PISTEOFF: Backcountry Ski Touring Pack System for Female Photographers and Filmmakers

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Preface: Definitions

Backcountry skiing and photography are both highly technical areas that contain language that can be confusing to understand. This list of definitions helps to build an understanding of base knowledge that will help better understand this research.

ski filmmaker(s) and photographer(s) - (noun) - Used to describe both skiers and snowboarders that photograph and film ski and snowboard athletes. "*Ski"* is used as a general term to address any snowsport athlete. In this paper, "ski" will generally refer to both ski and snowboard unless otherwise noted.

skins - (noun) - Ski skins are a piece of fabric that is cut to match the shape of a ski. One side has an adhesive that allows it to stick to the bottom of the ski while the other side, or the skin side, features short hairs that are angled. When pressure is applied to the ski, the hairs grip the snow to keep the skis, and the skier, from sliding backwards.

to skin or skinned - (verb) - To travel uphill on the mountain on skis. *ex. "We skinned up about 4 miles to the top of Illumination Rock."*

groomed or groomers - (adjective or noun) - The ski runs that are manicured by machines (also known as snowcats) for a velvety smooth, consistent snow (can be referred to as corduroy).

transceiver - (noun) - An electronic device that is able to send a receive signals that aides in quickly finding bodies in an avalanche. Also referred to as a beacon.

probe - (noun) - A metal rod used to probe through avalanche debris for buried victims.

tour - (verb or noun) - Skiing in the backcountry in un-patrolled areas.

off-piste - (adjective) - Off of groomed trails.

s*plitboard* - (noun or verb) - A snowboard that has been split in half down the middle (lengthwise) so that each half can be used independently like a ski to travel uphill in the snow. It also refers to the action of traveling uphill in the snow on a splitboard. A snowboarder in the backcountry is considered a splitboarder.

ICU - (noun) - Internal Camera Unit, as used by the company *f-stop,* to describe an internal camera storage system.

RED camera - (noun) - Industry standard for action sport cinematography.

Introduction

The inclusion of female athletes both in front and behind the camera in the ski industry has been a changing narrative for decades. Women long fought for their time in ski films and times are now changing with more female athletes represented in ski films across the industry. Through researching the current market of the state-of-the-art products for female photographers and filmmakers to carry their gear in the backcountry, valuable insight into what is working and what needs are unmet will be uncovered. Research will also surround the current material and manufacturing methods for the current products to more fully understand how these products are made and the decision making behind their creation. An important part of this research will also cover existing patents and intellectual property surrounding this particular area, as well as color and graphics to create a cohesive collection that speaks to the design. It is believed by the researcher that addressing the apparel and equipment needs of these athletes will help increase the accessibility and representation of females in the ski industry. Creating gear that is suited for these specific athletes creates a sense of belonging for these athletes and will help increase the number of females both in front and behind the camera.

Problem and Product Area

How can we design backcountry ski equipment and apparel for female photographers and filmmakers to perform their jobs more effectively without having to sacrifice their own safety?

This collection will focus on the development of equipment and apparel for these athletes. The research will be conducted to create an innovative touring collection. The line plan will include a touring backpack and vest for these athletes to create a complete collection to allow these athletes to perform their jobs on the mountain more efficiently.

History

Figure 1. Arnold Fanck in 1925 (A Century of Ski Films, 2021)

The history of ski touring dates back to the prehistoric times with the Nordic people. The earliest written documentation of ski touring dates back to 1555 by Olaus Magnus, a historian who recounted Norwegians attaching long skis with fawn skins on the bottom to their feet to provide traction on uphill climbs (Herran, 2018). During the California Gold Rush in the 1800s, Norwegian brought skis to the Sierra Nevadas for the first time. John “Snowshoe” Thompson became one of the most well known and prolific Norwegian ski mountaineers of his time. He used skis to deliver mail at least twice a month up and over the Sierra Nevada mountain range to remote mining camps and settlements. He would carry over 100 pounds of mail over 90 miles to these

camps (Beede, n.d.). What started as a tool and means of transport soon became something used for adventure and exploration. In the early 1900s, Dartmouth College formed an outing club that formed a passionate community of alpinists. Many members of this club continued to achieve many of the first ascents in the area (Herran, 2018). The sport has only since grown since then. With emerging technologies, touring has now become easier and more accessible for the greater population and has become a meditative escape for many people.

Movies have always had a special place in the growth of skiing and ski touring. It is a crucial part of ski touring's history as the motion picture camera was invented around the same time that skiing was growing as a sport in the Alps. There is old footage of these early days dating back before World War I. Arnold Fanck's "Das Wonder des Schneeschuhs" or "The Wonder of Snowshoes" is considered the first commercial ski film. It was released on December 23, 1920 and followed an expedition of skiers climbing up the glacial slopes of the Swiss Alps. It documents skiers performing various stunts, tricks and even leaping crevasses. Fanck later co-founded the Berg and Sportfilm company to create many other popular ski films (A Century of Ski Films, 2021).

The Athlete

Today, men make up a majority of the ski industry's market, but statistics are showing that this is slowly changing. According to the Snowsports Industries America studies, in 2013 only 38 percent of skiers were women whereas in 2018 that number has increased to 40 percent. In addition, in 2018 the sale of women's skis increased by

85 percent and men's ski sales dropped by 11 percent (Athena, 2022). The numbers are even more disparate in the ski film industry. Ski films have long been dominated by men. Industry legends like Ingrid Backstrom recount there only being a few spots open for females in ski films and they were "fiercely guarded" (Krass, 2021). For this research, it is important to focus on females photographers and filmmakers to help increase access and representation on both sides of the lens.

The chosen user group for this research is female photographers and filmmakers age 25-40 that are advanced to elite skiers and snowboarders. Examples of users that fall into this group are Leslie Hittmeier, Editor for Teton Gravity Research and Lead Videographer for Disney+'s Edge of the Earth, Iz La Motte, photographer and filmmaker based in the Wasatch Range, and Anne Cleary, founder of Mad Tree Productions and Director of The Approach. Although these athletes spend majority of their time documenting the feats of other professional athletes, they are also athletes themselves. They are carrying all the same gear as these athletes — skis, transceiver, probe, shovel, extra layers — in addition to pounds of camera gear up steep mountain faces.

Market Size

Estimating the market size of the female backcountry ski photographer is challenging as there are not many public records describing the number of total photographers in the outdoor action sport space, let alone females focused on backcountry snowsports. This is quite the fluid occupation and many of these people generalize their title simply as a "photographer". According to IBISWorld, a trusted industry research company, the photography industry employment in the United States

as of July 2022 was 300,777 people. About 20% of photographers are women, which means there is an estimated 60,155 female photographers in the United States (Photography Industry in the US - Market Research Report, 2022). For a more narrowed view of estimated action sports photographers, looking at social media, @womeninactionssportsphotography is a new Instagram account that is looking to build the community of female-identifying photographers and filmmakers in outdoor/ adventure and action sports. It is a relatively new account that is still gaining traction but as of December 2022 has 812 followers (Wmn in Action Sports Photo, n.d.). This account represents members who are dedicated to this community and care about lifting and supporting other female creators. These followers are likely to care enough to invest in a product such as specially designed female backcountry ski photographer and filmmaker pack and make for a good start in estimating this niche market size. Another statistic to note is the growing number of photographer jobs in the United States market. According to Zippia, a leading data-driven career website, photographer jobs are growing at a rate of 9% between 2021 and 2030, which is faster than the national average (Professional Photographer Demographics and Statistics in the US, 2022).

With the growth of social media platforms such as Instagram and TikTok, influencers and micro-influencers are increasing, and thus increasing the demand for photographers and filmmakers. The growth in demand for high quality content partnered with the growth in outdoor recreation these past few years indicates that the need for outdoor action sports photographers will only increase (Associated Press, 2021).

Environment

This research is focused on a town sitting in the heart of the Selkirk Mountain range — Revelstoke, British Columbia. Revelstoke has long been a popular destination for resort and backcountry skiers and snowboarders. It is known for its deep powder, striking mountain vistas, and charming town. Although there is only one main resort in Revelstoke, many people flock to Revelstoke for its backcountry - many trails only accessible by helicopter (Stuart, 2017). This research will focus on the peak backcountry season, mid-January to mid-March. During this time, the weather typically has an average high of 35°F and low of 21°F (Revelstoke Climate, Weather by Month, Average Temperature (Canada) - Weather Spark, n.d.). The Selkirk mountains sit at an elevation of 11,545 feet. On average, the resort in Revelstoke receives 34 feet of power per season. The heli-skiing areas receive an average of 46 to 60 feet of powder per season. In comparison to some other ski areas, the snow Revelstoke area receives is on the heavier side — this is common of the Pacific Northwest areas due to the climate. Depending on the varying conditions of the season, it is not uncommon to experience a little rain crust on top as well (Revelstoke, n.d.).

Jobs to Be Done

The primary jobs to be done are split between four main categories uphill travel, downhill skiing or snowboarding, safety, and photography.

In the backcountry, uphill travel is one of the key things that sets it apart from typical resort skiing. In the backcountry, unless athletes are using assisted forms of travel such as cat-skiing or heli-skiing, athletes must travel uphill using backcountry ski

PACKING LIST

1. Extra lens
2. DSLR camera body with lens
3. RED cinmeatic camera with lens
4. Extra SD cards
5. Tripod
6. Extra batteries
7. Water
8. Snacks
9. Ice axe
10. Skins
11. Collapsible poles (for splitboarders)
12. Helmet
13. Sunglasses
14. Goggles
15. Shovel
16. Beacon (often worn on body)
17. Probe
18. Extra gloves or mittens
19. Airbag system
20. Crampons
21. Crevasse rescue kit
22. Walkie talkie
23. Ski straps
24. Beanie
25. Extra warm layer

Figure 2. A general packing list of what one filmmaker might bring up on a day of shooting.

or splitboard equipment. Athletes “skin” uphill by attaching climbing skins, similar to pieces of carpet that temporarily stick to the bottom of skis or splitboard, to provide traction for going uphill. Unique parts of this job in comparison to typical skiing include the use of retractable poles for snowboarders and the removal of the skins once the athletes reach the top of their line. Backcountry snowboarders use poles to help their ascent, but once they are ready for the downhill, poles are retracted and placed back in their packs. Additional considerations for this is the setup and breakdown of the uphill portion — athletes are often kneeling in the snow in cold and windy conditions. Snow often sticks to the climbing skins after uphill travel and need to be placed back into the

athlete's pack or jacket after uphill travel (Beginner's Guide to Backcountry Skiing and Snowboarding, 2020).

The downhill skiing and snowboarding is very similar to that of traditional skiing and snowboarding in the resort. A key note in the backcountry is the snow is often untouched and not groomed. This means athletes are often shredding through lighter snow and deeper powder. The conditions can often be less predictable with unmarked objects and changing terrain (Beginner's Guide to Backcountry Skiing and Snowboarding, 2020).

