the world (Wanrooy and Anthony, 2006). Heli-skiing is a well-established industry, with British Columbia, Canada having an estimated 90% of the global market share. In Canada the industry accounts for approximately 100,000 skier days with gross revenues exceeding $100 million annually (HeliCat Canada, 2015). Outside of British Columbia, Alaska in the USA now has the highest concentration of heli-ski companies. The industry continues to grow and has seen an increase in the number of providers, with many newer operations starting around the world, including more new operations in Alaska, the Arctic (e.g. Greenland), Central Asia, and the Himalaya.

The focus of this paper is to explain a method that we have developed for operational tracking and auditing of terrain preferences by heli-ski guides (Hendrikx et al., 2016). In this paper our focus will be on how our methods could be employed more widely, and the benefits of detailed tracking and terrain use analysis can bring to an operation.

2. METHODS

During the spring of 2015 three different Heli-Ski companies collected data for our project. These were Majestic Heli-Ski, SEABA-Heli and BlackOps Valdez Heli-Ski. At each operation we had one or more guides that were actively engaged with the research project.

As part of their routine heli-ski operations their days terrain use was recorded using a handheld GPS (Garmin Etrex 20). The GPS was simply turned on, and placed in the top pocket of the lead guides pack at the start of each day, and then turned off at the end each day. A simple daily tracklog was recorded for each day and stored on the GPS. The GPS was configured to record the position at the “Most Often” setting, providing the highest spatial resolution tracklog possible with the given device (approx. 3m point distances while skiing).
In addition to the GPS data collected for each day, the following associated information was also documented:

- Date
- Staging Areas (if multi areas are uses)
- Guide name
- Lead Guide (yes / no)
- Avalanche Hazard
- Avalanche Problem
- Number of days skiing with current group
- Level of ability of group
- Purposed / desire to ski given area
- Have you skied this area before (this season)
- Have you skied this area under these conditions
- Are you clients demanding particular terrain, and did this meet their demands?
- How many weather days in the last 7?
- Will other operators use this area if you don’t?
- Have other operations already used similar terrain?

Similar to the approach taken by Hendrikx and Johnson (2014) and Hendrikx et al., (2016), each track was brought into a Geographic Information System (GIS) and overlaid on a Digital Elevation Model (DEM) and key terrain metrics were extracted. Care was taken to extract just the terrain used while skiing – and not any of the helicopter flight track. The methodology is described in more detail in Hendrikx et al., (2016). These terrain data were then linked to the responses to the questions listed above. An example of a typical data sheet is shown in Figure 1.

Analysis of the resulting terrain metrics within GIS allowed us to review key aspects of the guide’s decisions with regards to terrain use, and compare these to the response to the daily questions.

As at the end of Spring 2016, this analysis step was being undertaken several weeks / months later as a result of the data volume, and workflow. However, an automation routine is being developed to allow for real-time terrain metric feedback to individual guides and their organizations.

3. RESULTS AND DISCUSSION

No new terrain analysis is presented here. Rather, we focus on the implementation of the method with the three different operations.

Hendrikx et al., (2016) showed that GPS analysis could show statistically significant differences in terrain choices by lead guides. Specifically, this work showed that this was only possible when similar terrain was compared – i.e. One drainage skied under different conditions (Figure 2).

The system however did not work when all tracks were analyzed without consideration to regional variability of the instability. In summary, Hendrikx et al., (2016) urged caution with “blind” interpretation of the terrain metrics from this approach, without fully understanding the context of the decision making framework.

Having now collected data from three different organizations, with different daily operational practices and procedures, we can confirm that the
collection of the track data via GPS is fairly straightforward and does not hinder the daily operations. The completion of the daily log is a little more cumbersome, and requires active participation – but can be completed in less than 2 minutes.

Despite some of the limitations of this method, we suggest that if this analysis were fully automated and summary terrain metrics provided in near real-time (e.g. at the end of a day) that objective and unbiased assessment of the days terrain usage could be performed by an operation. These terrain metrics or summaries of these metrics could then be plotted for each day, and for each guide, to document and check for potential issues such as “terrain creep” or potentially hazardous behavior by one or more guides due a range of external (i.e. non-snowpack stability), influences.

This process would also aid a heli-ski company that wanted to catalogue their terrain and also assist in developing rules and guidelines for usage of that terrain, or as a teaching tool for senior guides to pass knowledge about terrain selection to newer guides. This approach may also play a useful role for educating clients on how and why guides select terrain over the course of several days, or for auditing operational activities by external entities like Occupational Safety and Health. Furthermore, for those operations where terrain is shared GPS tracking could reduce overlap of terrain use and be used to share stability reports.

Terrain analysis of the individual tracks and associated responses to the daily log will be presented in a future manuscript.

4. CONCLUSIONS

Using handheld GPS devices, we successfully recorded the terrain usage data, and associated responses from three different organizations for the Spring of 2015. Analysis of tracks from one organization show the clear utility in this approach for assessing and documenting statistically significantly different terrain use under specific conditions. Having worked with three different operations, we propose that this methodology, if implemented and operationalized in real-time could be useful for operational self-checking, transfer of institutional knowledge, and external auditing.

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