AVATARS

Aerial Vehicles for Avalanche Terrain Assessment and Reporting Systems

GATEWAYS TO BLUESKIES

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Understanding Avalanches

Rapidly accelerating snow is dangerous and costly

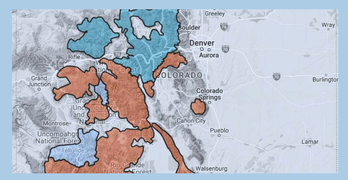
150
Deaths by avalanches yearly worldwide

40%
Avalanche professionals injured on the job

Millions in annual economic losses

Professionals make hazard maps to communicate danger in various areas

93%
of fatal avalanches triggered by humans



However, data collection is limited...

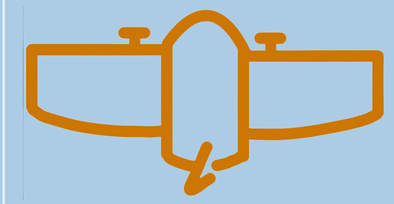
Digging snow pits takes hours of physical labor

The spatial variability of snow limits usefulness of snow profiles

Many areas are too dangerous to access

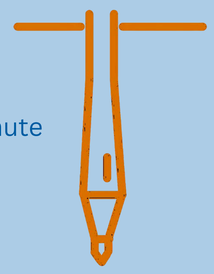
...so maps can be misleading or inaccurate. Enter AVATARS.

Developing the System



Tailsitter UAV

- vertical take-off and landing
- horizontal flight (35+ mph)
- hovering capability



Snow Probe

- creates hardness profile in under a minute
- lightweight and transportable
- high-resolution measurements

The Combination: AVATARS

1 Aerial Surveying

Capture high-resolution photogrammetry

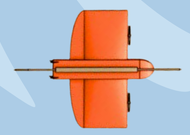
Identify warning signs while promoting worker safety

Survey hundreds of acres each flight

2 Probe Deployment

Vertical take-off and landing

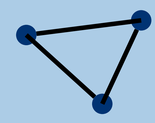
High-velocity horizontal flight



Force & optical sensors measure snowpack and create snow profile

Creating a Safer Tomorrow

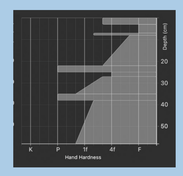
Increase the amount of measurements



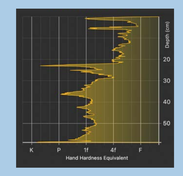
From point measurements...

... to extensive data networks

Standardize data at higher resolution



From highly variable hand profiles of snow hardness ...



... to repeatable, automated profiling at 1mm resolution

Apply results to daily forecasts and long-term models

- daily avalanche forecasts more accurate
- forecasts available for broader range of regions

- integrate data into operational models
- predict avalanche behavior going forward
- understand avalanches within context of changing climate

2025 2026 2027 2028 2029 2030 2031 2032

Prototype Development

Combine existing and new technologies to develop prototype for aerial-surveying and probe-deployment use-cases

System Testing

Test the system in an operational environment, with special emphasis on cold weather conditions and connectivity constraints

Preliminary Integration

Integrate system into statewide avalanche centers, later expanding to regional avalanche centers. Develop risk management protocols and data management plans.

Full Operational Integration

Implement robust training systems into avalanche centers. Scale use while addressing barriers such as public acceptance.

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