Safety is an important consideration in the backcountry. With any outdoor endeavor, having enough water, food, and layers is key. Any equipment or apparel designed for backcountry touring should consider the conditions of the environment on the entire route of the mountain as this factors into the amount of additional layers, water, and food is needed. In addition, avalanche safety is one of the most important things when it comes to the backcountry. Every person in the backcountry needs to carry their own safety gear. This includes, at a minimum, a shovel, transceiver, and probe. The transceiver is typically worn on the athlete's body with a harness or strap or is put into a pocket close to the athlete's body, often attached with a D ring. The shovel and probe is stored inside the athlete's pack and only needed in the case of an emergency rescue. Quick access to this gear is key to ensure a swift avalanche rescue. Some modern day packs now include airbags that allow athlete's to float above the snow in the case of such an emergency. The gear is useful in being found as someone who falls victim to an avalanche, as well as assisting in the case of searching for a buried partner (Avalanche Safety Gear and Checklist, 2020). Figure 2 provides a

general overview of what might be some of the things carried by one of these athletes. While what one person brings on the mountain is a very personal decision, a number of these items pictured here are things the athlete should not be without — including the aforementioned avalanche safety equipment.

In terms of capturing content, this varies from each user. Photographers and filmmakers are often carrying their cameras on them or in some quick carry form on the uphill to be able to easily take shots during this travel. The uphill is a less risky place to carry the camera because typically one is moving slowly and steadily. On the downhill, the camera tends to stay inside the bag unless a photographer is posted up in a specific location stationary and waiting for the athletes to ski or snowboard towards them. The conditions are more unpredictable and athletes are moving at higher speeds. The camera equipment needs to be easily accessible but also protected from the snow and the elements when not in use (Jackson, 2020).

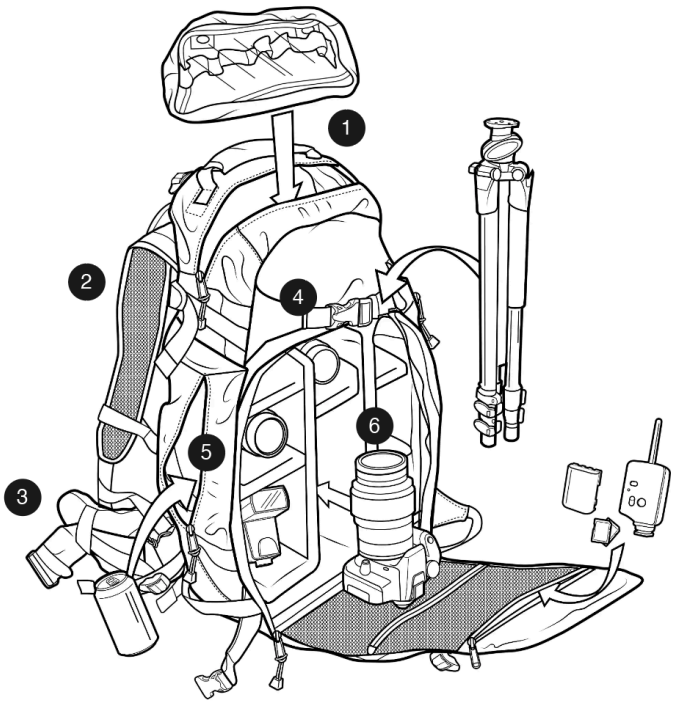
Current Product Landscape

Camera Bag

Most camera bag companies now carry an action or adventure line that is catered towards outdoor and sports photographers. These bags tend to be larger and more rugged than the typical camera bag. They are made from durable and weatherproof materials and often have many internal compartments and external straps to allow for varied organization and carrying options. The camera bag has many different jobs to be done.

Product Anatomy

1. Internal storage
2. Shoulder straps
3. Hip strap
4. External storage
5. Water bottle storage
6. Camera storage



Camera Bag Anatomy

a. Camera Organization

The pack must organize and protect camera lenses, bodies, and additional accessories from snow, water, and abrasion.

b. Avalanche Safety

The pack needs a designated pocket for avalanche safety equipment, specifically a shovel and probe.

c. Ski and Snowboard Carry

The pack needs to have some sort of system to carry skis or a snowboard when boot-packing. This includes options for helmet and pole carry as well.

d. Hydration

The pack needs storage for food and water.

e. Female Fit

The strap and fit of the bag must consider female fit.

f. Materials & Manufacturing

The current camera bags in the market are made of a durable, water-resistant material on the outside — often a nylon ripstop. This is usually a multi-layer construction, often with a technical film heat-laminated to it to add durability and waterproofing. The internal camera units that help with the organization of the pack use EVA foam and fleece to serve as a modular protection and organization for the camera and camera parts. There is a lot of labor cost in backpack manufacturing as the steps are quite manual. The fabrics for these backpacks are of cut and sew construction. The material is prepped with anything that might need to be heat-laminated on, such as the technical film backing, then is cut into the various pattern pieces to construct the backpack. Sewing is done in concurrence with the assembly of the various hardware pieces such as tension locks, buckles, and D-rings. For the sewing process, specialty

Shimoda Actions X50 (Action X50 Backpacks, n.d.)

f-stop TILOPA 50L (TILOPA 50L DuraDiamond® Travel and Adventure Camera Backpack, n.d.)

sewing machines such as bar tack machines are used and sewn at 6 to 10 stitches per inch to ensure the durability of the stitch without degrading the fabric.

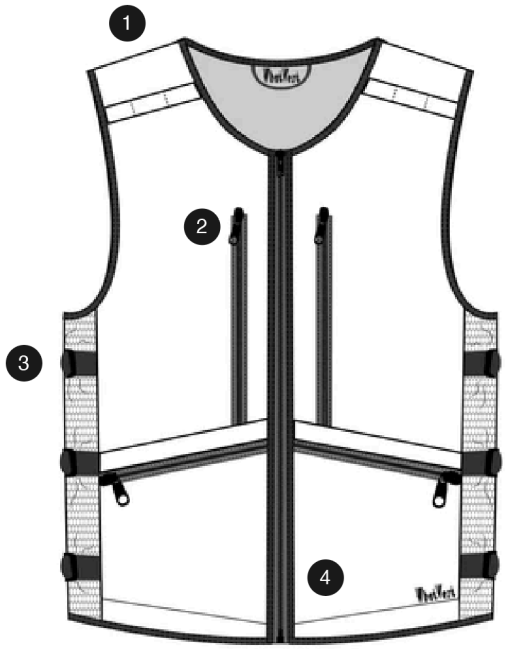
PRODUCT	PRICE	FEATURES	BENEFITS
Shimoda Actions X50*	$329.95	• Multiple entry points • Adjustable shoulder straps • Expandable roll top closure • Camera insert compatibility	• Allows for easy and varied access to gear • More custom fit • Allows for flexibility in size of pack • Increased organization and protection
f-stop TILOPA 50L*	$499.99	• Large compatible camera insert • Heavy duty weather-resistant DuraDiamond fabric • Many external straps • Large external water bottle holder	• Increased protection and organization internally and externally • Allow for ski and snowboard carry • Fits Nalgene water bottle

Vest

The vest market is less saturated than the packs. Photography vests are more common among wildlife photographers and they are losing popularity. Sidecountry ski vests are only now becoming a more popular option for skiers living in places like Utah and Washington where backcountry access can be found just outside the boundaries of the ski resort. The vest has less jobs to be done than the pack. The use of the best is to minimize the need of carrying a pack or to work in conjunction with the pack.

Product Anatomy

1. Shoulder fit
2. Internal storage
3. External storage
4. Vest closure



Sidecountry Vest Anatomy

a. Hydration

The vest needs an option for water and food storage.

b. Camera Organization

The vest needs to keep camera accessories organized and protected from the elements.

c. Avalanche Safety

The vest needs options to carry avalanche safety gear - transceiver, shovel, and probe.

d. Materials & Manufacturing

The current vests in the market are made of durable woven nylon, often Cordura, and paired with various meshes for breathability and for pocket storage. These vests often use nylon ripstop as well for its durable qualities. Both of these products use traditional manufacturing techniques such as cut and sew and seam taping. The seam taping helps to ensure that the seams are waterproofed. These vests are often a little more

complicated and required special hardware preparation as well. There are often many buckles and D-rings that are attached with webbing.

WhatVest (Full Send - Teal/ Rust/Black, n.d.)

Dakine Poacher RAS (Online Outdoorwinkel | Klimmen, Wandelen & Trekking | Bergfreunde.nl, n.d.)

PRODUCT	PRICE	FEATURES	BENEFITS
WhatVest*	$322	• 9 pockets • Additional straps on back of vest • Hydration pack compatibility • Interior avalanche equipment	• Increased organization • Multiple carry options for skis, snowboards, and helmet • For easy access to hydration • Designated access for probe and shovel
Dakine Poacher RAS*	$194.95	• Airbag compatible • Hydration compatible • Additional clips for safety components • Designated pocket for avalanche equipment	• Increased options to bring avalanche safety gear • Good organization of items

Graphics, Logos, Colors

Snowsport apparel comes in all different colors and graphics. While most apparel comes in bright colors so athletes are easily found on the mountain by friends, coaches, and other skiers, photographers opt for more neutral colors to camouflage into their surroundings (L. Hittmeier, phone interview, October 26, 2022). Photographers do not strive to stand out in whatever environment they are shooting in. They want to blend in and be hidden — whether that is donned in white to blend in with the snow or wearing black to look like a tree in drone shots. This limits the colors and graphics trends that can be applied in this space. However, looking at these trends

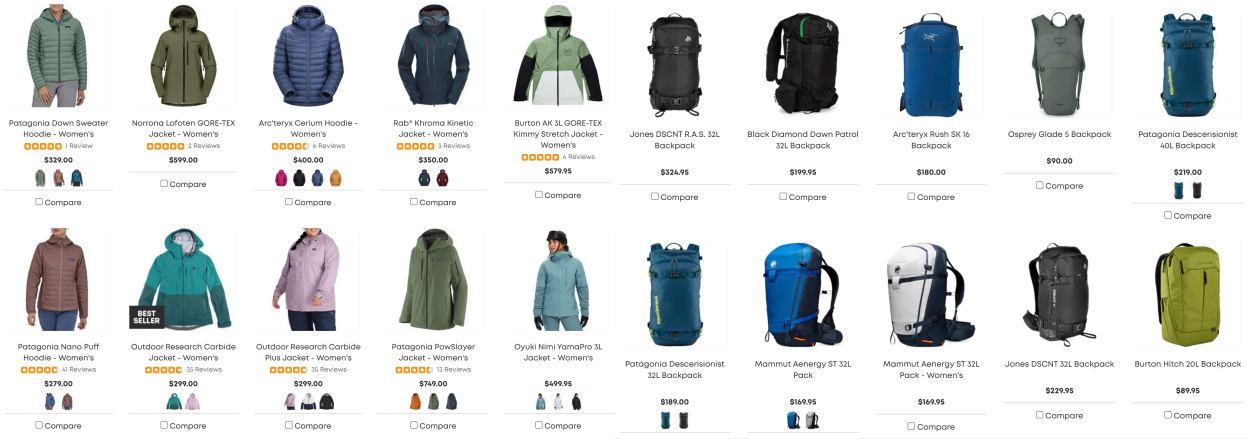
Active Core Colors A/W 22/23 (Kostiak, 2020)

will help to apply graphics and colors in a functional way in internal components of a bag or vest and still allow athletes to express themselves in areas they can.

