Backcountry Ski Equipment for Courses That Cover More Distance Than Elevation

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History of skiing

The first recorded mention of skiing dates to 8,000 BCE. Mentions of the first skis are seen in the Xinjiang Region of China. In this time skis are first used to traverse snowy landscapes for subsistence hunting and survival.

Skiers from China eventually immigrated to Scandanavia, bringing the sport of skiing with them. In Scandanavia, the sport of skiing evolves to include turning techniques. The shape of skis changes to make them shorter and nimbler. During this era the Telemark turn, and the Christiania turn are developed. These are still the predominant turning techniques used in modern skiing. During this time ski bindings mostly consist of straps used to hold the boot to the ski.

Sport Overview

The modern sport of skiing can be broken down into two subcategories, Nordic and Alpine. These two categories are named after the places where they developed. While skiing originated in Scandanavia, the techniques and equipment evolved as the sport moved throughout the world. The category of alpine skiing originated in mountainous alpine terrain of central Europe (“Alpine Skiing”,2023). In alpine skiing, the foot is locked to the ski at both the toe and the heel, providing more leverage to the ski (“What is Nordic Skiing and How Does it Compare to Alpine Skiing?”, n.d.). Being able to leverage the ski helps when skiing steep terrain and making fast, powerful turns.

Alpine skiing most often refers to downhill skiing. Alpine skiing includes racing on groomed trails but the subset that will be the focus of this project is backcountry alpine skiing. Backcountry alpine skiing, sometimes called alpine touring skiing, refers to any skiing where the user climbs a slope before transitioning to ski downhill.

Nordic skiing is named for the Nordic region it calls home (“Nordic Skiing”, 2023). Many people also refer to Nordic skiing as cross-country skiing. In this type of skiing only the toe is attached to the ski (“What is Nordic Skiing and How Does it Compare to Alpine Skiing?”, n.d.). This allows the user to more easily extend their stride. The terrain Nordic skiing originated from

consists of rolling hills, making efficiency while traversing more important than descending. Nordic skiers use different types of waxes, skins, or fish scale patterns to allow their skis to grip the snow (Knott, 2022).

Within the subset of Nordic skiing there are also many different disciplines. Most of these originate from racing. The subset that will be the focus of this paper is backcountry Nordic skiing. This subset uses wider skis and more supportive boots to venture off the groomed track. While the gear used for backcountry Nordic skiing can be skied down hills, it is most at home in rolling terrain. Descending on Nordic skis is made challenging by the nature of the flexible boots and lack of locked heel. Turning these skis can be difficult and many people rely on the telemark turn technique. The telemark turn technique is a turning technique in which one ski moves forward and the opposite knee is bent towards the ground ("Meaning of telemark turn in English",n.d.). This technique requires years of practice and mastery to confidently ski in difficult terrain

User

The user I am designing for ski tours on courses with more distance than elevation gain. They ski in places such as the northern Midwest, Alaska, Colorado, or eastern Canada. These are all places that are cold enough to receive snow. The places this user tends to recreate are large landscapes that can feature mountains, valleys, rivers, and lakes. While the user might live near mountains or not near mountains, they seek out flatter terrain in hopes of traversing the landscape and covering long distances.

Backcountry skiing is a large industry in the United States. According to the Sierra Sun, "SnowSports Industries America estimates that there are more than six million backcountry riders in the United States" (Absolon, 2023). These users are advanced to expert skiers who enjoy exploring beyond the boundary of the ski resort. The user has experience skiing and might have experience backcountry skiing in larger mountains. They follow the general trend of the growth of backcountry skiing. Backcountry skiing is the fastest growing segment in skiing (Rosalsky, 2020).

There are several races and traverses that demonstrate a user base. The growing number of entries and increasing popularity shows the potential for a product collection such as

this to succeed. The Grand Traverse Race in Colorado draws around 200 racers each year with the online athlete forum including over three thousand athletes ("2022 montane grand traverse" n.d.).

Race Case Study: Alaska Moutain Wilderness Ski Classic

The Alaska Moutain Wilderness Ski Classic is a race that is held in the wilderness of Alaska (Mehl, 2011). The course venue changes to a different mountain range every three years (Mehl, 2011). The athletes are only provided with a start and end location, requiring them to make their own route-finding decisions (Mehl, 2011). Due to the nature of the race, distances can vary from 140 to 180 miles (Mehl, 2011). Even though the race is called the Moutain Wilderness Ski Classic the distance covered far exceeds the elevation climbed.

For courses like the Alaska Moutain Wilderness Classic some athletes opt to modify their boots and other equipment to gain efficiency (Anrothar, 2017). One user on Telemark Talk online forum posted about removing the tongue, cuff, and buckles from a pair of alpine touring boots (Anrothar, 2017). This same user also mentions adding "bellows" to several pairs of boots to gain more metatarsal flexibility (Anrothar, 2017).

Figure 1

According to Anrothar on Telemark Talk, these modifications allowed for several benefits when touring on flat ground. When compared to a traditional Alpine Touring boot, they mention

the modifications improved their ankle range of motion and provided a more natural stride (Anrothar, 2017). The additional metatarsal flex made touring on flat ground more comfortable (Anrothar, 2017). When comparing the modified Alpine Touring boots to traditional Nordic ski boots, they found that the comfort was similar and there was no loss of striding efficiency (Anrothar, 2017).

Other users on the same forum can be found making similar modifications to boots to gain efficiency. Turnfarmer on Telemark Talk forum posts about modifying an Alpine Touring boot to gain forefoot flexibility (Turnfarmer, 2019).

Figure 2

Race Case Study: Grand Traverse Ski

This race covers over 37 miles of distance but only 6,800 feet of elevation gain, for a ratio of roughly 184 feet gained per mile ("The grand traverse ski ascent" n.d.). For reference, the race the Grand Traverse was inspired by and one of the top ski touring races in the world, Patrouille des Glaciers, covers a similar distance at 34 miles ("Patrouille des Glaciers" n.d.). The Patrouille des Glaciers however, climbs over 13,000 feet, a ratio of 382 feet gained per mile ("Patrouille des Glaciers" n.d.). For the most part the gear used by the athletes of these two races is the same. Athletes of both races used lightweight alpine touring gear ("Gear Guide" n.d.).

The difference in gear requirements between the two races due to the distance to elevation gain ratio is evident when looking at past races, alternative gear setups, and gear

modifications. The flatter and more rolling terrain of the Grand Traverse makes it a more appropriate course to use Nordic ski gear. Nordic ski gear can allow athletes to move incredibly quickly and efficiently due to the "kick and glide" motion (Smith, 2000). Nordic gear is also easier to skate on which can improve efficiency even more (Perkins, 2022). Some athletes still opt to use Nordic gear in the Grand Travers, whether for efficiency or to pay homage to the history of Nordic gear being used in the race (Acuff, 2017). In the early iterations of the race most teams used Nordic gear but in the mid 2000s people began switching to Alpine Touring gear (Ted, 2013). Even though descending on Nordic gear is more technically difficult there are still athletes that are competitive using Nordic gear (Perkins, 2022). As recently as 2021 there have been teams using Nordic gear ranking as high as second place (Perkins, 2022).

Problem Area

Currently backcountry skiers in flat and rolling terrain must weigh options for equipment that are designed with other environments in mind. Some use gear designed for skiing in large alpine environments. This gear is optimized for long, steep, climbs, followed by fast and powerful descents. Due to the nature of skiing in these large alpine environments, the gear isn't optimized for frequent transitions. It grips the snow well but doesn't have the ability to glide.

Some skiers use gear designed for Nordic skiing. This Nordic gear is lightweight and efficient in flat and rolling terrain. It struggles to climb steep hills and doesn't provide the support that most skiers prefer for descents.

Neither of these systems are optimally designed for efficient travel in this type of terrain. How can we enable more skiers to experience new backcountry terrain by improving overall touring efficiency in flat and rolling terrain. The problem area that I will focus on is creating a system that can optimize the best elements of both alpine and Nordic skiing equipment. This gear will excel in rolling terrain with many short climbs but will provide sufficient support while descending.

Athlete Role

The role of the athlete in the sport of backcountry skiing is mostly self-determined. Objectives can be personal and are often dependent on weather and snow conditions. To ski in the backcountry there are a few required actions. These include approaching, ascending, transitioning, and descending. Approaching is the action of navigation from the trailhead to the slope that will be skier. This could be several miles of flat or rolling terrain. It could be on groomed trails or in deep, fresh snow. The approach to the skiable slope depends on the area and the objective for that day. Ascending is the climbing of the slope that will be skied. This might be done multiple times in a day on the same slope or could be done while traversing rolling terrain. Transitioning is the switch from climbing to descending. This could include switching boots and bindings from walk/climb mode to ski mode, adding additional clothing layers, or removing climbing skins. Descending is the action of skiing down a slope. Over the course of a ski day most of these actions will be completed multiple times.

Jobs to be done by a boot to complete the athlete role are, unlock cuff to allow articulation, lock cuff to provide support, keep feet warm and protected from elements, and provide sufficient foot lockdown. Jobs to be done by a binding to complete the athlete role are lock heel for descending, unlock heel for climbing, lock toe for both climbing and descending, and release in the event of a fall. Jobs to be done by pants to complete the athlete role are carry avalanche beacon, carry snacks, carry other small objects, allow for sufficient breathability and thermoregulation, and protect from the elements.

Rules and Regulations

Other than possible local laws and rules regarding use of land there are no set rules to the sport of backcountry skiing. Only rules that follow best practice for ethical backcountry use must be followed by skiers. These include leaving no trace, respecting nature, and coming home safe.

The standard that must be considered for this project is for the boot and binding interface. There are many different types of boot fittings available, only certain types are

officially certified by Dynafit and TUV (Dawson, 2019). To ensure compatibility boot and binding compatibility, Dynafit certified boot inserts will be used.

Sport Environment

The environment for the sport of skiing is cold due to the requirement of having access to snow. The specific environment of the Midwest region of the United States is cold, with temperatures ranging from –10 F to 25 F ("Climate of Michigan", n.d.). The terrain that will be experienced is rolling, forested hills. The highest prominence of a slope on could expect to experience ranges from 800 feet to 1600 feet.

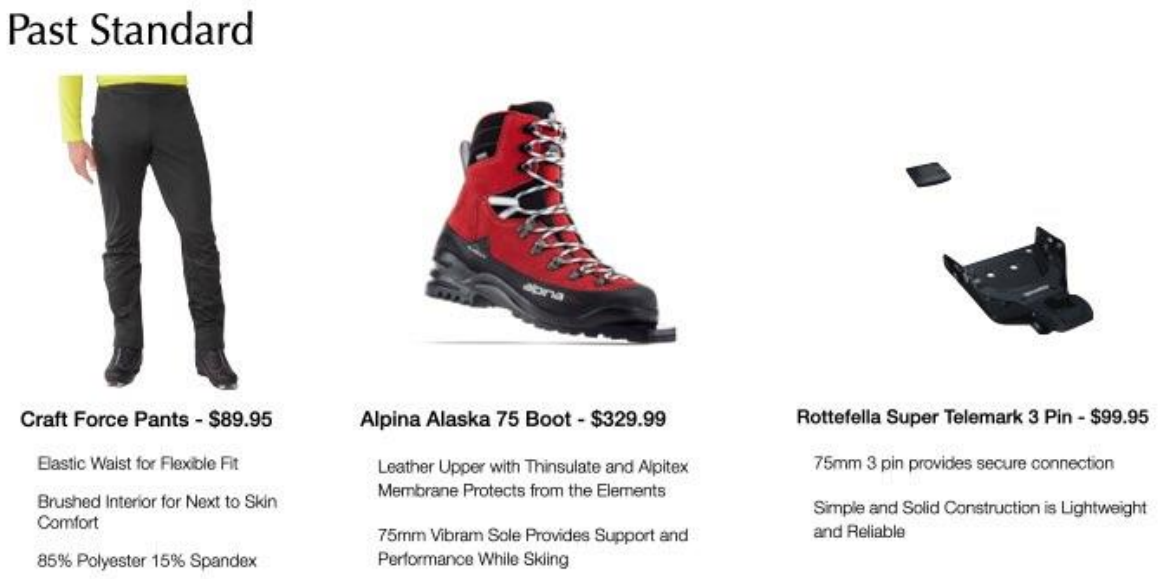
Footwear/ Equipment/ Apparel

The focus of this project will be to create an innovative new ski boot that is optimized for backcountry skiing courses that cover more distance than elevation. Pants will also be created to complete the collection of products and complement the functionality of the boot. The bindings that pair with the competitor boots are listed to show different functionality. Athlete insights have shown that the durability and reliability of the bindings are one of the main reasons these athletes choose to use alpine touring boots instead of nordic touring boots.

