

Finger on the Trigger: an Opportunity to Reduce Injury by Improving Ski Airbags

ABSTRACT

This RFP aims to inform design teams about an opportunity to improve avalanche airbags for the use by an Italian group of backcountry skiers and ski guides, SUCAI. This group, as well as many skiers around the world, wear avalanche airbags when skiing off resort grounds in order to lower the risk of being fatally buried in an avalanche. This RFP aims to solicit proposals to improve the mechanism that triggers the airbag. Specifically, the design team is to propose a new device that can produce a pulling effect through a Bowden cable in the event of an avalanche, triggering the avalanche airbag to inflate.

From our first interactions with Luca, our contact with the Italian backcountry skiing community, we were struck by the danger avalanches posed to skiers. When an avalanche is triggered there is a substantial risk of being buried under it, as the raffling snow tends to run over anything in its path. This safety concern is mitigated by backpacks with integrated airbag systems, which allow the user to rise on top of the snow particles by increasing its size, a principle also known as the Brazil Nut Effect. Currently, these systems rely on a handle trigger for manual activation that, in high stress moments like avalanches, can be forgotten about or impracticable. Moreover these backcountry backpacks are infeasible for skiers, as the trigger system is incompatible with the use of ski poles.

The opportunity being presented through this RFP is to improve the current design for trigger systems intended to deploy ski airbags. One of the main concerns with current designs is that the motion required to trigger inflation is exaggerated, and not always possible to perform when caught in an avalanche. Thus, this opportunity seeks to promote designs that maximize speed of deployment, safety, and reliability.

The reason behind scoping down directly to trigger systems specifically was that the airbag was a proven and effective safety measure for backcountry skiers (a statement which Luca agreed with). In fact, our research showed that *properly deployed* airbags tended to halve avalanche fatalities (Temper). Given this research, we felt it appropriate to focus our opportunity on the trigger mechanism in order to maximize the number of successful airbag deployments.

Based on our interactions with Luca and other SUCAI members, as well as our own research on the backcountry snowsport community, it is clear that a design space for a new airbag trigger mechanism exists, and improving their design would increase the safety of those who take part in backcountry skiing and snowboarding. Moreover, the scoping and requirements model offers first-year engineering design teams the resources and fundamental understanding required to best aid them in diverging and converging on a broad set of candidate designs.

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