Current color trends in the outdoor and snowsport space trend towards healing nature tones. The active core colors according to WGSN trends for A/W 22/23 include a lot of grounded and versatile neutral tones (Kostiak, 2020). This is also echoed in

Current - basic and traditional logos.

looking at current top styles at top outdoors stores such as REI, evo, and Backcountry. Below is a photo of the top selling ski and snowboard jacket styles at evo, which aligns well with the color trend report.



Highest rated ski and snowboard jackets at evo.com (Women's Ski & Snowboard Jackets | Evo, n.d.)

Top rated backcountry backpacks at evo.com (Online Backcountry Backpacks | Evo, n.d.)

Looking at these current jacket and backpack styles, graphic applications are typically not included. Instead, there is a focus on color blocking and textures. Both outerwear and backpacks typically include one large logo placement. For outerwear, this typically is on the left chest pocket and for bags it varies but is often seen either on the top center front or along the side of the pack. Below are some examples of current brand logos that stick to traditional and safe design.

With current branding there is a big focus on achieving greater and bigger initiatives — as seen in this North Face advertisement pictured above. With the growing trend of healing and inclusivity, brands are encouraged to “make their values their best-selling product” and “lean into being the little guy” (Buhay, 2022). From this, campaigns such as K2’s new collaboration with Brain Dead is bringing the cross over

The North Face Question Madness Advertisement (Sid Lee, n.d.)

K2 x Brain Dead Collaboration 2022 (Chow, 2022)

of street style and adventure sports. Their campaign was photographed on film and combined young and casual energy with extreme sport (Chow, 2022).

With the U.S. Ski and Snowboard team partnering with Kappa as their official technical apparel partner for the next Winter Games in Italy, trends toward more

Future — youthful and playful, street style leaning logos.

streetwear styles are likely to increase (U.S. Ski and Snowboard Team, 2022).

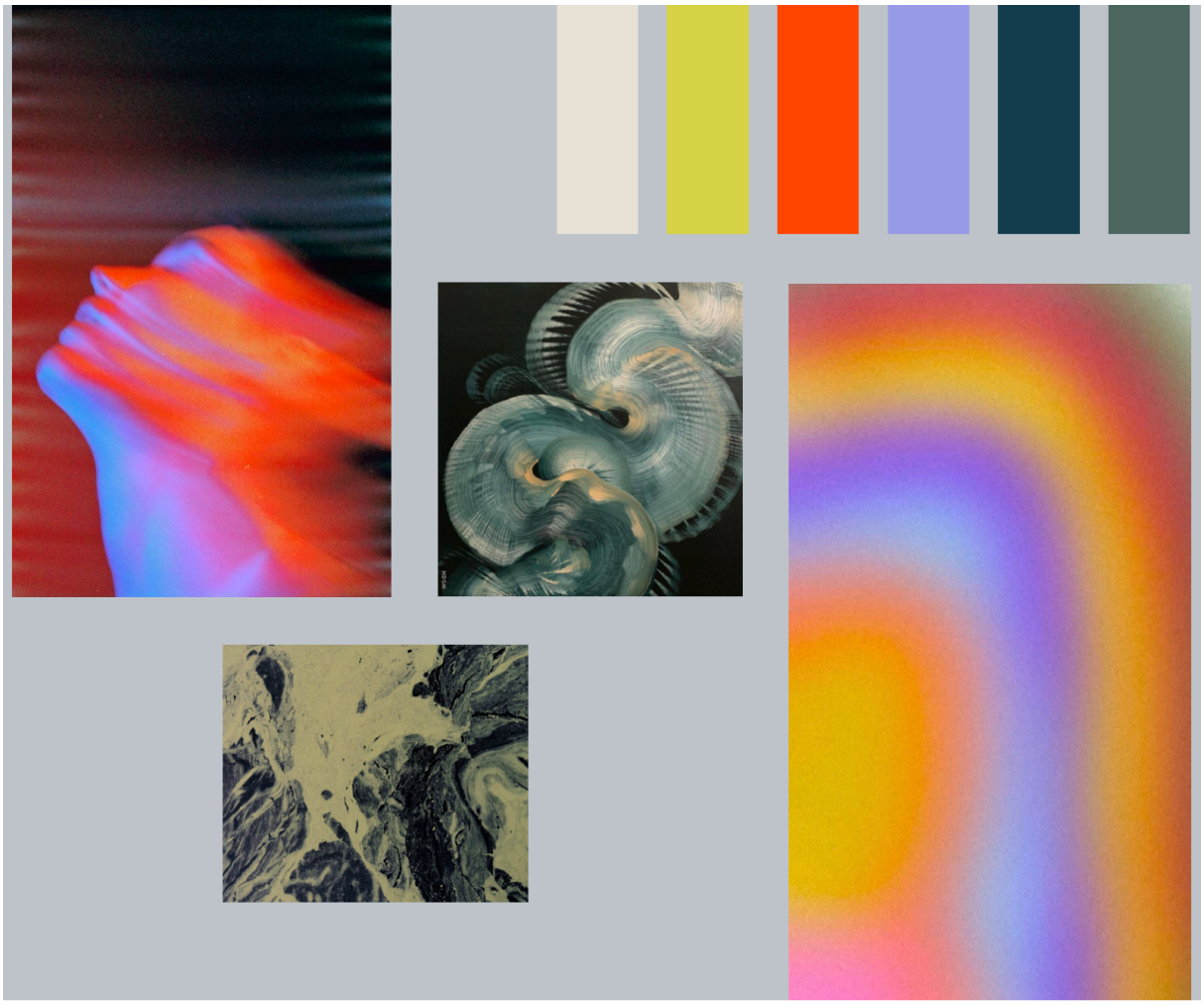


Figure 3. Future color and graphic mood board

Looking forward, WGSN speaks to a lot of focus on nature and healing while also leaning into the metaverse and future-looking ideas (Kostiak, 2021). With all this considered, future colors and branding will take elements of the grounding neutral tones and providing pops of color that lean into the futuristic healing elements is the grounding experience that this collection will bring.

Physiological Research

Research on backpack carry often originates from military research. Soliders are often required to carry heavy loads of equipment and supplies on their backs during

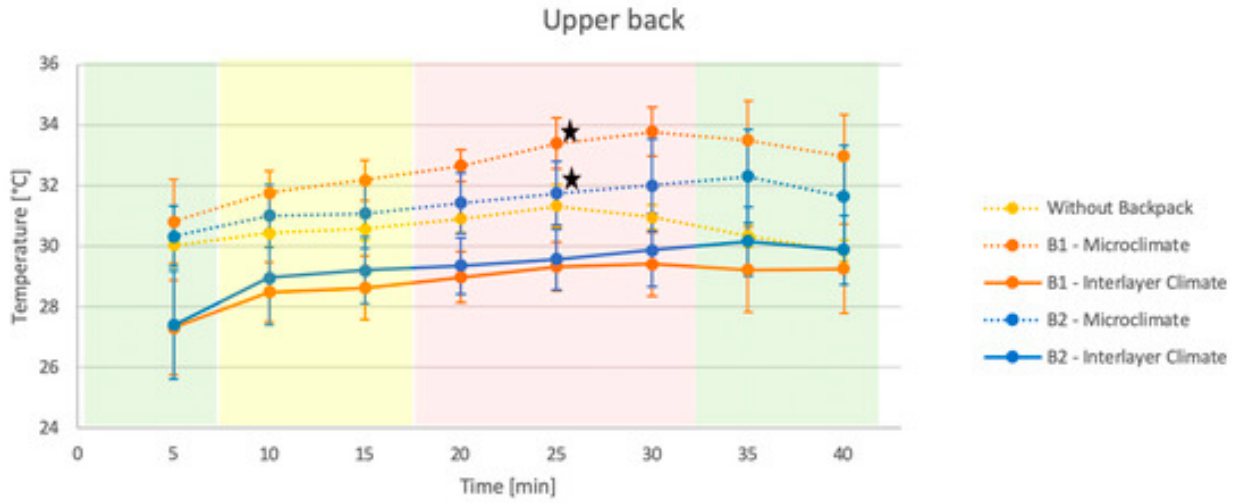
military training and operations. A well-designed carriage system increases the likelihood a mission is accomplished (Knapik et al., 2004). A lot of these studies can be transferred to ski touring research as the physiological aspects of the load carry and movement is similar.

Thermoregulation

Efficient thermoregulation is a key factor for performance and comfort. A humans thermoregulatory system helps to establish a feedback loop between heat production and heat loss. During uphill travel in ski touring, how moisture and heat is transported from the body to the environment is very important to an athlete's thermal comfort (Wilfling et al., 2020).

In a study of backpack design on thermophysiological factors in hiking, the researchers analyzed the relative microclimate of a participants' shirt and the interlayer climate between the shirt and backpack. The test was completed with two different backpack designs. B1 and B2 backpack designs differ at the upper shoulder strap attachment system. B2 has a more open and innovative net design that was proven to show a significant different between mechanical and thermal comfort — as seen in the figure below (Wilfling et al., 2020).

Research demonstrate that energy consumption and heat production is increased with external loads as well as muscle movements. Carrying backpacks brings in an obstacle for the heat to dissipate from the skin. This promotes heat accumulation between the skin and the backpack. This study optimized the skin temperature by lofting the backpack straps to create better air exchange between the pack and the back (Wilfling et al., 2020).



There is a signficant difference, as marked by the ★ for back temperatures between B1 and B2 (Wilfling et al., 2020)

Hydration

Alpine Descents reports that with 2% fluid deficit, athletes can experience mental deterioration, decreased group cooperation, discomfort, lack of energy and appetite, flushed skin, impatience, sleepiness, nausea, an increased pulse rate and a 25% loss in efficiency. These are all factors that affect decision making in the field. The recommended amount of hydration per day is 3 to 4 liters at a minimum, but this increases by a liter in cold and higher altitude conditions (Physiology of Mountaineering, 2017).

Biomechanical Research

Female specific biomechanical research for load carry is hard to find. This section will focus on general ergonomics of different types of backpack carry.

Although the backpack is the most traditional and widespread type of carry, research is done to analyze if this is the best type of carry ergonomically. The backpack

From left to right: 1) backpack 2) front pack 3) double pack 4) T-pack (Genitrini et al., 2022)

creates a backward shift of a user's center of mass. This causes a user to lean forward to keep the center of mass aligned with the new amount of weight (Genitrini et al., 2022).

A double pack allows for the natural posture under load carriage to mimic the posture of the body in an unloaded condition more so than the other pack styles. The front pack offsets the back load and allows for a more distributed carry. The negative of this carry is loss of vision and the thermoregulation of the body as there is now another obstacle in heat dissipation (Genitrini et al., 2022).

This research concluded that for optimized carry, a non-flexible and shorter shoulder strap with a hip belt, and vertically distributed load at the thoracic region, allow for better comfort. The pack should also not affect 40% BM (Genitrini et al., 2022). With this in mind, research specific to snowboarding and skiing changes the center of mass of the body and vision limits that could indicate better use of some of the other carry methods.