One style of each of these items will be designed. One colorway will be created to align with future color and branding trends. One size will be created for prototyping purposes, but the product line should include mondo point sizing from 22 to 32 to accommodate for all sizes of men and women.

Current Product Landscape

Figure 3



The current product landscape of people backcountry skiing in rolling terrain can be broken up into two basic categories of Nordic gear and Alpine gear. According to Superior Highland Backcountry, an advocacy and community building group in northern Minnesota, the optimal gear for backcountry skiing locally is a three-pin binding and 75mm boot system. This system was invented by Rottefella in 1927 and is still preferred by many to this day ("About rottefella" n.d.). The system is prized for its simplicity and ruggedness. The binding can be made cheaply out of stamped aluminum ("75 Mm – Backcountry" n.d.). The stamped pieces are rivetted together to create a simple but durable system.

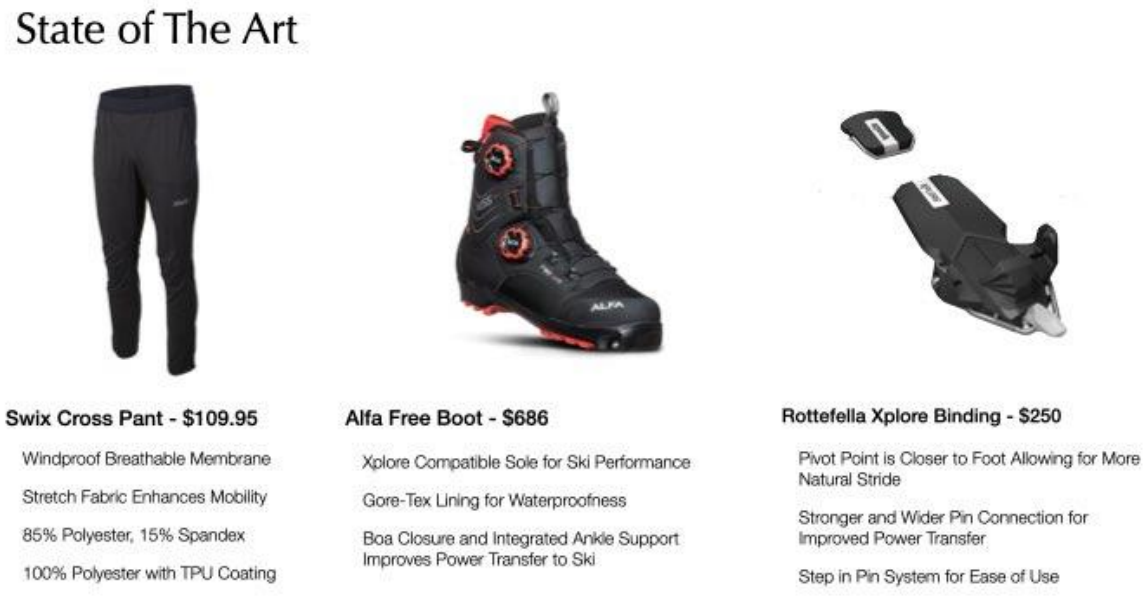
To pair the Rottefella Super Telemark 3 pin binding, the Alpina Alaska is a popular boot option. The boot uses a leather upper with an integrated Alpitex waterproof membrane to keep the feet dry ("Alaska 75", n.d.) The upper uses Thinsulate synthetic insulation to keep the feet warm ("Alaska 75", n.d.). The boot uses a Vibram rubber sole with a 75mm three pin binding interface at the toe. This binding interface is a simple rubber wedge that connects to the binding

via three holds and a latch. (Figure 4). Due to the way that the binding clamps onto the ski, the pivot of the foot is hindered by the flex of the boot sole.

Figure 4

To complete the collection of past standard products, the Craft Force Pants fulfill the basic needs of Nordic ski pants. Their 85% polyester and 15% spandex fiber content makes them stretchy and moisture wicking (“Craft Force Pants”, n.d.). The fit is optimized for the movements of Nordic skiing. The elastic waist and cuffs allow for optimal fit (“Craft Force Pants”, n.d.). These pants provide the most basic functionality that is needed for Nordic Skiing, but they lack many of the features that one might seek for backcountry skiing.

Figure 5



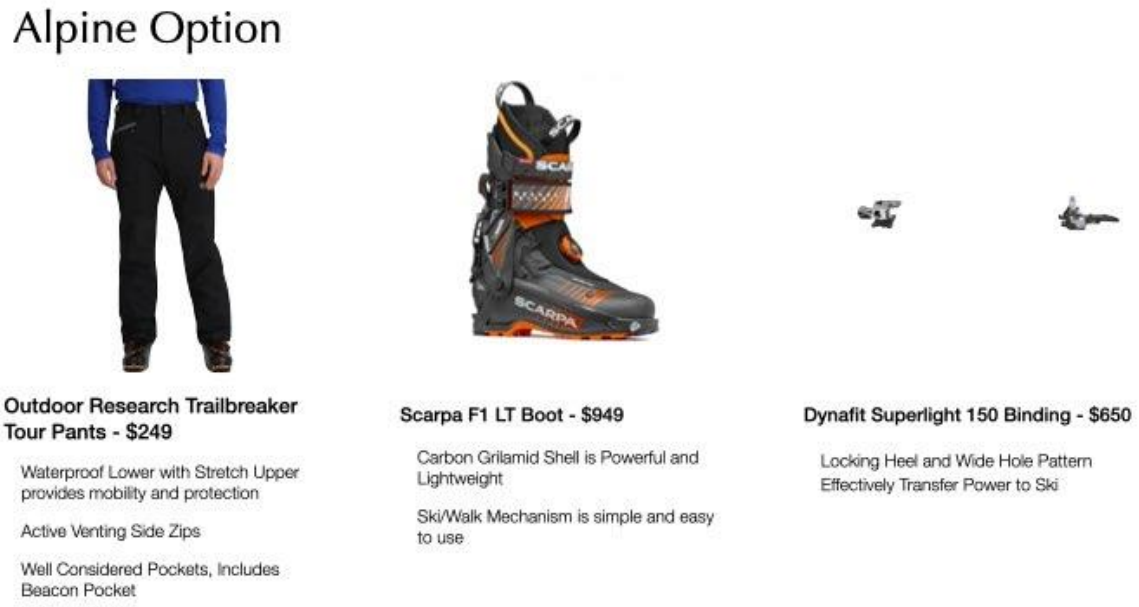
The recent innovation from Rottefella has been the introduction of the Xplore binding system. This system has been created to replace and outperform the 75mm three pin system of the past. This binding system interfaces with a specific boot sole design that has toe spring loaded pins on the toe. These pins snap into the binding and create a wide, stable, platform for transferring power to the ski. This pin interface also allows the boot to pivot freely with little friction when desired. The binding uses interchangeable rubber flexors to alter the stiffness of the boot pivot ("Rottefella Xplore Backcountry Off-Track" n.d.). The binding also includes a 36mm heal riser for climbing steeper slopes.

Similarly to the 75mm system, all the boots the will pair with the Xplore system will be made using a standard sole to ensure compatibly. Currently the boot that provides the most control while descending on the Xplore system is the Alfa Free ("Alfa FREE A/P/S GTX XPLORE Boot Review 2022" 2021). Users have stated that the cuff of the Alfa Free boot is stiff enough to allow a skier to drive the ski through the cuff, allowing for more control. These boots use a Gore-Tex lining and a treated upper to keep moisture away from the feet. A thermal midsole is used to help keep the feet warm. The upper consists of AlfaAir and Cordura. AlfaAir is the company's

proprietary outer membrane system that allows moisture to escape through the upper of the boot (“All about ALFA’s Outer Materials”, 2021). The closure of the boot uses the Boa fit system. There are two different Boa dials so the user can tighten the upper cuff and lower portion of the boot independently.

The pants that a user might pair with this binding system are the Swix Cross Pants. These are another Nordic ski specific pant that are tailored to the movements of the sport. These pants, however, provide more protection from the elements than the Craft pants mentioned above. The main material for these pants is an 85% polyester, 15% spandex blend. The front panel of the pants consists of a 100% polyester, 100% tpu coated shell fabric to protect from wind and snow. The lower rear leg fabric consists of 100% polyester. All fabrics are treated with DWR. The rear of the pants has a reflective embellishment for low light visibility. The main seams are constructed using a cover stitch to reduce the possibility of chaffing (“Swix Cross Pant”, n.d.).

Figure 6



The state-of-the-art products for the alpine option are the Scarpa F1 LT boot, Dynafit Superlight 150 binding, and Outdoor Research Trailbreaker Tour Pants. This binding system is the standard for alpine touring bindings. It uses two pins that lock into the front of the boot to allow

frictionless pivoting of the boot during walking. The heel piece of the binding can then be switched from walk mode to ski mode and allow the heel of the boot to lock down to the ski. This allows for optimal control and power transfer to the ski. The Dynafit Superlight 150 binding is constructed using forged aluminum for the main componentry. The lever that is used to exit the binding is made using plastic injection molding. The pins that interface with the boot are made from machined stainless steel.

The boot that pairs with this binding system is the Scarpa F1 LT. This is an alpine backcountry ski boot. It has fittings to be used with any Dynafit style tech binding that locks both the heel and the toe of the boot for descending. These boots are made of a carbon Grilamid shell ("F1 LT Men's", n.d.). The cuff and lower shell portions are injection molded and connected at the ankle with screws and bushings. This allows the user to rotate their ankle when the boot is in walk mode. The ski/walk lever is made from machined aluminum and attached to the boot with a series of pins. The lever and be lowered and latched to the lower shell of the boot, locking the cuff and lower shell together with a rigid connection. The upper cuff closure consists of two hook and loop straps with buckles to allow for quick adjustments. The buckles are made from machined aluminum and attached to the cuff with screws and pins. The lower shell portion includes a Boa closure and waterproof gaiter system. The gaiter is sewn and bonded to the lower shell. The binding interface fittings are attached to the rear of the lower shell with screws. The toe piece binding interface is integrated to the lower shell during the injection molding process. The Vibram outsole is bonded to the lower shell. The liners used in the boot are made by Intuition Liners ("F1 LT Men's", n.d.). The liners are made with dual density, closed cell, die cut foam ("Our Foam, Boot Liner | Intuition Liners" n.d.). The liners are sewn with polyester fabric using double needle topstitch machines and Stroebel machines.

Figure 7

The pants that complete the alpine option collection are the Outdoor Research Trailbreaker Tour Pants. The pants consist of a bluesign approved 50% nylon, 43% polyester, 7% spandex upper portion ("Men's Trailbreaker Tour Pants" n.d.). The lower, snow and water resistant, fabric is a bluesign approved Ventia 3l 100% Polyester shell ("Men's Trailbreaker Tour Pants" n.d.). The scuff guard is made from 100% 420D nylon. The fabrics that are used allow the pants to have a breathable, stretch, upper with a water resistant, durable, lower leg. Some features that are included are an integrated snow cuff gaiter, zippered thigh vents, large cargo pockets, and an avalanche beacon pocket with integrated lanyard ("Men's Trailbreaker Tour Pants" n.d.). These pants have a more relaxed fit than the two previous Nordic specific pants, this allows for more layers to be worn when backcountry skiing.

Figure 8


Parts & Pieces
Machined Aluminum
Forged Aluminum
Pin Assembly
Stainless Steel
Securely Interface with Boot
Forged Aluminum
Reduce Weight
Injection Molded Plastic
Usable In Cold Environments

Figure 9

State of The Art Materials

Material innovation in the plastics of ski boots is trending towards more high performance more sustainable materials. Current Grilamid polyamide technologies focus on reducing weight and increasing stiffness of plastic shells of ski boots. Grilamid LFT uses long glass or carbon fiber reinforcements to increase stiffness while reducing weight ("Grivory, grilamid and grilon lft" n.d.). These Grilamid plastics can be manufactured with currently available commercial injection molding technologies.

Figure 10

Another plastic that is used for ski boot shell manufacturing is Pebax. Pebax Rnew is a recent innovation that has the potential to decrease the environmental impact of manufacturing boots. Pebax Rnew is manufactured from castor bean oil, allowing it to be renewable and absorb carbon dioxide during growth ("Bio-based pebax | Arkema pebax powered®" n.d.). Pebax Rnew has been shown to be high performance. There are also bio-based grilamid products available similar to Pebax Rnew. Grilamid 1s and Grilamid 2s contain high to very high levels of bio-based content ("Ems-grivory—Greenline" n.d.).

Shell Manufacturing

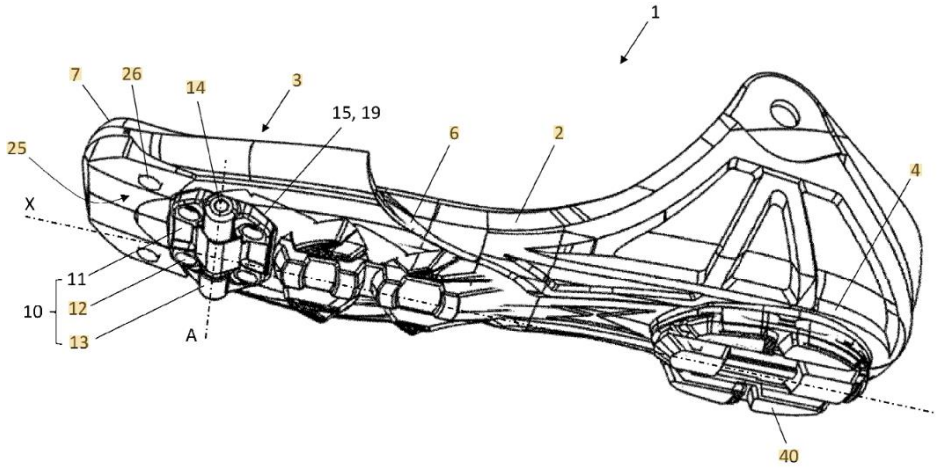
Figure 11

Ski boots use a blend of materials, including plastic, foam, metal, and textiles. Typically, the outer shell is plastic composition, while the inner liner is made from foam. The outer shell's formation is achieved through injection molding, where molten plastic is injected into a mold, sculpting the boot shell's desired shape (“How Ski Boots Are Made” 2019). The plastic shell is formed around a last, which determines the internal width of the boot shell (“How Ski Boots Are Made” 2019). Buckles, cuffs, straps, and other hardware are attached to the shell using rivets or screws (“How Ski Boots Are Made”, 2019).

Patent Landscape

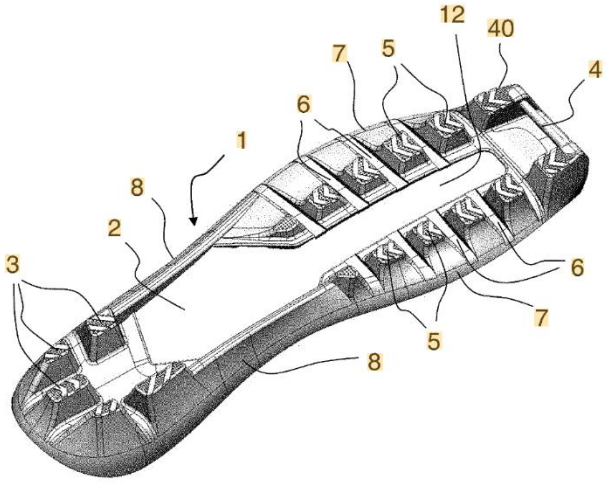
In this section I have selected five patents that are related to the product area that I will be designing within. The first three patents are related to boot sole and boot articulation methods.

Figure 12



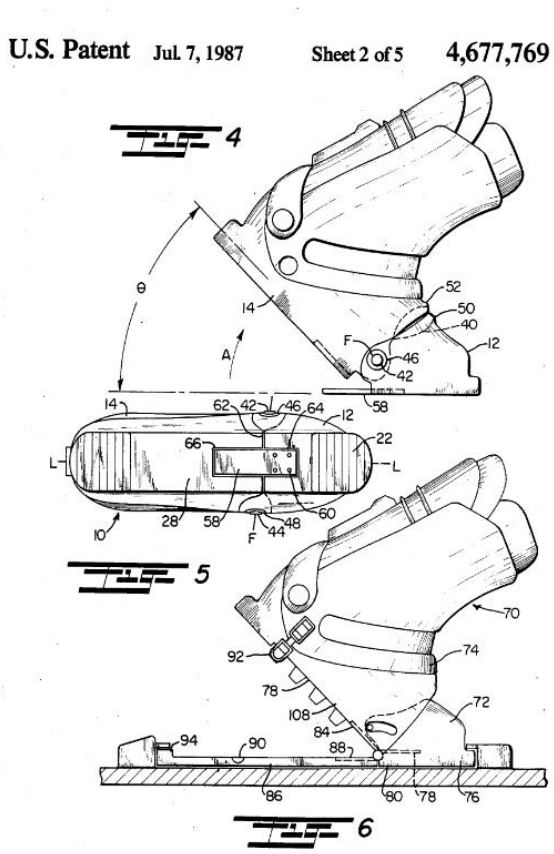
The first patent that was evaluated is EP3935985A1 (Svensson, 2022). This patent is for a ski boot sole and binding system (Svensson, 2022). This patent describes a system to mount a binding system directly to the sole of a boot in multiple locations and styles (Svensson, 2022). The binding interface system can either be mounted at locations 14 or 26 shown in figure 12 (Svensson, 2022). This patent is currently held by Madshus (Svensson, 2022). Any conflict with this patent can be easily mitigated by the licensing of patent EP1559457B1. This is common within the backcountry ski boot industry to ensure binding compatibility. Many backcountry ski boots sold will come with an orange indication of the binding interface being made and licensed by Dynafit.

Figure 13



The next patent that was evaluated was patent number US20170208893A1 (Garbujo, 2017). This patent is for a method of making a ski boot sole as a modular assembly and is assigned to Rossignol (Garbujo, 2017). This patent describes a sole system that is comprised of a main sole piece with a recessed slot for modular stiffness plates (Garbujo, 2017). The use of this modular plate and hole system allows the stiffness of the boot sole to be tuned to the user and use case (Garbujo, 2017). This patent can be easily avoided by not including a modular element to the design of a boot sole.

Figure 14



The next patent was patent number US4677769A (Ahmad, 1986). The main element of this patent is the inclusion of a mechanical pivot about an axis that coincides with the toe joints (Ahmad, 1986). This patent also includes the use of springs and pistons to regulate the resistance between the toe portion and rear portion of the boot (Ahmad, 1986). This patent can be avoided by using soft plastics and textiles to achieve a toe pivot that doesn't use a mechanical system.

Figure 15

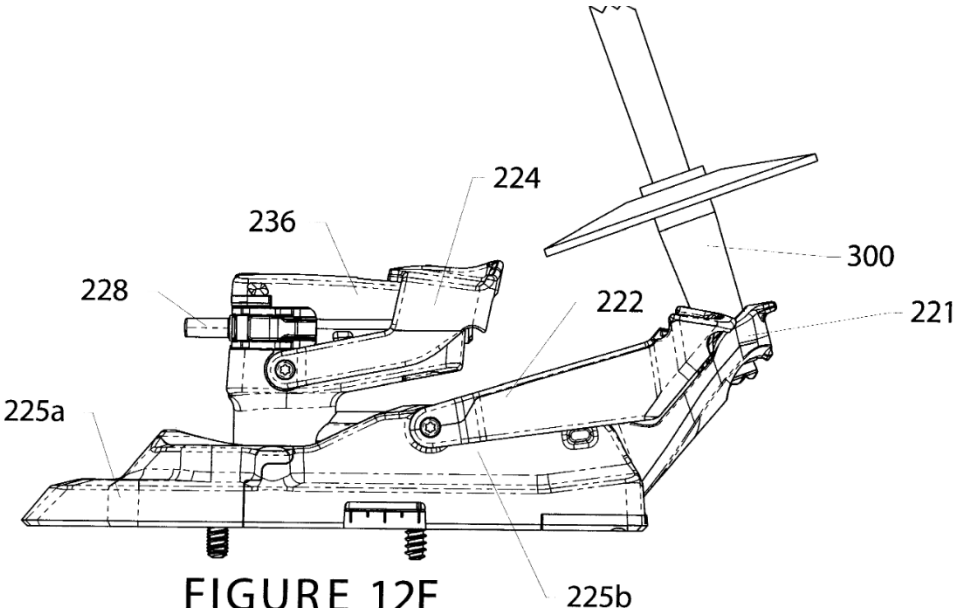
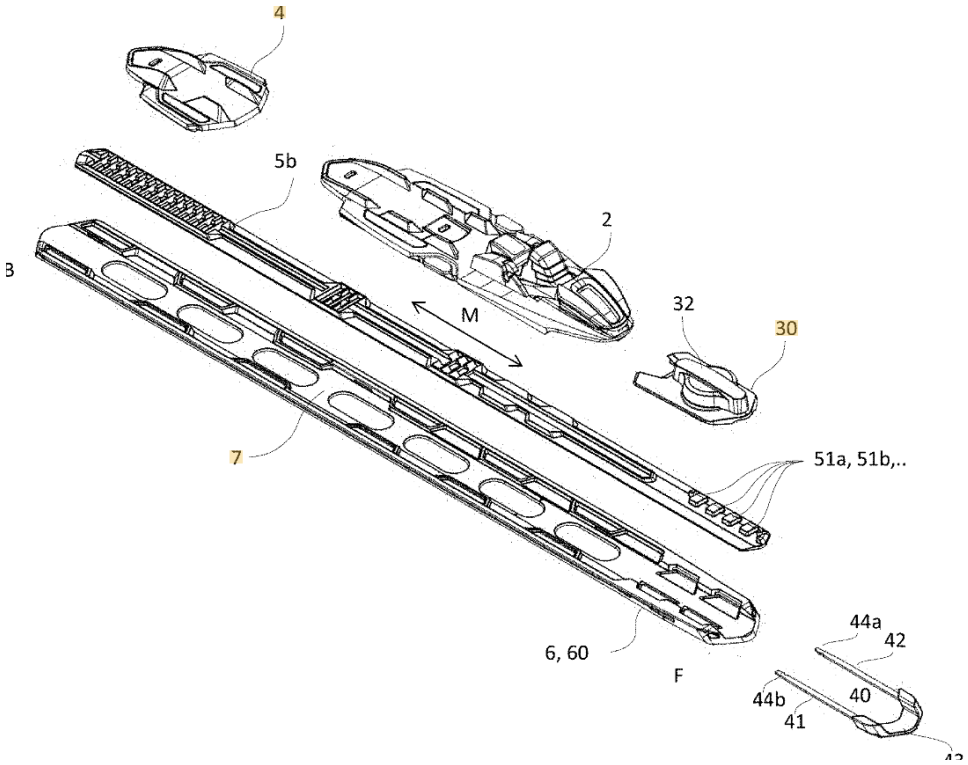