In military carry research, it was concluded that military carriage system often have vest and belts to allow for moving items from the backpack the front of the body. These items are typically ones that need to be quickly accessed or needed frequently. Pack frames and well-padded hip belt help to reduce the load on the shoulder and help reduce injury (Knapik et al., 2004b).

Psychological Research

As athletes venture out into the backcountry. Safety is often of the greatest concern. In a field study, participants made lower rick judgements under physical activity than before the activity. This means that throughout the tour, athletes can anticipate a misjudgment in their risk analysis. Easy access and increased protection may increased the overall perceived safety. This can result in underestimations of danger (Raue et al., 2019). This can be applied to the use of airbags in the environment. Airbags can often provide a false sense of safety. In the field, athletes could make riskier judgement calls because they feel that the airbag is a higher safety benefit that will save them in the case of danger. This places a false claim on the amount of risk in the field.

Athlete Research

Goals

The goal of the research is to understand how current female photographers and filmmakers user their packs and what their needs are. Through one-on-one interviews with different photographer and filmmakers, a better understanding of how to serve the needs of this group of athletes will be developed. These interviews will be semi-structured using guiding questions to help understand the thought process of these athletes. The target consumer of this research is female ski filmmakers and photographers who are in the backcountry. Reaching out to male ski filmmakers and photographers will also be key to understanding how the female needs are different than males. Appendix C lists the athletes to be reached out to and the questions that will help guide the one on one interviews.

A portion of the research will also focus on getting in the mind of the user by trying it out. User research will be conducted as a ski filmmaker or photographer through a series of ski tours with photography gear. This will help inform the research from a more purely empathetic standpoint.

Through watching ski films such as NEXUS, The Approach, DGP Tapes: How to Make a Ski Film, I was able to identify some of the most important female ski photographers and filmmakers in the current industry.

Responses

23 SEP 2022, FRI	9 – 9:30am	Dorothy <> Irene | Photography Gear Discussion
18 OCT 2022, TUE	10 – 10:30am	Dorothy x Iz | Ski Touring Photography Pack
21 OCT 2022, FRI	10 – 10:30am	Dorothy <> Susie | Ski Photography Bag
1 NOV 2022, TUE	12 – 12:30pm	Dorothy x Taylor | Designing a Female Ski Photography Pack
3 NOV 2022, THU	9:30 – 10am	Dorothy x Sophie | Designing a Photography Pack for Females
22 NOV 2022, TUE	10 – 10:30am	Dorothy x Sofia | Female Photography Pack Design

List of past calendar events with various female photographers and filmmakers. This is not a complete list of interviews.

Over the course of several months, one-on-one interviews were conducted with athletes to understand their current experience with their gear. 8 athletes were interviewed. The questions in Appendix C were used to guide the interviews. These are the key insights and quotes pulled from the interviews:

- “I want one thing that I can use for a lot of different things.” (Danison, S, personal communication, November 3, 2022)
- “It’s nice to separate the camera gear from the rest of the gear.” - Anne Cleary

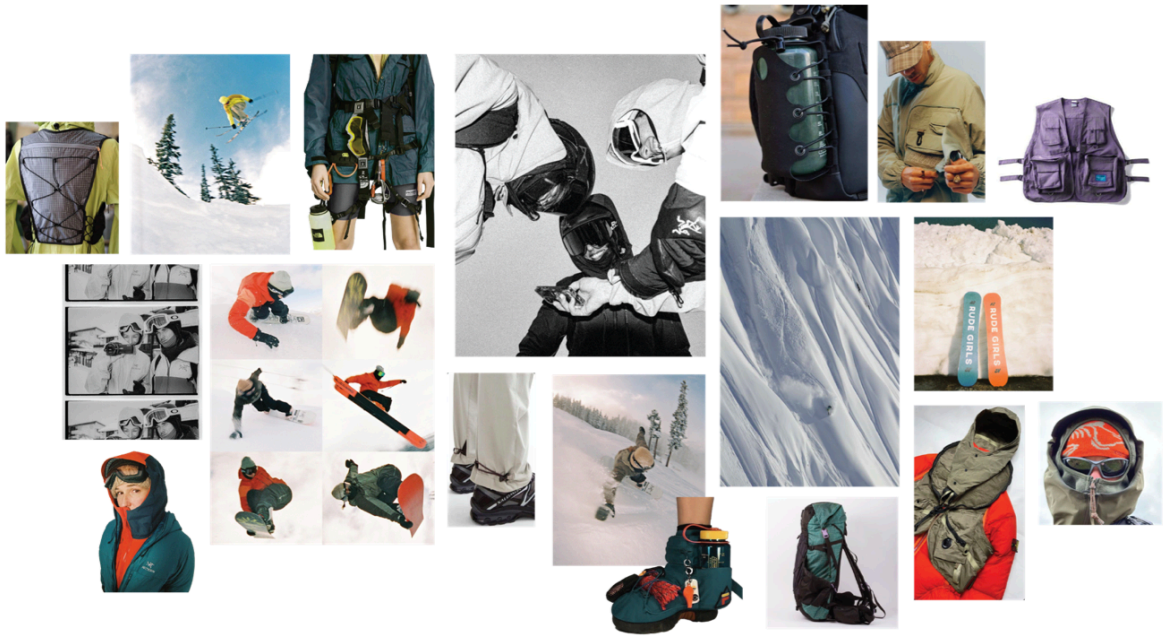
- “It becomes harder to access things inside the pack when there are items strapped to the outside.” - Susie Theis
- “I bring at least 5 batteries for photos and keep them in my chest pocket to try and keep them warm.” (La Motte, Iz, personal communication, October 18, 2022)
- “It’s hard to find a good place to put the tripod. Sometimes I carry the tripod (in the bag) on the front, and pack on the back.” (Cleary, A, personal communication, November 8, 2022)
- “The packs need to be durable, especially when heli-skiing. It goes on the outside basket as we fly to the location.” (Cleary, A, personal communication, November 8, 2022)
- “The pack can’t be too tall or else it will hit my helmet on the downhill.” (Theis, S, personal communication, October 21, 2022)
- “Everything is cinched down almost all the way and there is still room. It might be because I have a shorter torso.” (La Motte, Iz, personal communication, October 18, 2022)
- 7/8 interviewees said that the hip belt does not cinch down tight enough
- 5/8 interviewees use a Shimoda pack (either the Actions x30 or x50)
- 8/8 interviewees said it is hard to keep batteries warm on the mountain
- 8/8 interviewees are concerned about protecting their camera equipment
- 5/8 interviewees use an ICU to organize their gear

Aesthetic Ideation, Direction, and Branding

PISTEOFF Color Palette

The aesthetic focus and direction of this design will focus in a utilitarian direction with a more skate and street influence to lean into the gritty and rebellious demeanor of this new wave of athletes.

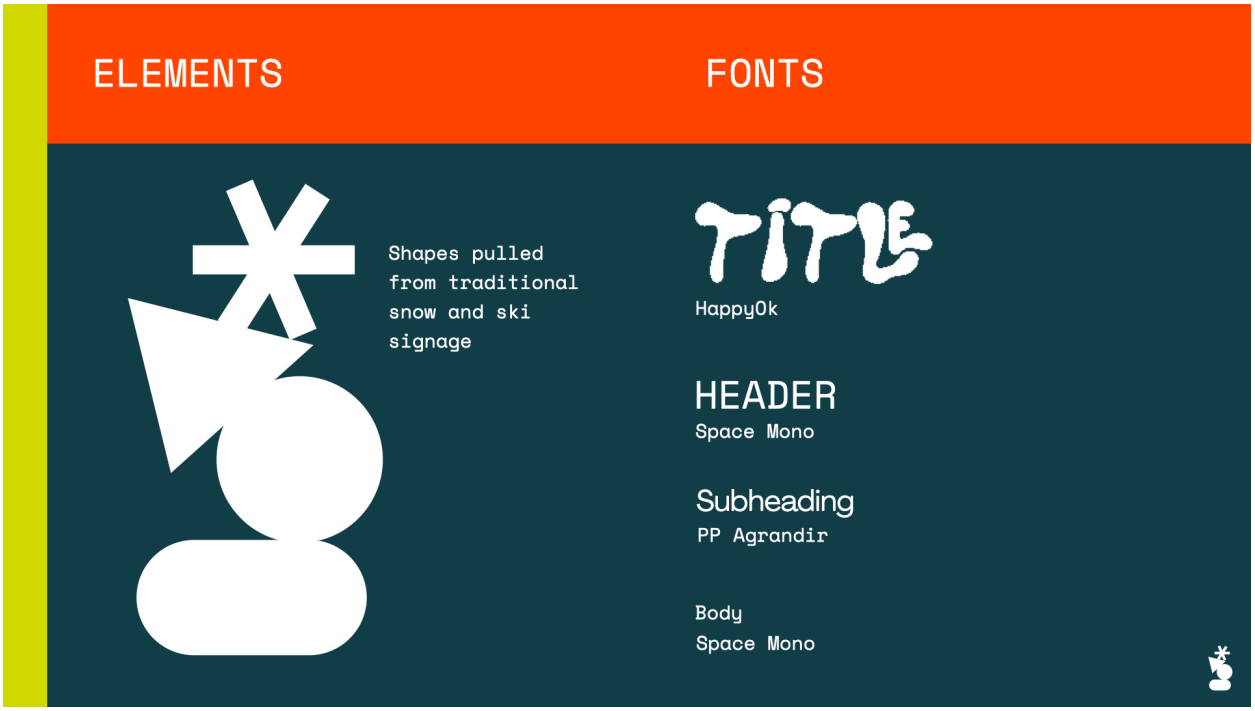
Color is a big part of this project as it is also a tricky thing for these athletes. These athletes typically work to blend or stay behind the scenes in their work. They



Moodboard

like to wear black to mimic a tree from drone shots and not detract from the athletes that are typically wearing more colorful apparel. However, a lot of these athletes also crave color and need for safety reasons in the backcountry. The chosen color palette

pull emerging trends in this space and can be used in a way to offer an edge for these athletes.



The PISTEOFF branding leans into this new wave of athletes that this product is inspired by. The logo leans into this more modern, funky style that these athletes are looking for.

Ideation and Prototyping

In the design process, I wanted to view the whole system that these photographers and filmmakers were using. Through the jobs to be done analysis, it was clear that these photographers and filmmakers were mobile and needed something that could move and serve them in their fast pace environment. Safety and versatility were the two things I wanted to focus on the most. The idea of “wearable equipment” consistently came up in my research. This is the idea that has become a recurring theme in the outdoor industry. This can be seen with trail running vests, fly fishing packs, hip packs, and even in the bikepacking industry. There is this push to have everything that one would need as close to body as possible. Ergonomically, this helps to distribute the weight better, but it also creates greater and easier access to equipment.