FIGURE 12F

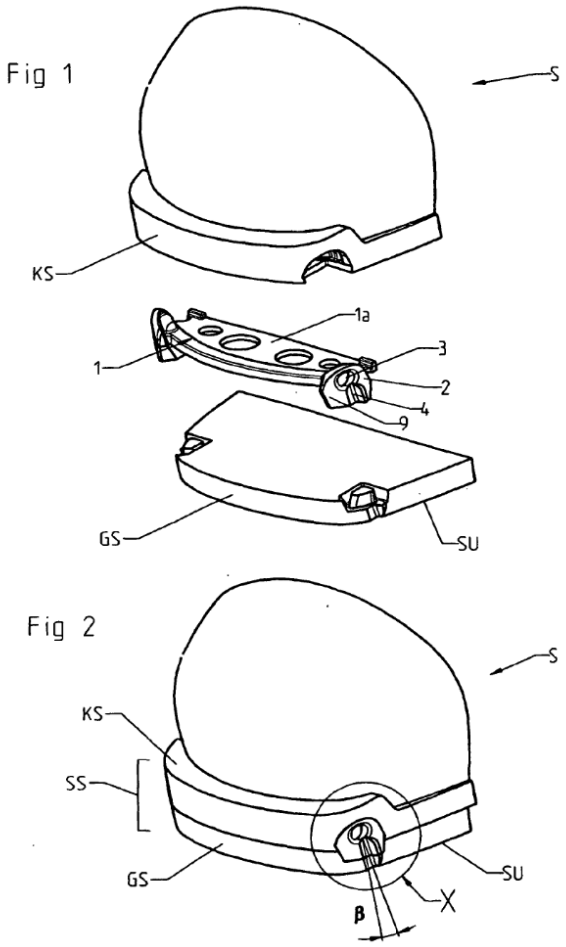
The next patent is EP2259850B1, for a ski binding heel unit. This patent describes a ski binding heel unit that can be transitioned from uphill (stowed) and downhill (deployed) with the use of a single motion (Shute et al, 2009). The binding uses a lever that cams the heel piece forward and backward to clear the boot heel (Shute et al, 2009). This patent functions in a similar method to the intended function of the binding design of this project; however this patent will be avoided by creating an adjustable binding mounting plate instead of a binding.

Figure 16



The next patent is US10933297B2 (Anderssen, 2017). This product is intended to move a cross country ski binding forward and backward along the ski in order to change the characteristics of the ski (Anderssen, 2017). Moving the binding allows a user with a waxless, “fish scale”, ski grip pattern to alter the amount of grip or glide the ski provides (Anderssen, 2017). The patent describes a binding that is mounted to a plate that is mounted to the ski, the binding is then adjusted on the plate using a dial (Anderssen, 2017). This patent also describes a method of mounting the binding plate to the ski using various glue pockets. This patent can be avoided by using screws to mount the binding plate (Anderssen, 2017). Using a similar plate system with various pins and notches to secure the binding will also need to be avoided.

Figure 17



The final patent to be considered is EP1559457B1, not because it will be avoided but because it will need to be licensed (Barthel, 2007). This patent describes the boot binding interface that is used as an industry standard for backcountry ski boots. Many different brands make bindings that interface with this system (Barthel, 2007). The system works by using two metal divots on the side of the boot that interface with two locking pins on the binding (Barthel, 2007). By licensing this patent, the binding system that is design can be ensured to be compatible with current boots and safety standards.

Color Trends

Figure 18

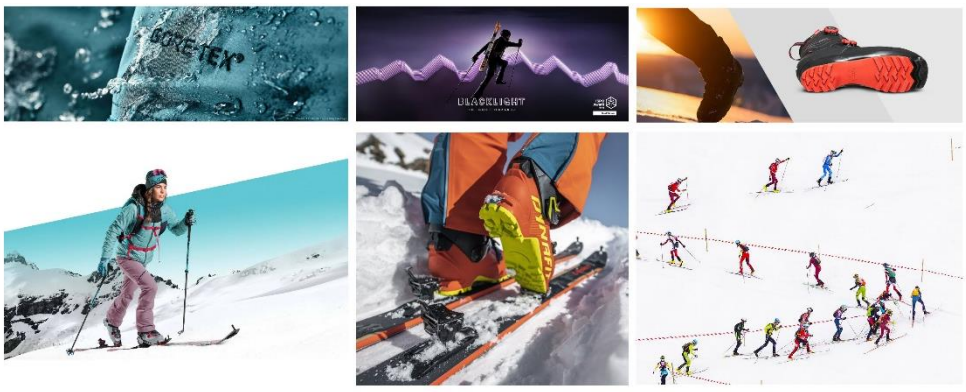
Current colors in the ski industry are highly visible and intense (Berger, 2020). Colors such as bright orange, lime green, periwinkle, and turquoise are common and often don't complement each other (Berger, 2020).

Figure 19

Future color trends according to WGSN, color trends in the future will increasingly be influenced by the changing climate of our world (Samba, 2023). Color trends will be representative of desires for restoration (Samba, 2023). WGSN claims familiar tones will connect with consumers while intensely bright natural colors will represent the urgent need to stop climate change. This color palette mirrors the sentiment of the backcountry ski community by portraying the anxiety towards changing climate. The colors that are used in this project will aim to harmonize with each other and be more meaningful than what is currently in use.

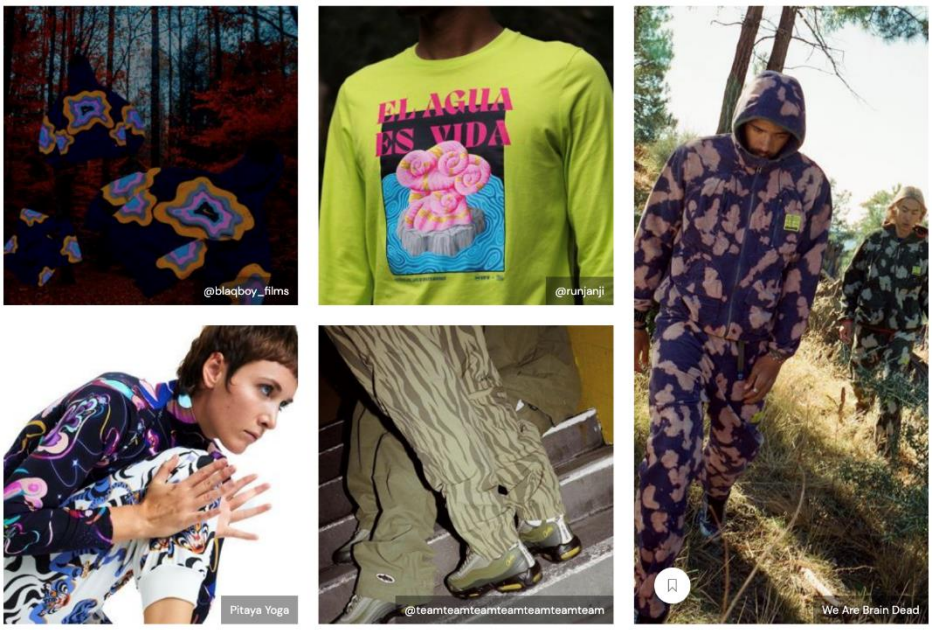
Graphic Trends

Figure 20



Current graphic trends in the ski industry include bright colors, invoke motion, and energy. Some current graphics applications such as the Dynafit Blacklight collection trend towards a high tech, nostalgic, style, but don't push into the future Super-nature trend.

Figure 21



According to WGSN, autumn and winter graphic trends include Super-nature (Browning, 2023). The Super-nature trend looks to connect users to nature by referencing the digital world we live in (Browning, 2023). Colors and patterns that appear in nostalgic technology are morphed to blend with nature. Patterns like digital camos are used along with bright colors that contrast natural tones. This can be seen in the ski industry though the use of colors that are contrasting but reference natural tones. The ski industry can push this digital nostalgia trend due to the high-tech nature of backcountry ski apparel and equipment. The recent Dynafit Blacklight collection pushes this trend through its use of digital graphics (“Dynafit international” n.d.). While this product line is starting to tap into the digital nostalgia of the Super-nature trend, it doesn’t reference nature in the way WGSN is expecting. This trend will be important in the backcountry ski community due to its attempt to connect to nature. Escaping the crowds and finding time in nature away from technology is one reason many choose to pursue the sport (“4 reasons to go backcountry skiing” n.d.).

Branding and Logo Trends

Figure 22

Branding on ski boots has been mostly minimal. Logo placements on ski boots can be viewed as large text blocks placed along the side of the boot. They can also be found as small text logos placed somewhere along the cuff or other major feature on the boot. Comparing the branding of La Sportiva ski boots (Figure 22) to the branding of Atomic or Salomon ski boots can show the different use of brand text logos. La Sportiva routinely uses the words "La Sportiva" as the main branding on a boot ("La sportiva north America—Shop for backcountry ski boots" n.d.). The brand name features on many boots across the entire length of the clog section, with some boots featuring enlarged text features (Figure 22) ("La sportiva north America—Shop for backcountry ski boots" n.d.). Atomic boots, however, feature minimal text to accomplish branding. Atomic boots only feature text in a minimal portion of the clog (Figure 23), typically along some main structural element ("Touring boots men | atomic us" n.d.). Atomic also accomplishes branding through the use of similar forms among their boot line and by using consistent colors. The consistency along all of their boots allows the branding to be succinct and easy to identify. La Sportiva's branding is maximal and differs among their boot line ("La sportiva north America—Shop for backcountry ski boots" n.d.). Many of the boots in La Sportiva's line use consistent color to achieve branding but there are several that differ from this language. This

allows consumers to differentiate La Sportiva boot models but makes the brand as a whole less identifiable on the mountain.

Figure 23

The branding that Salomon (Figure 24) uses is close to that of Atomic but leans even farther towards branding through form and materials (“Salomon” n.d.). Where Atomic uses form and color to brand their boots, Salomon uses form and material. Atomics branding uses neutral colors with red, Salomon’s branding focuses on the form of their single boot offering and the use of recycled materials. Salomon branding uses their signature Skywalk touring sole, made partially from recycled rubber, and their “Surelock” ski walk mechanism (Koppa,2023). The “Surelock” mechanism has been used on several Salomon ski boots in the past and is visually unique to the brand.

Figure 24

Physiological Research

Physiological needs for ski touring and cross-country skiing can be incredibly demanding. Aspects to consider are technique, terrain, conditions, and descending (Smith, 2010). Technique in cross country skiing uses both the upper and lower body to propel the athlete forward. There are many different techniques that use different combinations of ski strides and pole strikes.

A few of these are double poling, skating, and parallel, “classic”, striding. Double poling refers to using both poles at the same time to push the skier forward without using the legs (Kelly, 2022). This technique mostly uses the upper body (Kelly, 2022). This double poling motion

can engage the arms, shoulders, and core to provide maximum force to the snow. This technique is useful in most types of skiing since the skier is sometimes found in a flat or slight downhill.