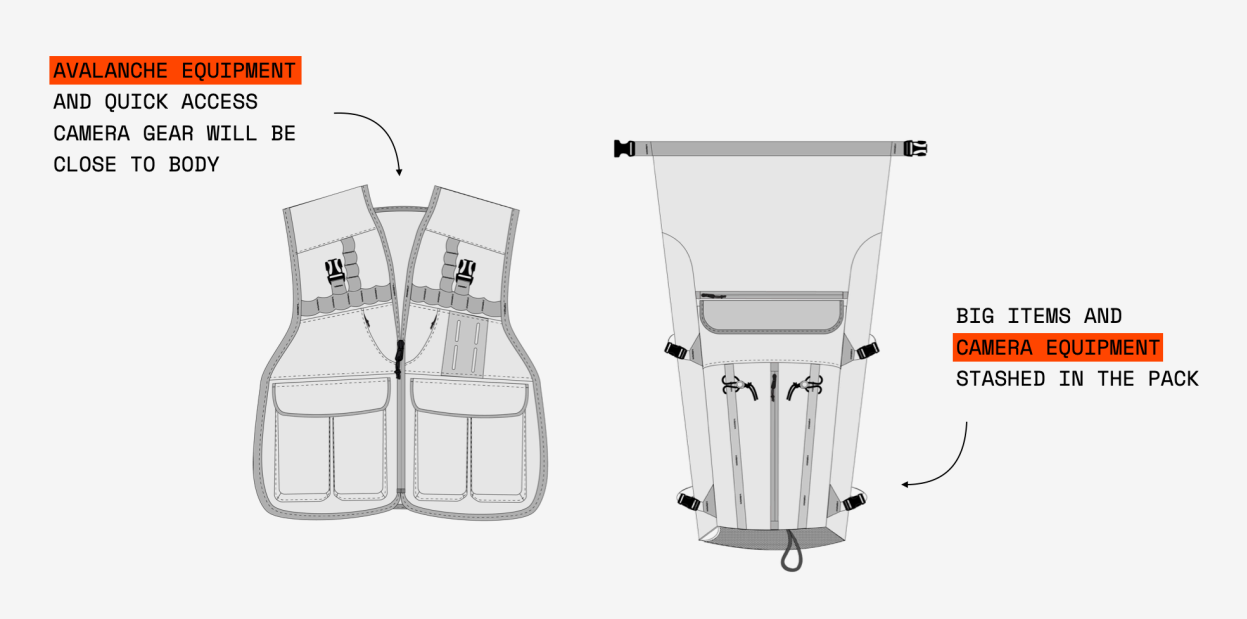
Sketch compilations during the design process

Vest work like prototype - front and back

Pack work like prototype - front and back

This led me to explore how a vest can be used for ski photographers and filmmakers. For these athletes, the items that would need to be close to body are the avalanche safety equipment (probe and shovel), batteries, and camera body. A modular system would allow the athletes to choose a system that works for their particular need based on the day or the job.

In my prototyping, I explored how a pack could be connected to a vest and used in conjunction with the vest. Instead of having straps, the vest would be used as straps. The vest provides a close to body carry method that distributes the weight across the body and chest. The vest would be able to carry the avalanche safety

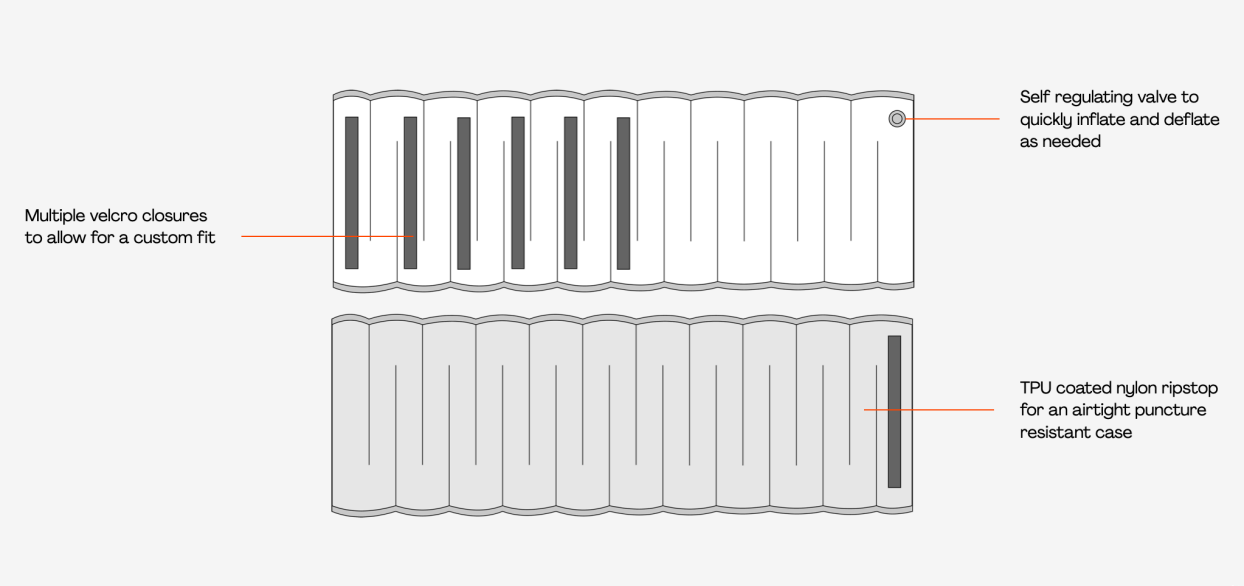


Tech flats of modular vest and pack system

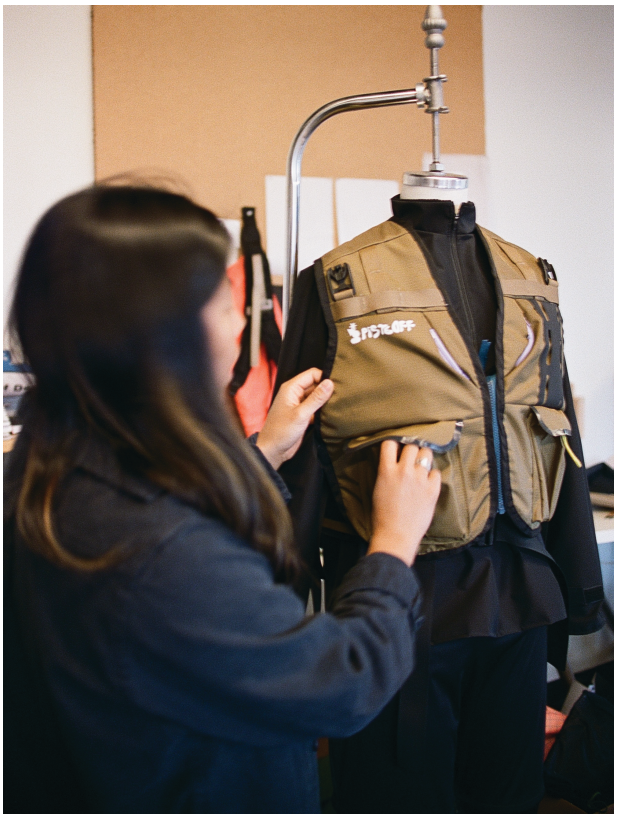
equipment and the pack carries the rest of the equipment, including camera equipment, extra layers, and ski gear.

Work like prototype of inflatable camera protector

In addition to the pack, the creation of an inflatable camera protector would help to save on weight and offer a more versatile solution. The inflatable camera protector can be inflated to any degree of inflation and has multiple closure solutions to offer a more customized fit to the apparatus it is enclosing.



Tech flat of inflatable camera protector



Test Plan

Product Selection

Testing current state-of-the-art products is a big part of understanding what is currently working and not working for athletes. The three products below feature one state-of-the-art product currently used by athletes from each category of this collection's line plan.

1. Backpack: F-stop Lotus 32L - $319.99
2. Vest: Dakine Poacher RAS - $168.75

Testing will be conducted with each of these products to understand how the product is working.

1. Storage

Products to be Tested: Backpack, vest

Study Size: 2 female photographer and 2 female filmmaker

Equipment: Sony Mirrorless DSLR, RED cinema camera, long lens (70-200mm), short lens (24-70mm or 50mm), puffy, transceiver, shovel, probe, water, extra batteries, extra SD cards, mittens, tripod, skis, snacks, water bottle, water hydration sleeve, walkie talkies.

High Level Questions: How much can be stored? How does the storage affect balance and movement? How are they using the external storage? How easily can gear be accessed?

Performance Metrics: Efficiency and no sacrifices in safety

Step	Procedure	Data Collected
Subject Sign Up	Reach out to local photographers and filmmakers. Ask to fill out human subject consent form.	Times and date availability. Consent form.
Subject Preparation	Set out all the possible items and let the test subject choose what they would like to bring.	What items did each athlete choose? After all items are chosen, write down why they chose these items.
Data Collection	Ask subject to pack all the chosen items into a pack and ask them to complete a survey of why they are packing this way.	Video of how they packed their items. The survey will include a 5 point Likert scale to understand why they made their decisions.
Data Analysis	Review data and videos to understand human behavior.	Compare the data and note if there is any consistent behavior.

Example Survey Questions

All these questions will be asked to be answered on a 5 point Likert scale unless otherwise stated.

1. Rank in order of importance when considering what items to pack: Weight, Avalanche Safety, Shooting capability, Personal Health Safety (ex. Food and water), Warmth, Camera safety
2. Safety is a top priority when packing for a backcountry expedition
3. I don't care about the weight of my pack as long as I can fit it all inside or on my pack.
4. I put more focus on my fitness rather than looking for less things to bring.
5. I think about comfort and balance when packing my bag.
6. Protection of my camera is very important to how I pack this bag.

2. Fit: Equipment

Products to be Tested: Backpack, vest

Study Size: 2 female photographer and 2 female filmmaker (from Test 1)

Equipment: Equipment picked in Test 1, skis or snowboard

High Level Questions: What is the most uncomfortable? How does location of bulky items affect movement?

Performance Metrics: Comfort

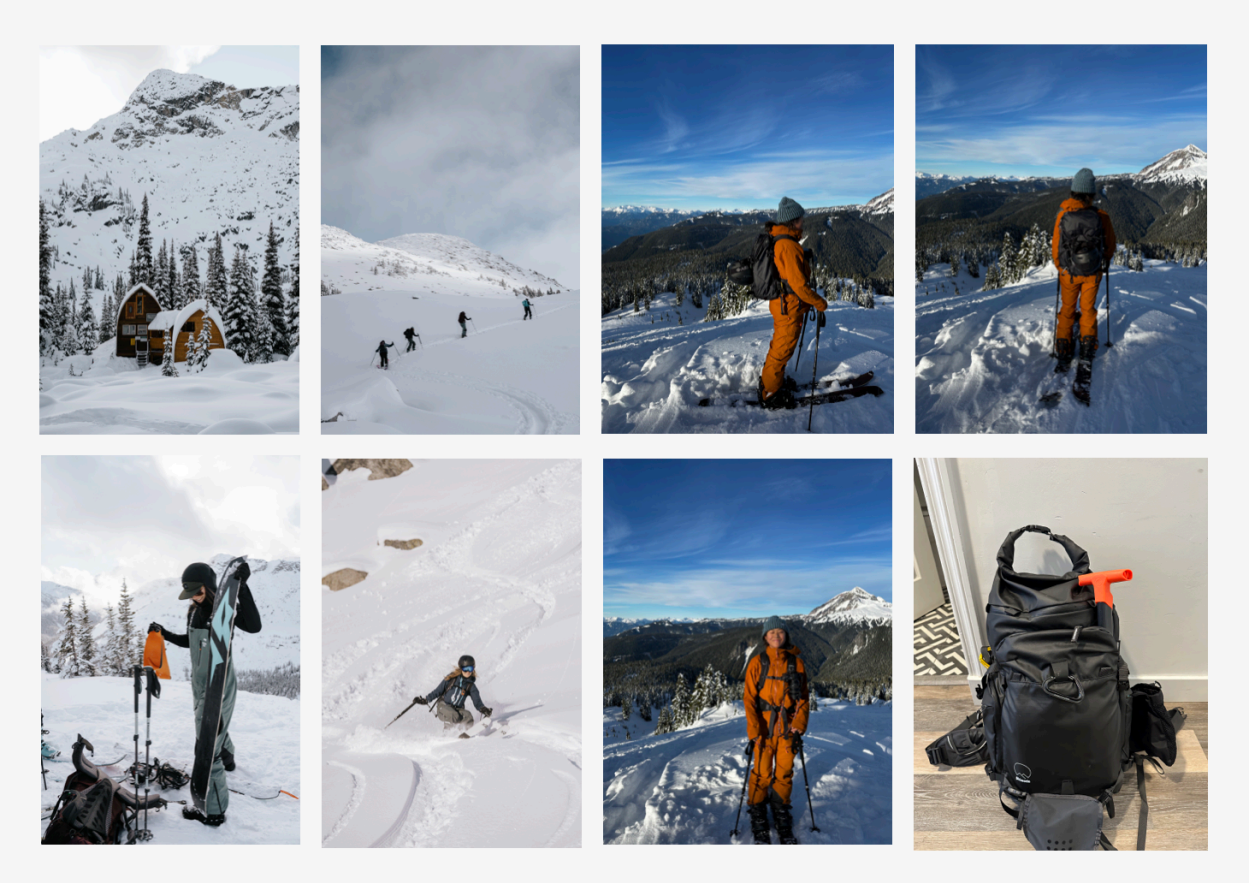
Step	Procedure	Data Collected
Subject Sign Up	Use same test subjects as Test 1. Ask to fill out human subject test consent form.	Find availability to go touring. Consent form.

Step	Procedure	Data Collected
Subject Preparation	Use the items they packed in Test 1. Ask them to put on pack. Record the subjects height, weight, chest, torso, hip measurements	Photo with pack on Measurements
Data Collection	Take pack at least 1 mile uphill and 1 mile downhill. Complete given tasks - a) take out avalanche gear b)take out camera gear.	Take photo of pack off to see how tightly everything is cinched Use 5 point Likert scale survey to understand pain points.
Data Analysis	Review data and photographs to understand human behavior.	Compare the data and note if there is any consistent behavior.

Example Survey Questions

All these questions will be asked to be answered on a 5 point Likert scale unless otherwise stated.

1. I felt comfortable on the uphill travel.
2. I felt comfortable on the downhill travel.
3. Free response: Did you make any adjustments to how you packed the bag after you put it on initially?
4. Free response: Where were you the most uncomfortable? Could you change this with the way the bag was packed?
5. It was easy to access avalanche gear.
6. It was easy to access camera gear.



Product testing in Pemberton, B.C. at Wendy Thompson Hut

Test Results

1. Avalanche Equipment Testing

In this test, the user was asked to retrieve the avalanche safety equipment from the pack. The user was timed starting with the pack on their backs until they were able to take it off and retrieve the shovel, at least, out of their pack.

PACK	AVERAGE TIME
Shimoda Actions X30	16.21 seconds
F-Stop Lotus 32L	15.62 seconds
MHW Snowskiwowski	9.15 seconds

PACK	AVERAGE TIME
PISTEOFF Vest	7.29 seconds
PISTEOFF Vest and Pack	9.26 seconds

The user described that: "*I found this easier to use because there was only one compartment to reach for.*" Through this testing, it is seen that the PISTEOFF Vest provides a much faster time.

2. Camera Protection Testing

This testing was simply completing a weight test after a test of viability. I dropped an egg in each of the protectors from 1 yard high and confirmed that the egg did not break in either protector. This let me know that the camera protector wrap was just as viable. The weight test showed that the PISTEOFF Wrap is lighter but still offers the same amount of protection.

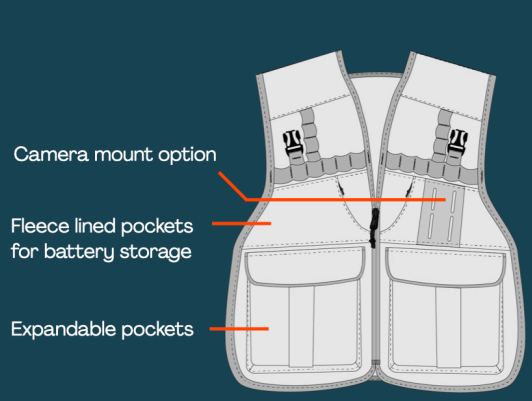
CAMERA PROTECTORS	WEIGHT
F-STOP SMALL ICU	0.9 lb
PISTEOFF WRAP	0.3 lb

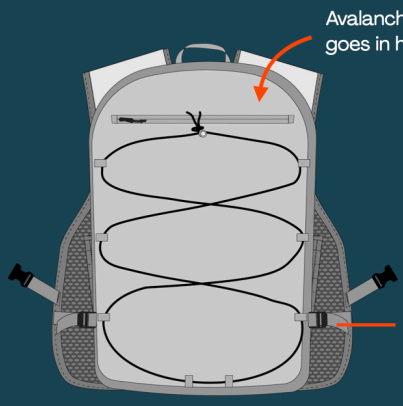
Final Design

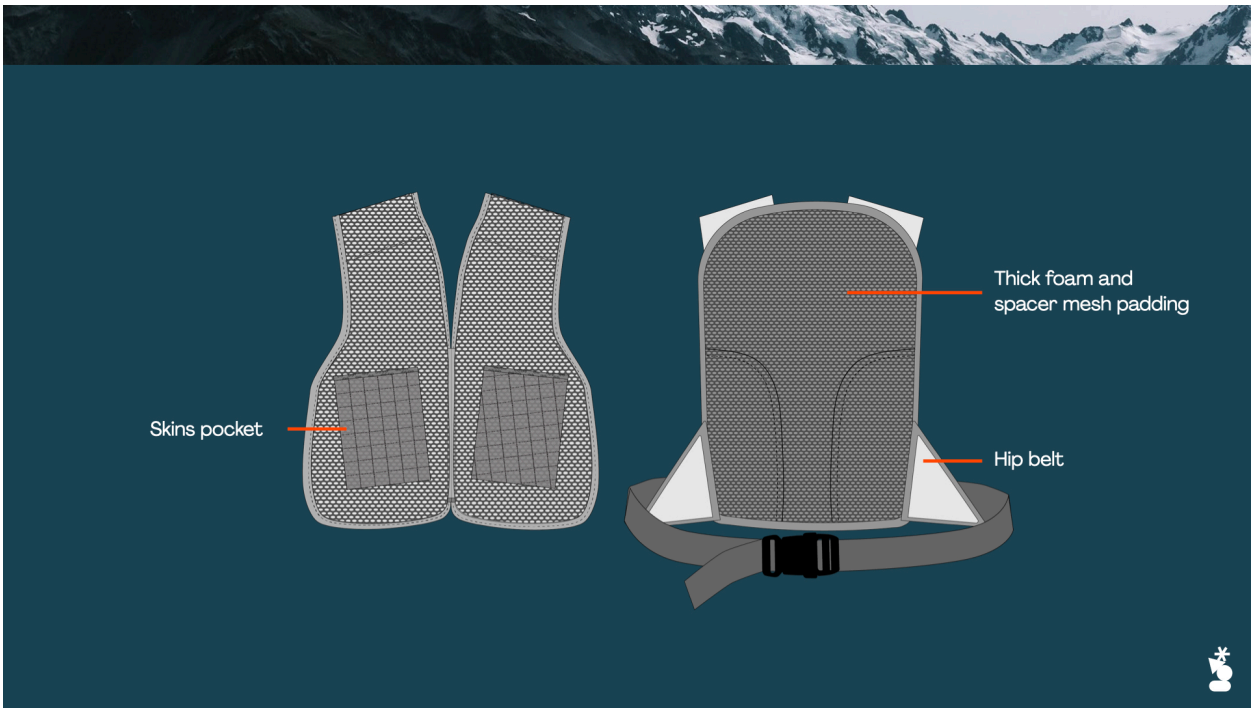
Through the testing and exploration, I created a modular pack and vest system that features an inflatable camera wrap.