The next technique is skating. Skating uses the legs to propel the body forward at higher speeds and typically incorporates some type of double poling action (Kelly, 2022). This technique is most seen in ski racing and will most likely not be used by the consumer that is focused on, in this project.

A third commonly used technique is the parallel stride. This technique uses the legs in a kick and glide motion to propel the body forward (Duoos, 2012). In this technique the arms can be used to supplement with polling. This is the main motion that will be used by the user in the project.

Biomechanical Research

Biomechanical research in this project will focus on the kick and glide motion that will be used by the athlete. The “kick and glide” refers to the motion of pushing down and rearward with one leg while shifting the skier's body weight to the other leg. This motion, paired with an optimal pressure distribution along the ski, is what allows cross country skiers to quickly traverse snow-covered trails (Smith, 2000). Cross country skis are designed such that the middle, cambered, section of the ski doesn’t touch the snow when the skier is standing on the skis. This middle section of the ski contains some element that can grip the snow; often wax, scales, or skins. Each ski stiffness must be tailored to the skier's weight to achieve this (Smith, 2000). As the skier “kicks”, they transfer their weight to the kicking ski. The force that is produced by the skiers kicking leg can be broken down into vectors that exert forces vertically down onto the snow and rearward (Smith, 2000). This vertical force vector compresses the middle camber of the ski allowing the grip pocket to grip the snow (Smith, 2000). The grip produced by this vertical force allows the skier to grip the snow and propel themselves forward (Smith,2000). After the kicking motion is completed, the ski returns to its normal state with the camber elevated off of the snow. At this point only glide wax portions of the ski are in contact with the snow allowing the

skier to make full use of the momentum generated by the kicking portion of the "kick and glide" (Smith, 2000).

Psychological Research

Psychological research was conducted to better understand and connect with the user. The paper *Differences in Sensation Seeking Between Alpine Skiers, Snowboarders and Ski Tourers* by Kopp et al. was used. Kopp explains four segments of sensation seeking developed by Bouter et al., 1988 and Zuckerman, 1971. He uses these four segments of sensation seeking to understand the differences between alpine skiers, ski tourers, and snowboarders. The four segments explain are: thrill and adventure seeking (TAS), disinhibition (DIS), Experience seeking (ES), and boredom susceptibility (BS) (Kopp, 2016). TAS is explained sensation seeking through taking new risks and seeking adventures. DIS is sensation seeking through drinking and partying. ES is seeking experiences of the mind and senses. BS is describing people who are easily bored and dislike repetitive activities.

Kopp et al. ranks ski tourers, snowboarders, and alpine skiers using these criteria. Ski tourers in thrill and adventure seeking and experience seeking (Kopp et al., 2016). Snowboarders were the highest in disinhibition and boredom susceptibility but were also high in thrill and adventure seeking (Kopp et al., 2016). Alpine skiers had the lowest total score among the three groups (Kopp, 2016). Kopp related this relationship to the ski tourer's sport being in mountains that aren't confined by a ski resort (Kopp et al., 2016). The ski tourer also didn't score high in boredom susceptibility (Kopp et al., 2016). These factors could lead to the conclusion that ski tourers are driven by some other factor than speed and adrenaline. The desire to explore and experience the mountains and nature must be higher than the desire to ski fast.

User Insights Plan

To collect user insights two different methods were used, Surveys and interviews. Surveys were sent to users using social media, online forums, and local groups to try to collect as

many answers as possible. The goal of the survey was be to ask what type of gear is currently being used, to determine ratings for fit, use, efficiency, and comfort of this gear. The information collected was used to help determine a common opinion on product issues within the community.

Luc Mehl has finished the AMWSC several times and won twice and is an expert in long winter traverses. He has agreed to provide input and insights into the ways and reasons that Alpine Touring boots are modified for this type of terrain. This interview will happen the week of December 4th. Questions for this interview will include:

- What are the benefits that you are hoping to gain when modifying a ski boot?
- What are the drawbacks you are hoping to avoid when modifying a ski boot?
- What have been the most successful modifications that have been made to boots you have used?
- Do you use a locking cuff and heel on some of your boots? What are the reasons for including or not including these features?
- What is the biggest drawback you see in current ski boot offerings?

A user insight questionnaire was sent using Reddit's Backcountry online forum. In addition to survey responses, general feedback from online users was collected by posting questions on different forums. Questions were posted to Reddit Backcountry and XCdownhill forums.

- How flat does a tour need to be before it's considered nordic ski territory?
- How much does forefoot flex matter for touring efficiency?
- Does a completely rigid boot like an alpine touring boot make the "kick and glide" motion less efficient?
- Assuming it doesn't affect torsional rigidity, would a sole with greater forefoot articulation make it easier to use the skis "grip zone"?
- How do boots effect touring efficiency?
- Does anyone have experience with courses that contain long, flat or rolling sections but also some steeps?

- How did the gear you selected affect your experience in this type of terrain?
- What would you do differently to make your tour more efficient?

User Insights Questionnaire

User insights were collected using a survey that was distributed via online forums and social media. The purpose of the survey was to gain a greater understanding of what equipment users prefer. Questions were asked to determine the demographic and level of experience of the respondents. Once the type of gear, experience level, and frequency of use is determined the rating for the gear that is used was determined. The responses from the questionnaire were used to a general sense of feedback from a larger group of users. Answers to the last three questions were used to ensure that desirable features are included in the design of this project.

- How many days a year do you ski in the backcountry?
- How would you rate your skiing ability? (Beginner, intermediate, advanced, expert)
- Do you use “alpine touring” or “telemark” / “nordic” boots and bindings?
- What is your preferred backcountry ski boot?
- What type of traction device do you use with this system? (skins, kick wax, fish scales)
- Rate your perceived descending control due to the system from 1 – 10
- Rate your perceived climbing efficiency due to the system from 1 – 10
- Rate your perceived flat trail efficiency due to the system from 1 – 10
- What are some reasons why you choose this setup?
- What are the shortcomings of the system that you experience most?
- What is one thing you would change about your current boot, binding, or ski pants set up to make your ski days more fun and efficient?