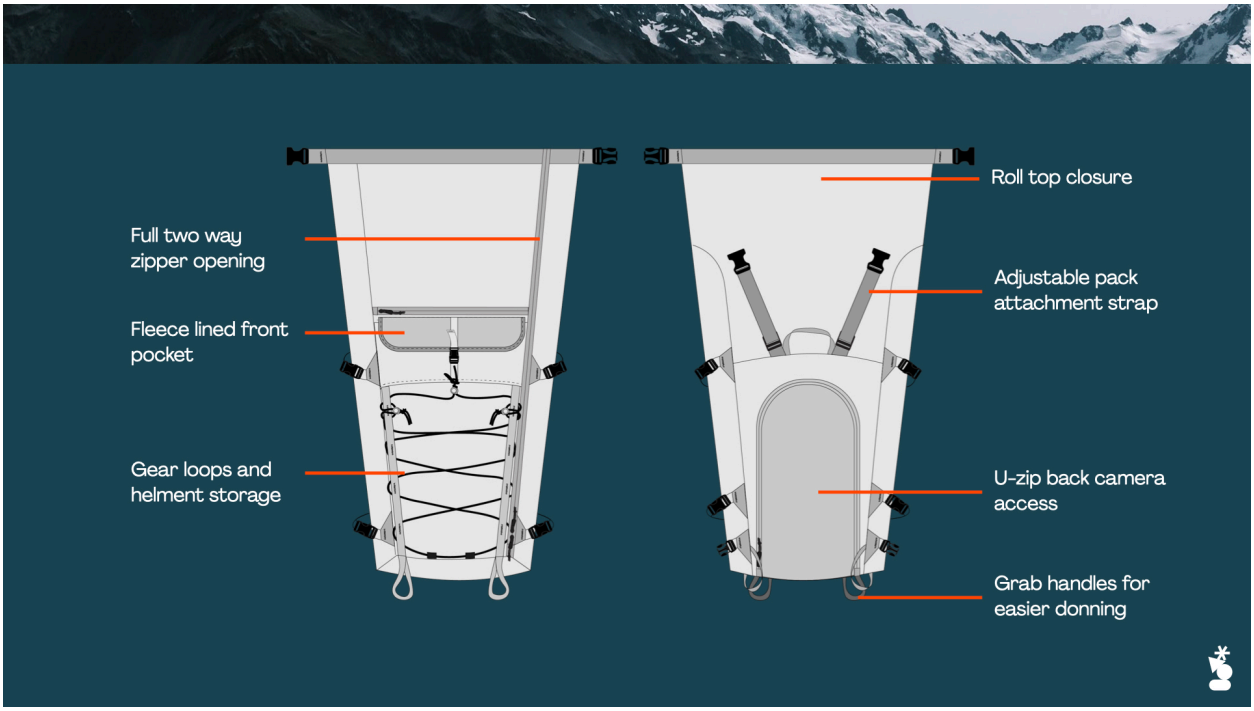
PISTEOFF

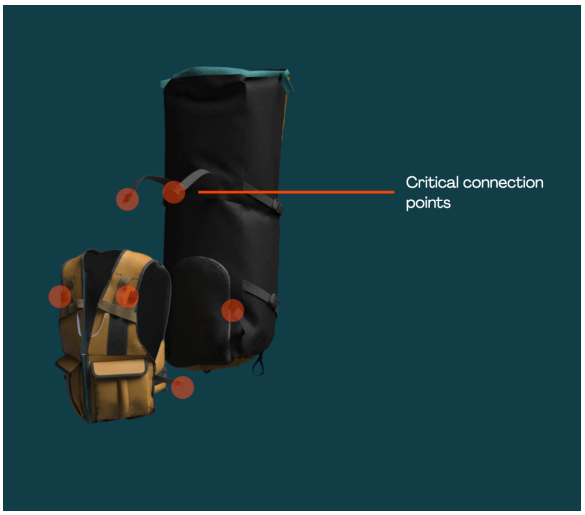
The Modular Vest and Pack System

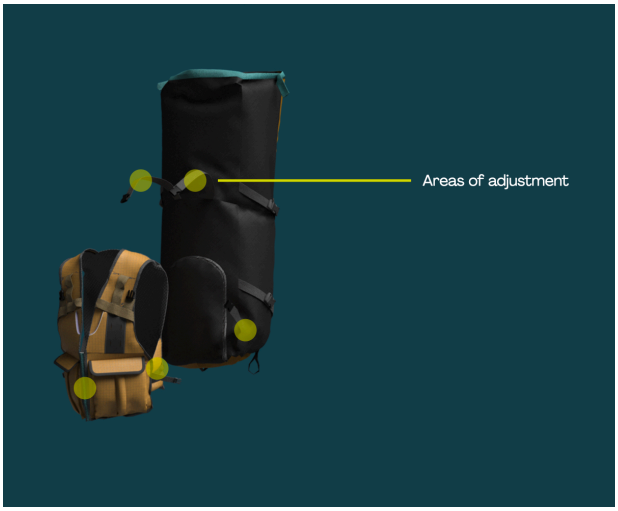


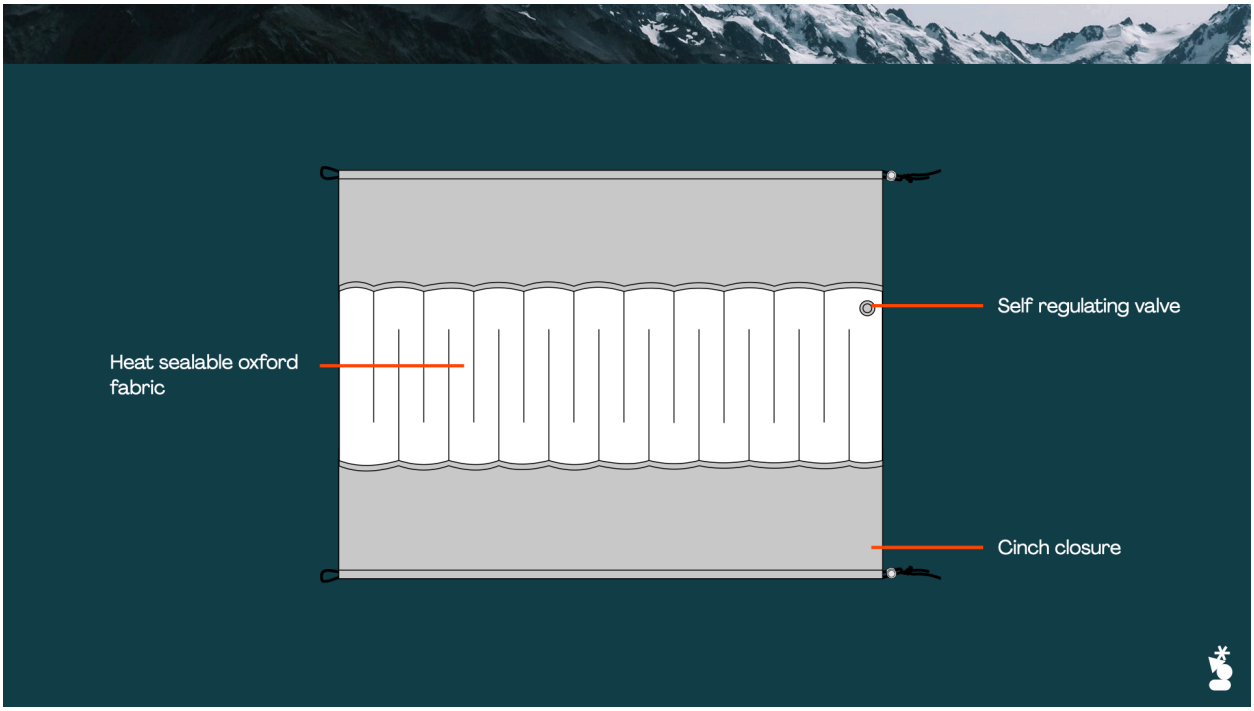


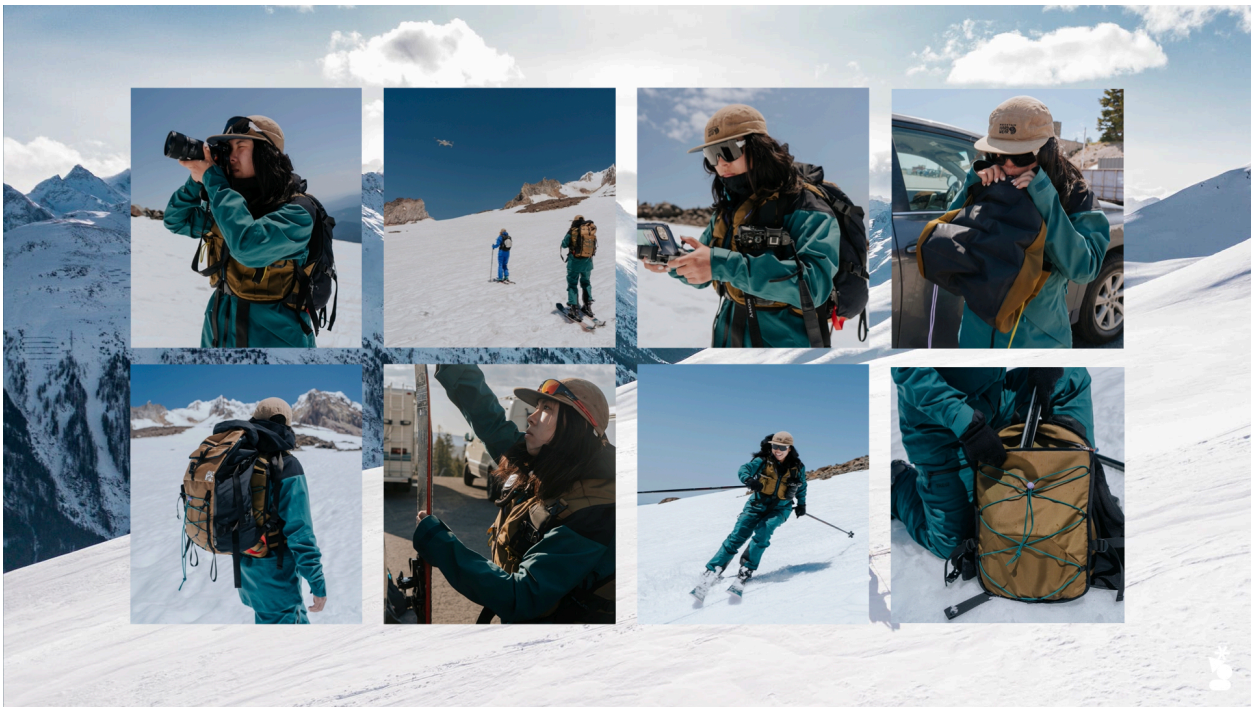

Skins pocket
Thick foam and spacer mesh padding
Hip belt


Full two way zipper opening
Fleece lined front pocket
Gear loops and helment storage
Roll top closure
Adjustable pack attachment strap
U-zip back camera access
Grab handles for easier donning


Critical connection points


Areas of adjustment


Heat sealable oxford fabric
Self regulating valve
Cinch closure



Professional Statement

Golden Circle

I want to bring the joy of the outdoors to everyone by designing fun but impactful apparel and equipment to encourage people move their bodies and try new sports through outdoor products.

Strengths Finder

The results of my Clifton Strengths Assessments showed these five different strengths as my top strengths. Knowing these strengths will help me guide my process for achieving success in this project.

1. Adaptability
2. Arranger

3. Harmony
4. Futuristic
5. Activator

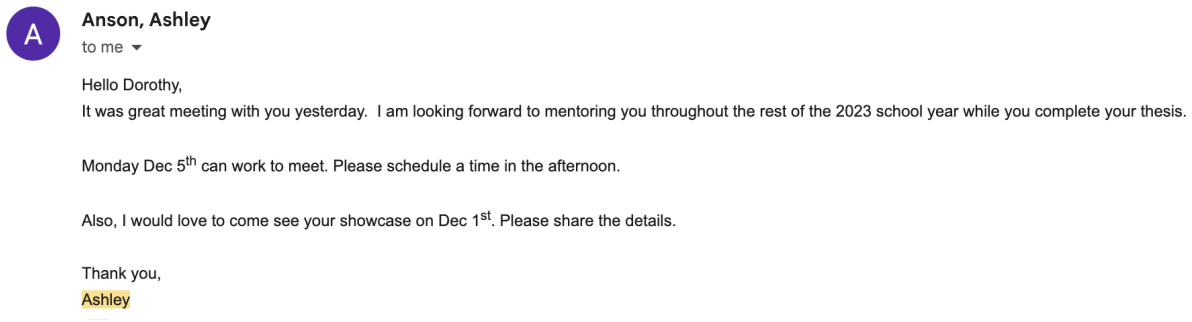
Alignment

This project aligns with my strengths because adaptability is always on my mind. As I think about designing for females creatives in the backcountry, I am constantly thinking about how this bag and apparel can be adapted for different types of photographers and filmmakers as they all prefer different gear. I am a futuristic thinker and an activator that is excited about making things happen and that is the approach I am taking with my project. My goal is to get more females behind and in front of the camera in the ski world and hope to do that my using my strengths.