User Insights Results

Figure 25

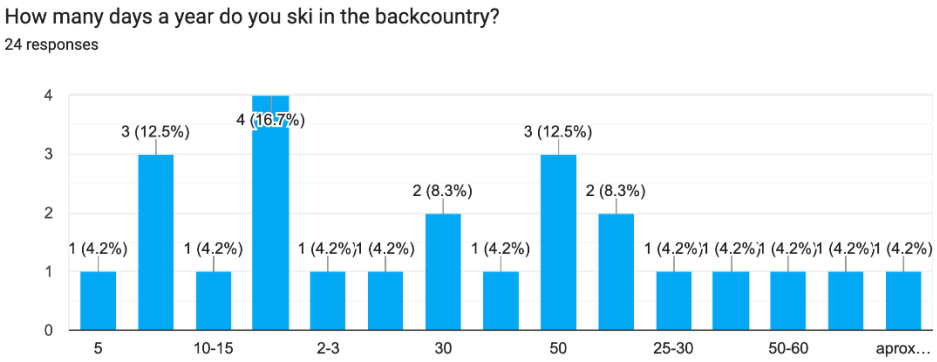


Figure 26

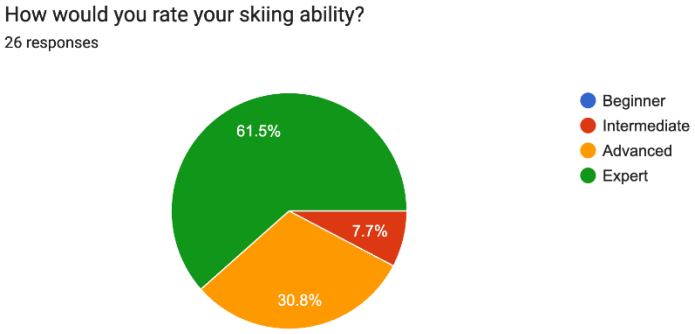


Figure 27

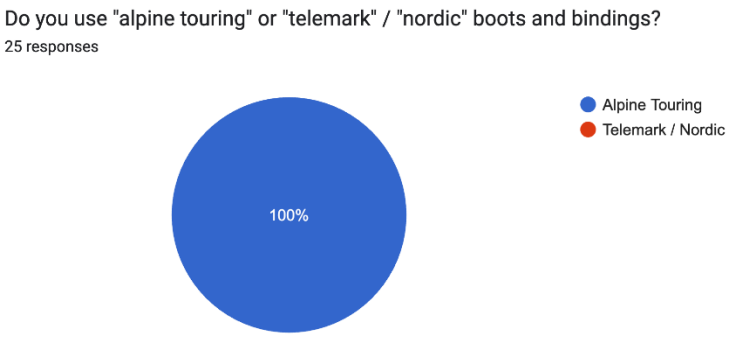


Figure 28

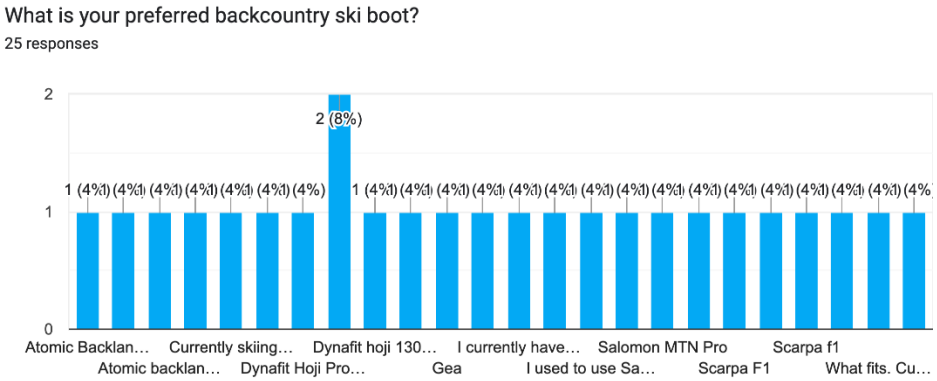


Figure 29

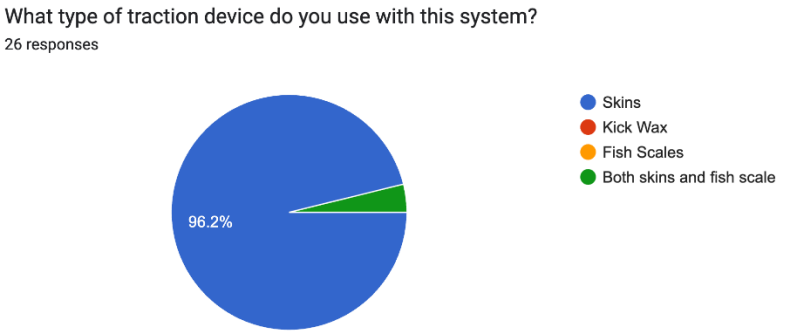


Figure 30

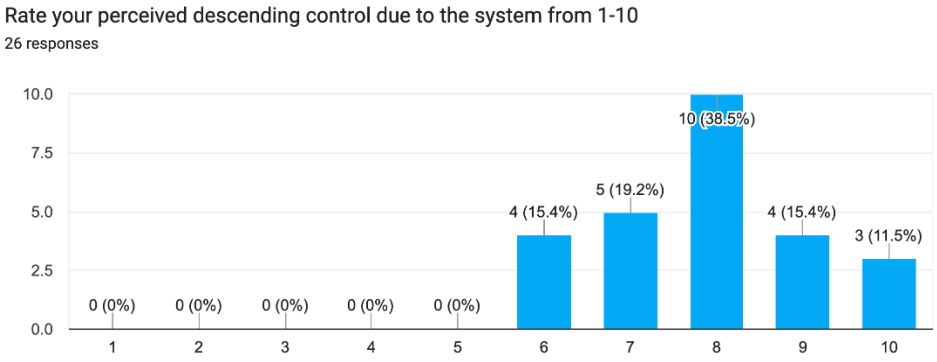


Figure 31

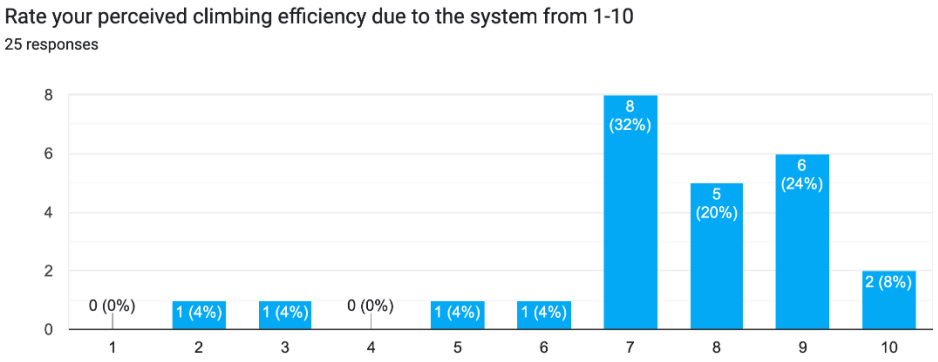
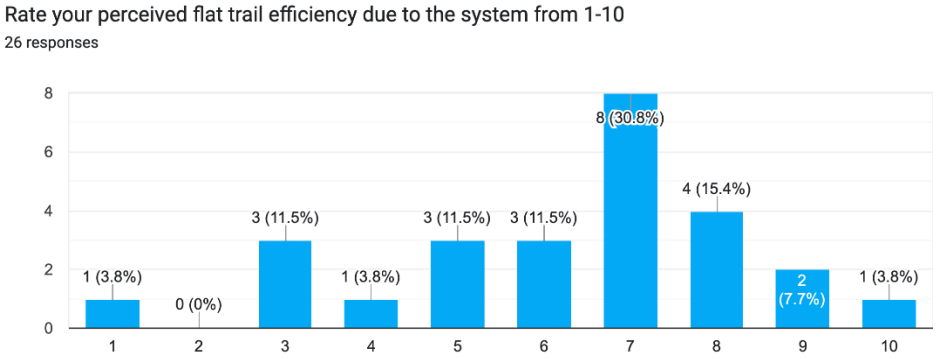


Figure 32



The user insights questionnaire I sent out received 26 responses. 61.5% of respondents identified as expert skiers, 30.8% identified as advanced skiers, 7.7% identified as intermediate skiers, and 0% identified as beginner skiers. 100% of respondents used alpine touring boots and bindings instead of “telemark” / “nordic” boots and bindings. 3.8% of respondents used a fishscale grip pattern for traction, the rest used skins.

Main take aways from the reasons users chose their boot setups were that users appreciate the versatility of the touring boots, finding them secure on downhills and performing well in both uphill and downhill scenarios. Users value the fast transition from ski to walk mode with a single lever, making it convenient for all-day tours. Overall, these boots were commended for their ability to "do everything" and provide an ideal balance between lightweight design and rigidity.

Some drawbacks users identified with their current setups include heavy weight, long transitions due to the ski walk lever becoming icy. Some users find limited range of motion on the uphill and a softer flex than desired on the downhill. Sizing challenges, with some users experiencing discomfort or toe pressure after sizing down, have also been reported. Some users express a desire for lighter, stiffer, and more progressive boots.

This user insight data shows that versatility, downhill security, ease of use, convenience, range of motion in walk mode, fit, and comfort are all aspects that must be considered during this project's design phase. It can also be noted that scores for flat trail touring efficiency were overall lower than climbing efficiency and descending control. This shows a possible need for improved flat trail efficiency for users who spend more time in this type of terrain.

SWOT Analysis

SWOT - CRAFT FORCE PANTS

Strengths

- Light weight
- Water resistant
- Fits well over top of nordic ski boots
- Good fit for athletic nordic skiing
- Warm enough but not too warm

Weaknesses

- Lack adjustability
- Doesn't breath well
- Cheap construction

Opportunities

- Should use adjustable waist band to accommodate different sizing
- Adding pockets would increase versatility

Threats

- As the user loses or gains weight they will need to replace due to lack of adjustment
- Other companies use higher quality construction methods might provide greater value
- Consumer might be willing to pay more for a different pair of pants that breaths better even if the fit isn't as good

Price and image of the Craft Force Pants are shown in figure 3

SWOT - ALPINA ALASKA 75

Strengths

- Comfortable and warm, insulated, soft, upper
- Alpitex membrane keeps feet dry
- Anatomical footbed provides comfortable fit
- Three Pin binding system interface is simple with no moving parts
- Typical boot lacing pattern can be adjusted for fit

Weaknesses

- Soft upper lacks Ankle support
- Soft sole lacks lateral stiffness to control ski
- Rubber sole can delaminate due to binding forces
- No ability to lock heel to ski
- Difficult to tie laces with gloves on in a cold environment

Opportunities

- Increase upper stiffness to increase support
- Increase lateral stiffness in sole to improve power transfer to ski during turns
- Add a way to increase cuff stiffness for descending

Threats

- Becomes irrelevant if binding standards change and manufacturers don't make three pin bindings
- Sole delimitation might deter consumers seeking high value

Price and image of the Alpine Alaska 75 boot are shown in figure 3.

SWOT - ROTTEFELLA SUPER TELEMARK

Strengths

- Simple rugged construction
- Inexpensive
- Fits widely available boots
- Lightweight

Weaknesses

- Can't step in, requires locking with hand or pole
- No heel lock function
- Toe lug system requires extending the boot sole
- No frictionless pivot mode
- Clamping the boot sole can cause damage to boot
- Won't release the boot during a crash

Opportunities

- Could widen toe interface to improve power transfer
- Update materials to make binding lighter and more modern
- Add some way to pivot more with less friction

Threats

- Might be phased out by newer technology
- Compatible boots might be more difficult to find in the future
- Safety conference may cause consumers to choose a releasable binding system

Price and image of the Rottefella Super Telemark binding are shown in figure 3.

SWOT - SWIX CROSS PANTS

Strengths

- Breathable fabric is effective for controlling sweat
- Wind resistant front fabric helps with warmth
- Stretch fabric benefits mobility
- Fit works well for nordic skiing
- Reflective embellishment for visibility

Weaknesses

- Lacks functional pockets
- No secure adjustment system for waistband
- Lower panels lack shell functionality

Opportunities

- Could add more pockets to increase functionality and versatility
- Add same TPU coated fabric from the front panel to the lower legs to improve protection in deep snow

Threats

- Users that require more layers in colder climates might not fit these pants
- Options with greater waterproofness similar to Gore-tex might be preferred in certain climates
- Main polyester construction might not resist certain mountain environments

Price and image of the Swix Cross Pants are shown in figure 5.

SWOT - ALFA FREE

Strengths

- Fits new Xplore binding system
- Integrated Ankle Support System increases support and control
- Gore-Tex liner, thermal midsole, and insulated upper keeps feet warm and dry
- Boa closure is easy to use

Weaknesses

- Binding interface pins can become iced over and stuck
- No heel lock for downhills
- Expensive

Opportunities

- Could add a function to increase stiffness for power transfer while descending
- Anti icing feature to improve reliability of binding interface

Threats

- Slow adoption of new binding system might make compatible skis and bindings difficult to find
- New technology hasn't proven ruggedness and long term durability in the same way Three Pin bindings have

Price and image of the Alfa Free boot are shown in figure 5.

SWOT - ROTTEFELLA XPLORE

Strengths

- Wider connection point increases power transfer to ski
- Step in function makes interacting with binding easier
- Frictionless pivot increases efficiency
- Interchangeable bumpers allow user to tailer binding to their needs
- Lightweight and includes heel riser for easy climbing

Weaknesses

- Must use Rottefella sole in boot construction
- No heel lock function for descending
- Doesn't release in a crash

Opportunities

- Add heel lock function for descending
- Could include more height adjustment for heel riser
- Interchangeable bumpers could be easier to swap with gloves on
- Add an auto de-icing function to pair with boots
- Add release function for safety

Threats

- Current users of other systems might not feel the need to switch to new technology
- Compatible boots are limited
- Safety conscious consumers might choose a releasable binding

Price and image of the Rottefella Xplore binding are shown in figure 5.

SWOT - OUTDOOR RESEARCH TRAILBREAKER TOUR

Strengths

- Functional pockets, included avalanche beacon pocket
- Zippered ventilation improves thermo regulation
- Snow gaiter blocks snow ingress at cuff
- Zoned stretch and shell fabrics improve fit, function, and protection
- Softshell is breathable and durable

Weaknesses

- Not entirely waterproof
- Not as insulated as other options
- Expensive

Opportunities

- Create better integration with base and mid layers to improve versatility in extreme cold
- Add additional options that use thicker, warmer, materials but offer the same functionality

Threats

- Not suitable to skiers in wet environments

Price and image of the Outdoor Research Trailbreaker Tour Pants are shown in figure 6.

SWOT - SCARPA F1 LT

Strengths

- Lightweight
- Large ankle articulation range of motion
- Simple mechanisms, Easy to switch ski/walk mode
- Comfortable fit
- Heel can lock for descending
- Cuff locks for better power transfer on downhill

Weaknesses

- Boa closure lacks heel hold
- Cuff closure not linked to ski/walk lever
- Only comparable with "tech" bindings, Can't use "shift" style bindings
- Not as stiff as other offerings

Opportunities

- Use a more secure closure on lower foot to improve heel lock down
- Increase stiffness

Threats

- Some users might prefer a stiffer boot even if it is heavier
- Lightweight boots are difficult to punch, if the boot doesn't fit it can't be modified to fit as easily as other boots

Price and image of the Scarpa F1 LT boots are shown in figure 6.

SWOT - DYNAFIT SUPERLIGHT 150

Strengths

- Lightweight
- Adjustable release value from 3 to 14 in lateral release
- Replaceable U spring to change vertical release value
- Simple design is easy to use
- Multiple heel raiser hight
- Heel lock for descending

Weaknesses

- Vertical release value not easily adjusted on the fly
- Additional product is needed to adjust for boot sole length
- Front toe release is not adjustable
- Price

Opportunities

- Could add adjustable release value to toe piece

Threats

- Only compatible with boots that have "tech" binding inserts

Price and image of the Dynafit Superlight 150 binding are shown in figure 6.

Competitor Products

Two options for competitor testing are testing the Alfa Free with explore binding or testing the Scarpa f1 with “tech” style alpine touring binding.

Alfa Free Boot

Free A/P/S GTX M - Xplore mountain ski boot size 43-44. Priced at $700 from Alfa.

Xplore Binding

Xplore BC Ski Binding, one size available. Priced at $250 on Backcountry.com.

The Alfa Free boot is a more direct competitor in the flat and rolling terrain touring category. This boot requires the Rottefella Xplore binding to be mounted to a ski to be used. This option would be more expensive due to the need to mount a pair of skis with a new binding. Changing my project to focus more on races like the Grand Traverse and Alaska Mountain Wilderness Classic would make this less of a direct competitor.

Scarpa F1 Boot

F1 LT MEN'S size 27, priced at $950 from Scarpa.