This project will support my future career in the industry because I am hoping to work in the snow or climbing space. As a photographer as well, this supports my interests in working as a freelancer in this space as well. I am passionate about giving marginalized groups access to the outdoors and inspiring others not to be scared to try new things. I recently attended Mountain Hardwear's Open Aperture clinic that works to diversify the faces behind and in front of the camera in the rock climbing community. Working in a space and for a company like this, in addition to designing gear would be my dream. I would love to stay on the West Coast or move back to Canada — cities like Bellingham, Squamish, and Santa Cruz are some of the areas that I would love to live. As I dive deeper into my 3D patterning and design skills, I hope to push into that space and make myself a more valuable asset in the industry by honing those skills.

Mentors

1. Ashley Anson / Arc'teryx / Sr Director of Women's, Hardgoods and Accessories



Anson, Ashley
to me

Hello Dorothy,
It was great meeting with you yesterday. I am looking forward to mentoring you throughout the rest of the 2023 school year while you complete your thesis.

Monday Dec 5th can work to meet. Please schedule a time in the afternoon.

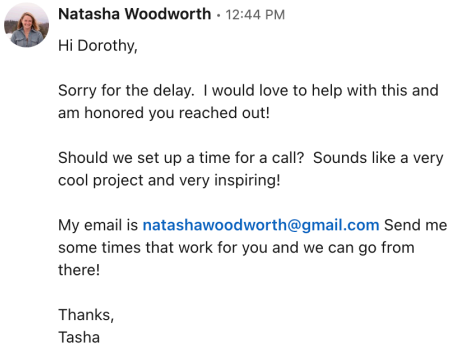
Also, I would love to come see your showcase on Dec 1st. Please share the details.

Thank you,
Ashley

Ashley will be my main mentor. We will set up bi-weekly 30-45 minute meetings to discuss my progress in my project. Ashley has extensive experience in the sports and outdoors world. She was a previous Design Director of Adidas Terrex and now works as the Senior Director of Women's Snow and Accessories at Arc'teryx. She has extensive making experience as well and will provide invaluable feedback and expertise in this area for both pack design and apparel design.

2. Natasha Woodworth / Patagonia / Advanced Concept Designer

Natasha is a previous designer at Patagonia that has worked on their packs, Women's Snow, and Advanced Concept teams. She just left to start her own women's mountain biking apparel company. She has designed some of Patagonia's top selling women's touring kits. She will be a secondary mentor to provide more in depth knowledge on apparel and women's fit. We plan to meet monthly and she is available over email and text as well.



Natasha Woodworth • 12:44 PM
Hi Dorothy,

Sorry for the delay. I would love to help with this and am honored you reached out!

Should we set up a time for a call? Sounds like a very cool project and very inspiring!

My email is natashawoodworth@gmail.com Send me some times that work for you and we can go from there!

Thanks,
Tasha

Appendix A - SWOT Analysis

Photos of each of these products are include in the earlier section of the paper titled "Current Product Landscape".

1. Camera Packs

Shimoda Actions X50 - $329.95				
	STRENGTHS	**WEAKNESSES**	**OPPORTUNITIES**	**THREATS**
Top Closure	Large expandable roll top opening to accommodate different trip needs	No option for additional organization on top of the pack	Create an expandable design with organization capabilities	People who only need one fixed sized bag will not want the extra bulk
External Fabric	TPU laminated ripstop nylon that is durable and water resistant	Heavy fabric	Use lightweight durable fabric	People value durability more than weight
External Storage	Multiple straps on all sides of the bag for multiple carry options	Finicky expandable water bottle sleeve	Creating simple yet functional external carry solutions	People who do not need external carry as much
Internal Storage	• Large organized compartment to separate camera gear from everything else • ICU specific for cameras • Easy side access	Few pockets to store smaller items	Create organization for small items	People looking for more of a bucket style bag with less forced organization
Straps	• Adjustable strap placement • Larger strap pockets for additional storage	Waist cinch does not fit around the female body	Design female fit for hips and chest straps	Lose male customers

f- stop TILOPA 50L - $499.99				
	STRENGTHS	**WEAKNESSES**	**OPPORTUNITIES**	**THREATS**
Top Closure	• Large zipper opening to the main compartment • Smaller top zip for small items	Fixed closure with no option for expansion or to accommodate taller items	Design a top closure to allow for expansion	Too generalist of a pack that people looking for more activity specific features won't be satisfied
External Fabric	DuraDiamond weather resistant and durable fabric	Heavy fabric with many attachment points that could be potential break points	Design a pack with durable attachment points and is lightweight	Packs with durable fabric will not be interested
External Storage	• Ice axe placement loops • Additional D-ring additional points • Easy access side pockets	Minimal straps available to carry both skis or tripod	Design pack with numerous external straps that can be for multi use	People who want a more minimal design with high function
Internal Storage	• Large organized compartment to separate camera gear from everything else • ICU specific for camera	No specific compartment for avalanche safety gear	Add an avalanche specific pocket	People not interested in using for backcountry will not be interested
Straps	Chest strap Good padding	Straps are not designed around the female body	Female specific design	Males will be less likely to buy this pack

2. Vests

DAKINE Poacher RAS - $194.95				
	STRENGTHS	**WEAKNESSES**	**OPPORTUNITIES**	**THREATS**
Hydration and Food Storage	Easy access front pockets for snacks	No convenient placement for water storage	Add a good hydration bag storage	Increase bulk and weight
Avalanche Gear Storage	• Large designated pocket that fits shovel and probe • Airbag compatibility	No additional benefits	Add walkie compatibility	Increase bulk and weight
Camera Storage	None	No specific pocket for camera storage	Add camera specific organization	Less general use

WhatVest - $322				
	STRENGTHS	**WEAKNESSES**	**OPPORTUNITIES**	**THREATS**
Hydration and Food Storage	Large back compartment and good small front pockets for easy access to water and snacks	No additional benefits	Improve fit of organization around chest for females	Reduction in storage
Avalanche Gear Storage	Large designated pocket that fits shovel and probe	No additional benefits	Add walkie compatibility and airbag compatibility	Increase bulk and weight
Camera Storage	None	No specific pocket for camera storage	Add camera specific organization	Less general use

Appendix B - Patent Landscape

These patents were chosen for their related features to this research. The patents are called out as positive design features that will only be used as inspiration and analysis in the ideation of this collection.

Avalanche Safety

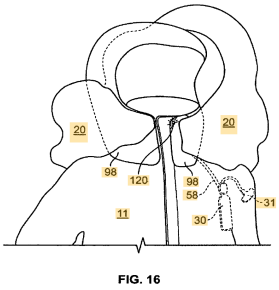


FIG. 16

U.S. Patent No. US7841344B2

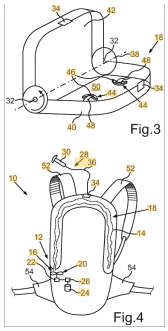
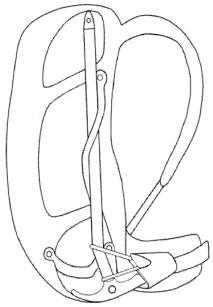


Fig.3

Fig.4

European Patent No. EP3517180A1



U.S. Patent No. US20130284784A1

- Jacket and method for surviving an avalanche (U.S. Patent No. US7841344B2)
- Carrying device for an avalanche airbag system (European Patent No. EP3517180A1)
- Mountain tool holster (U.S. Patent No. US20130284784A1)

Camera Carry and Protection

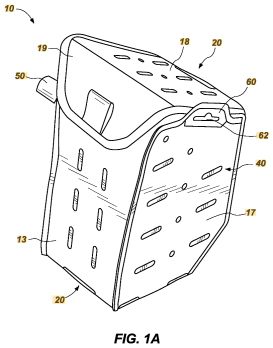


FIG. 1A

U.S. Patent No. US20200245736A1

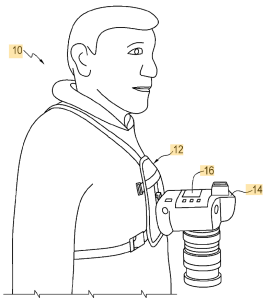
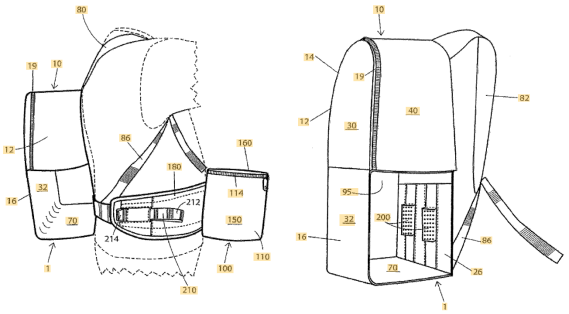


FIG. 1

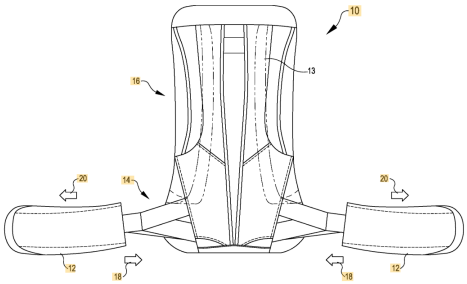
European Patent No. EP2159471A2

- Protective inserts for camera bags and storage systems including the same (U.S. Patent No. US20200245736A1)
- Camera carrying device (European Patent No. EP2159471A2)

Backpack Design



U.S. Patent No. US8534523B2



U.S. Patent No. US20170000244A1

- Backpack and waist bag carrying system (U.S. Patent No. US8534523B2)
- Adjustable waist pad for belt (U.S. Patent No. US20170000244A1)

Appendix C - User Interview Questions

Interviewees:

- Emily Tidwell
- Susie Theis
- Leslie Hittmeier
- Iz La Motte
- Sophie Danison
- Anne Cleary
- Sofia Jaramillo
- Robin O'Neill
- Adi Sadeh

Questions:

- If you are comfortable sharing, what is your size and weight?
- What types of shoots/assignments are you typically shooting?
- What pack do you currently use on your assignments?
- What photo and film equipment are you bringing on your assignments?
- Where do you struggle the most to fit items inside of your pack?
- If you are unable to fit certain items, what do you sacrifice? '
- What do you dislike about your current pack?
- When getting ready for a job or expedition, what are you most afraid of? (Breaking equipment, running out of water, being cold, etc)
- What do you look for when buying a pack?

- After an expedition, is there any specific part of your body or bag that is specifically uncomfortable?
- What do you think about when you are preparing what to wear for an assignment?
- If there are no boundaries and constraints of what could be possible, what would your ideal photography or film pack and kit look like? What features would it have?

Data Collection “By When” Timeline:

11/05/22: Watch 2-3 relevant ski films to understand the user and compile people to reach out to

11/07/22: Reach out to athletes, asking to interview

11/08/22: Complete interview questions and outline

11/20/22: Interview at least 6 different athletes

11/22/22: Identify key insights

12/04/22: “Try it yourself” - Get out into the field and test out a current pack and practice photographing in the field with gear

12/05/22: Identify key insights

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