This boot is also a competitor in lightweight ski touring. This boot uses “tech” style alpine touring bindings. This would allow this boot to be evaluated and used with a Dynafit “tech” binding that is already mounted to a ski. This binding will also be used for the remainder of the testing in the project. This boot could also be purchased from a local used/consignment store to save on materials budget. The preferred method to purchase this boot would be to try on and buy from a used source. There are also several other boots in the sub 1000 gram category which would provide similar characteristics for testing. Other boots in this category include the Scarpa Alien series of boots, Dynafit TLT series of boots, Dalbello Quantum, La Sportiva Raceborg, La Sportiva Racetron, and Atomic Backland. The differences in these boots are mostly fit and branding. Any of these products can be seen being used in the environment that is designed for

in the project. As Carly said during the testing plan meeting, any purchases from used gear shops can be approved by her over teams prior to purchasing.

Pants

Outdoor Research Trailbreaker Tour Pants

I own a pair of these pants from previous years of skiing. The pants will be tested by wearing them to evaluate for usefulness and ease of access to pockets. Access to avalanche beacon and other necessary items will be timed over the course of ten tests while wearing typical ski touring gloves. Access time will be evaluated.

Testing Plan

How can we design an alpine touring boot for courses that cover more distance than elevation? Based on user insights, flat touring can be improved by adding metatarsal articulation to a boot. The boot should also have a large range of ankle articulation similar to modern alpine touring boots. The boot also needs to be supportive enough in ski mode to transfer power to the ski. Performance metrics to measure when testing a boot design will be ankle articulation degree, metatarsal articulation degree, lateral cuff stiffness, and length of the paralell stride during the kick and glide motion.

Other qualitative data will be collected through athlete testing to measure perceived walking efficiency, comfort, and perceived control while descending.

For the pant portion of this project, time to access certain items will be assessed to ensure ease of access with gloved hands. Locations of pockets will be evaluated to ensure access to items doesn't interfere with other items such as avalanche beacons.

Methods:

To collect data on boot cuff and sole stiffness, a boot will be mounted in a binding toe piece perpendicular to the ground. Weights will be hung from the top of the cuff and the deflection of the cuff will be measured.

1. Clamp test boot into binding
2. Mount binding perpendicular to ground and set up camera tripod for measuring deflection.
3. Add 5 lbs to boot cuff and measure deflection. Repeat with 10 lbs and 15 lbs.
4. Overlay photos and measure the deflection using Rhino.

Testing boot "walkability" will also be important to ensure performance. Metatarsal articulation will be measured using the same vice testing set up that is used to measure torsional and lateral stiffness. Instead of twisting the sole, the sole will be bent at the metatarsal and angle achieved will be noted.

A stride analysis will be conducted to measure how the prototype boot performs. Pressure sensing insoles will be worn on both feet, the baseline boot will be worn on one foot and the prototype boot on the other. A tester will "skin" in a typical kick and glide stride. The pressure distribution and duration will be recorded and evaluated.

The pressure distribution of the insole can be used to determine which part of the foot the user is pushing on. This pressure distribution is important due to the biomechanical interaction between the user, the boot, and the ski to efficiently move using the "kick and glide" motion. The duration of time the user was able to pressure the front of the foot near the metatarsal phalanges joint was recorded through analyzing the pressure map. The boot with a longer duration with pressure concentrated on the front of the foot will be successful in lengthening the kick phase of the "kick and glide" motion.

Pant pockets will be evaluated by timing a user who is wearing the pants and wearing medium weight winter gloves. Access to each pocket will be timed ten times to find an average time. The items being accessed throughout the project will remain the same in all tests. Items will include avalanche beacon in dedicated pocket, cell phone, and a small snack.

Analyzing Data:

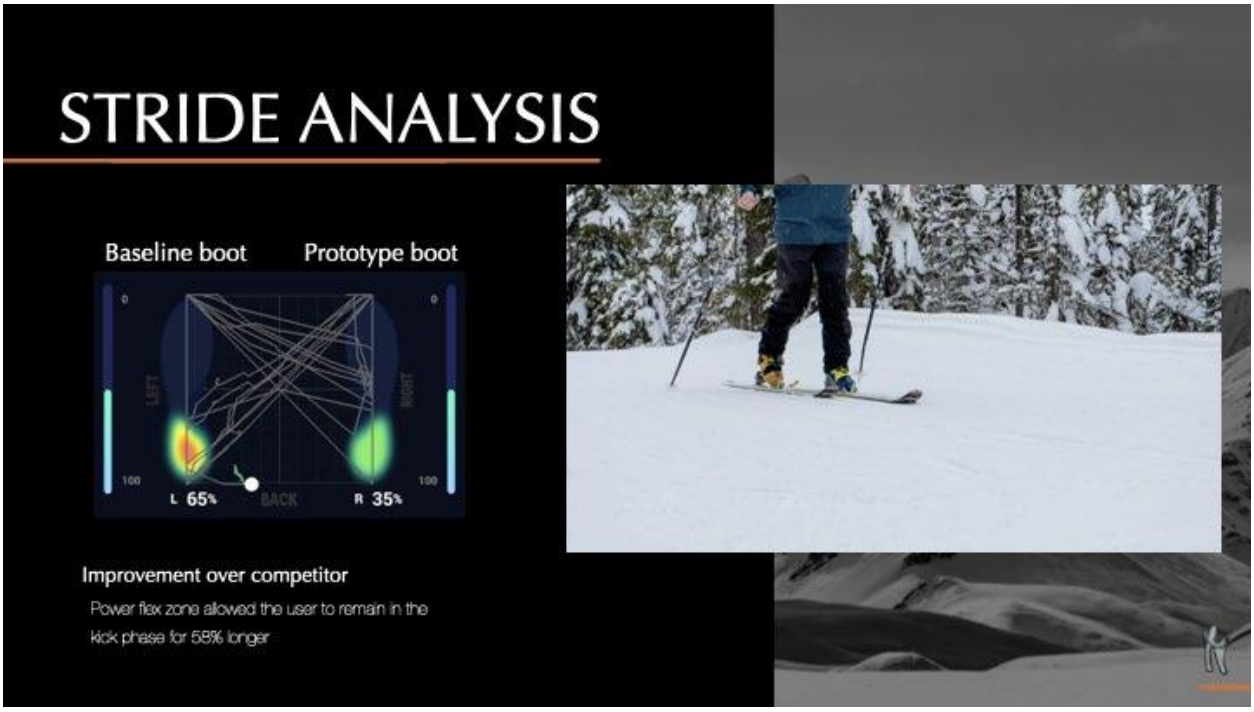
To analyze the data, I will first test an unmodified boot sole stiffness to use as a baseline. From this baseline I hope to see how modifications to a boot shell effect stiffness.

Data will be analyzed to determine a way to quantify the support that a boot is providing to its user. Numerical data from vice tests will be compared to qualitative data provided by user ski boot flex tests. By comparing this data, a goal user flex rating and a goal vice test score can be established for the remainder of the project. The goal flex and vice test scores can be used to compare state of the art products to the products created in the project and ensure success of the new product.

Testing Results

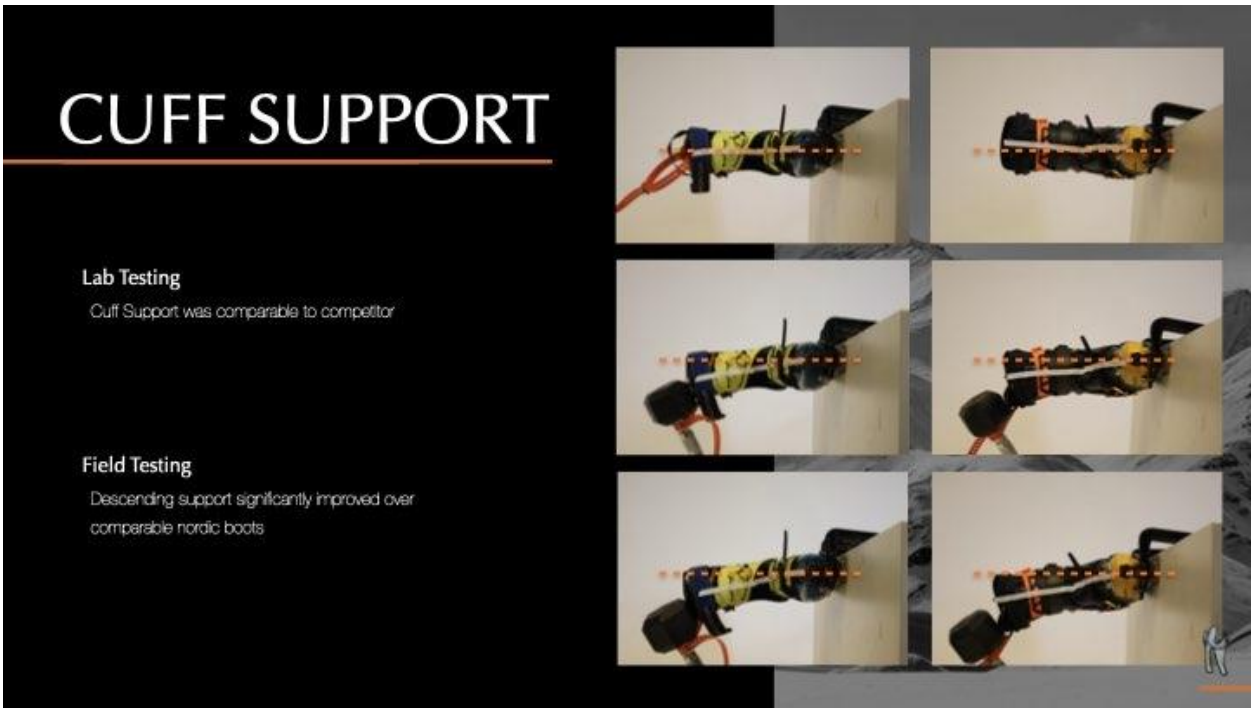
The stride test was conducted at Timberline ski area on a flat section of the alpine ski trail. The groomed surface provides a consistent testing environment. Through the stride analysis test the addition of the "Power Flex Zone" lengthened the stride by 58%. This proves that the technology was successful.

Figure 33



In the lateral cuff support test, the prototype boot flexed roughly 80mm more than the control boot with the 5lbs and 10lbs weights. With the 15lbs weight applied the prototype boot flexed 185mm more than the control boot. This shows that the boot is providing support but also shows that the upper cuff closure method could be improved. Optimizing the strap system will most likely lead to the prototype boot providing more support.

Figure 34



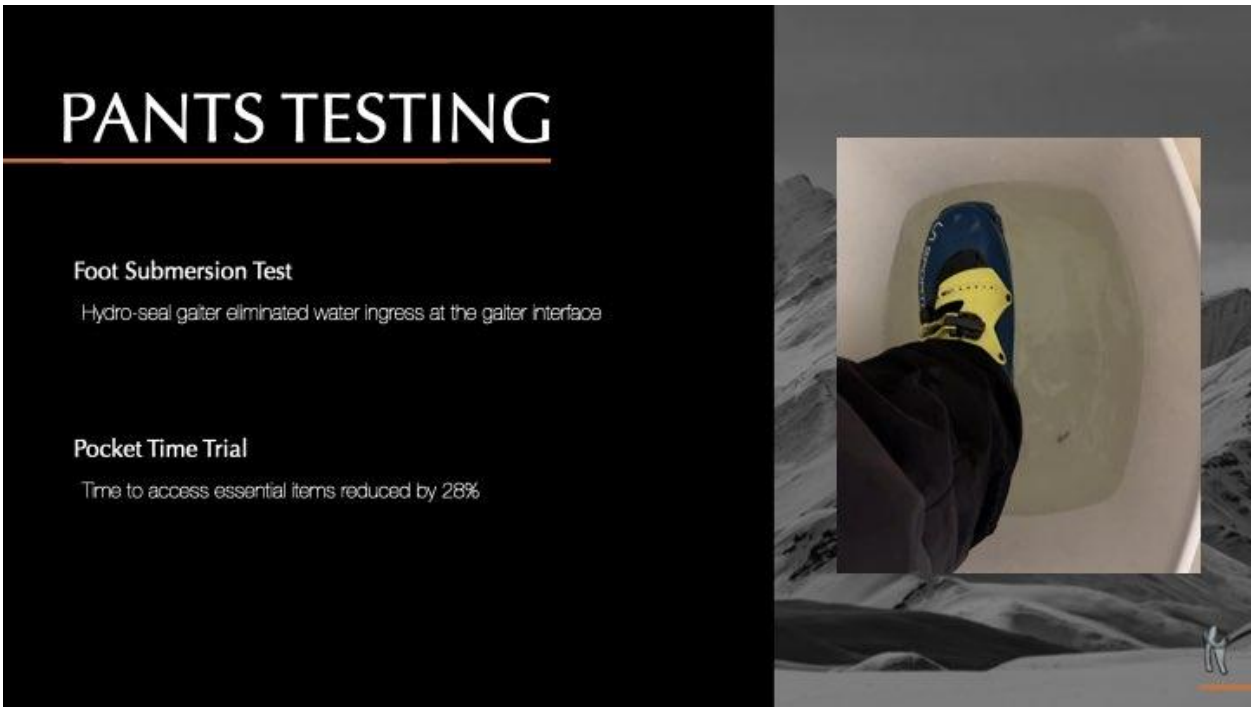
Through the process of fit testing for last shape, the ankle articulation was tested. During fit testing the articulation met the goal of 40 degrees in plantar flexion and 20 degrees in dorsal flexion.

In the “hacked” boot prototype the metatarsal articulation was improved from zero degrees to 25 degrees.

Figure 35

Pocket time trials used to test the pants concluded that the prototype pants allowed for 28% faster access time than the competitor pants. Foot submersion tests also showed that the pants / boot gaiter integration slowed the water ingress time by 75%.

Figure 36



Platform Technology

Power Flex Zone:

The Power Flex Zone is the area of the boot that provides articulation of the forefoot. This area is made flexible by removing shell material from key areas on either side of the forefoot of the boot shell. These cuts allow the boot sole to flex providing a more comfortable and efficient stride while the boot is in walk mode.

Dual Tongue System:

The Dual Tongue System comprises an upper and lower tongue that link the boot cuff, rear clog, and forefoot clog together in ski mode. While in walk more the upper tongue rotates up and unlocks the boot to fully articulate.

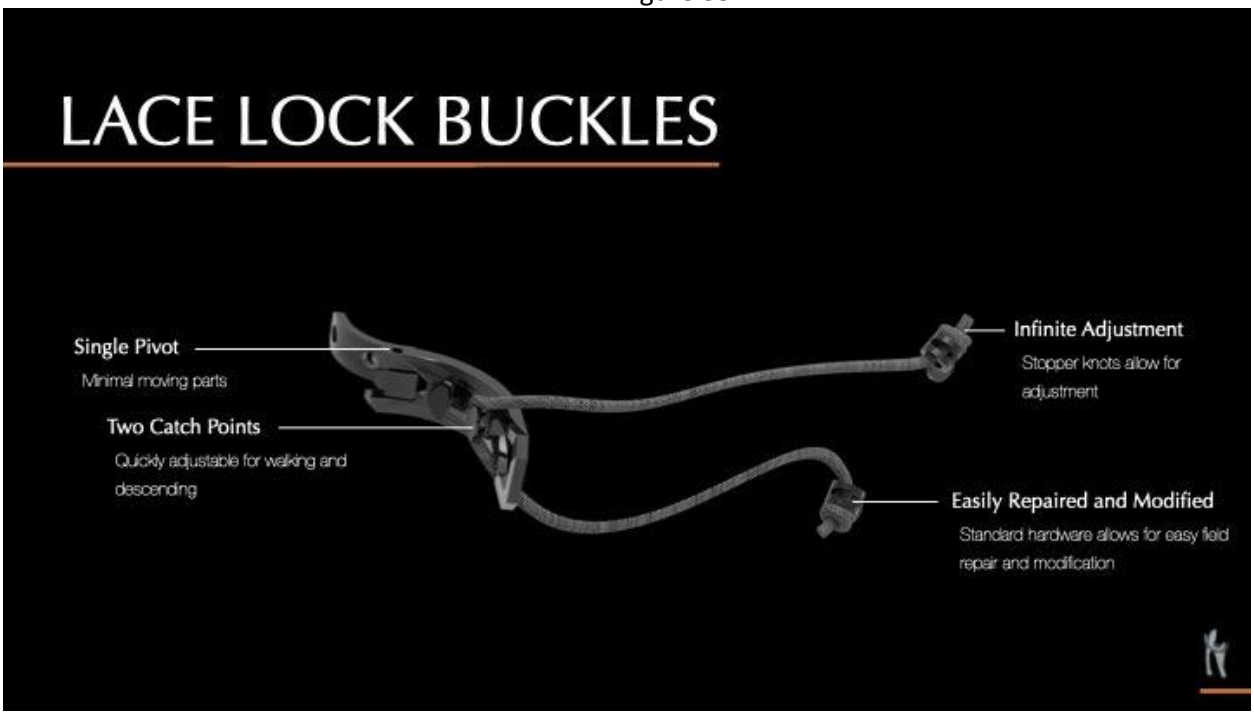
Figure 37


TECHNOLOGY
Power Flex Zone
Longer stride
Increased power
Improved comfort
Walk Mode
Dual Tongue System
Direct power transmission
No play in ski mode
Lace Lock Buckles
Easily modified and repaired
Allows for secure lockdown
Ski Mode

Lace Lock Buckles:

The Lace Lock buckles are the main lockdown and closure method for the boot. The buckles are made up of a main pivot and a base. On the main pivot there are two catches that secure a lace. The lace can be adjusted using stopper knots that are secured to eyelets opposite of the buckles.

Figure 38



Hydro-Seal Gaitor:

This gaiter system ties the waterproof gaiter of the ski boot with the waterproof gaiter of the pants. This system works by sealing the gaiters together with the main ski boot cuff strap. The pants gaiter is worn inside the ski boot cuff, over top of the ski boot gaiter. When the ski boot cuff strap is tightened, a watertight seal is created between the two gaiters.

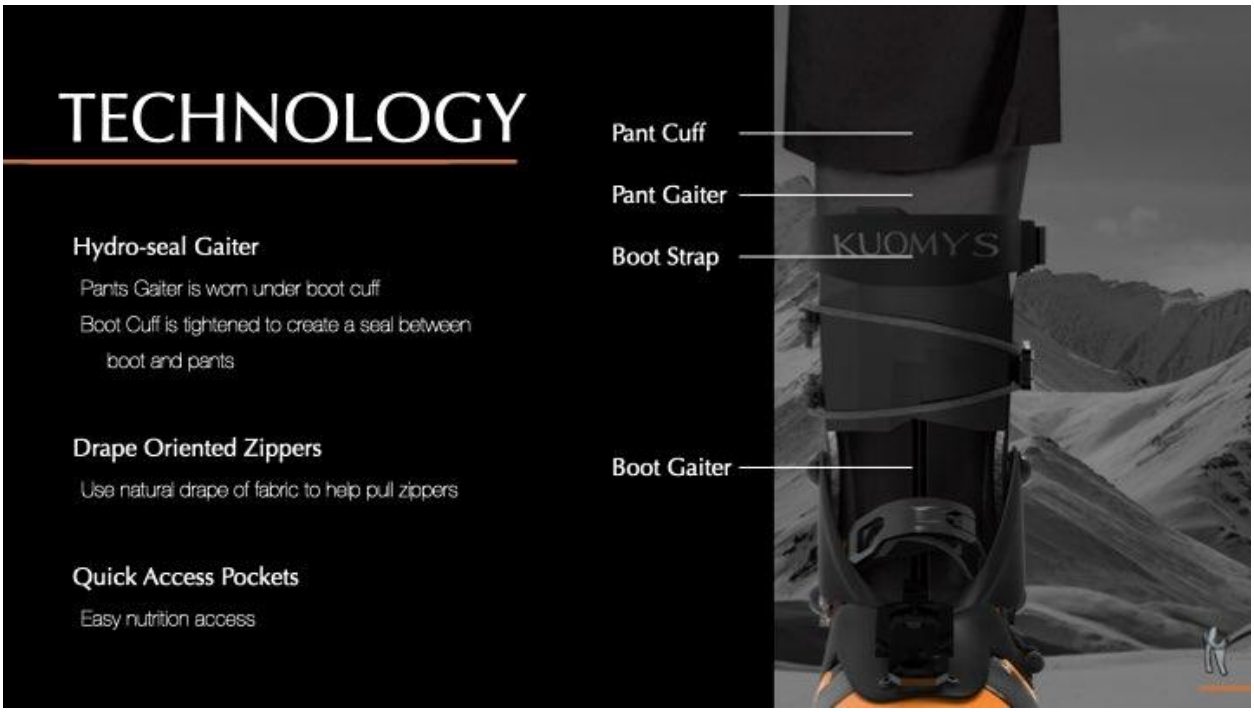
Drape Oriented Zippers:

These pant zippers are oriented in such a way that the pants pull from a natural point when the zipper is used. The main beacon pocket pulls from the hip and waistband at the top of the zipper and from the crotch at the bottom of the zipper. This allows for easier one-handed zipper function.

Quick Access Pockets

These pockets are similar to a cycling jersey rear pocket. They are stretchy and rely on the stretch and the top overlap to secure the pocket. These pockets are intended to hold small snacks and accessories that must be accessed often.

Figure 39



Strengths Finder

My top five strengths are Restorative, Analytical, Futuristic, Ideation, and Intellection (Rath, 2007). My restorative and analytical strengths will help me to learn new techniques for making and testing prototypes. One of the biggest hurdles to success in this project will be to create a skiable prototype. Learning through making will help me to optimize the materials and resources available.

This project will support my career by teaching me the process of designing ski boots. Learning how to design, prototype, and validate a ski boot design will help differentiate me from

other job candidates. This project will also provide a portfolio that demonstrates my ability to design ski boots. This project will help me to deepen my understanding of the ski industry in hopes of finding a career.

Branding

The name and logo of this project are derived from Sikuomys mikros, a small mammal that lived roughly 70 million years ago. The species was discovered in Alaska and given the nickname “ice mouse”. The logo comes from a modified 3d scan of the tooth that helped scientists discover the ancient species.

Project Mentors

Eric Noll – Patagonia

Austin Peters – K2

Javier Bennetton – Rossignol

Hi Joe,

see my answer:

A)
For the marketing requests and what you want to achieve, the first prototypes are created by hand, starting from the model that best reflects the required technical characteristics. This is a very delicate and difficult phase, this work is entrusted to model makers with a lot of experience because they must know how to manage the thicknesses and how to weld the various plastic additions required, it is an almost artisanal job.
B)
For new projects we are still in the "embryonic" phase, we are only evaluating the design proposals. The planning will be done around February.
C)
I believe that it is a truly useful and indispensable tool, both for its versatility and for the speed of creation of the components.
D)
Absolutely yes!

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GROUPE ROSSIGNOL
ANOTHER BEST DAY

Golden Circle

Why – help people to access and enjoy new backcountry terrain

How – efficiently cover more distance

What – create innovative new products that maximize athlete efficiency

Emphasizing exploration and a sense of adventure will be central to this project. Help people access and enjoy new backcountry terrain by creating innovative new products that maximize athlete efficiency to cover more distance. This statement will help to guide this project and direct design decisions.

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