

2015



Trending Boot Technology

# The Most Determinate Piece of Equipment in Skiing is the Boot.



Boots are the transmitters of body movement to the ski. Proper support, comfort, and performance application make the difference between a good day on the snow or a bad.

The best skis will not compensate if you are in the wrong boots, so skiing per se all begins with the boot.

# Ski Boot Anatomy



**Front-entry** or overlap boots are the standard in boot design for downhill skiing. The modern boot configuration with removable liner was introduced by Nordica in 1969.

The shell is the solid outer layer of the ski boot, and is made of two parts, the lower shell and the cuff. The lower shell is the part where your foot is contained and the cuff is the part that goes around the lower leg. Shells are made of plastics, mostly Polyurethane or Polyether. Two or three different types or densities are common, so that different areas of the shell can be optimized to affect strength, stiffness, flex, comfort and ease of putting the boot on and off. The shell's job is to be the exoskeleton of the ski boot, holding everything together, attaching to the ski binding, and providing the strength and stiffness necessary to transmit body forces to the ski.

The shape of the shell in relation to a person's unique morphology effects ski boot comfort. Because of the way front-entry boots clamp across the foot, pulling the sides inward, it is impossible to produce a single design that fits the complex range of foot shapes and sizes. Manufacturers produce a vast array of shell designs, yet there is still a large need for customization.

1969 era ad

**Nordica**

The best  
of the  
bunch.

**NORDICA**

**Nordica from Beconta**

You can buy Nordica boots in the shops that display this sign.

For free catalog and helmet stickers write: Dept N-1, Beconta, Inc., 50 Executive Blvd., Elmsford, N.Y. 10523 or 340 Oyster Pt. Blvd., South San Francisco, Calif. 94080.

# Complete anatomic adaptability is the buzz in boot technology today.

Salomon and its sister brand, Atomic are redefining the science.



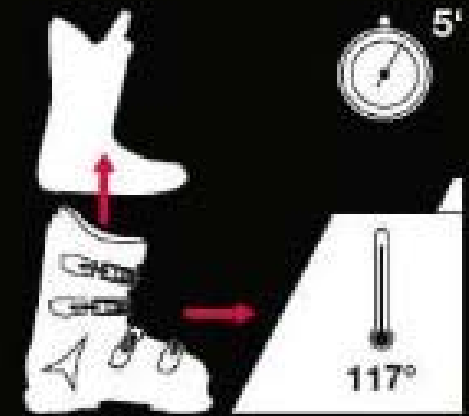
# Here's how it works.

[Salomon](#) and [Atomic](#) have introduced a wholly conformable boot technology and simplified the process, making it feasible to everyone. In about ten minutes and sans a rocket-science procedure, you get an ideal conformance to your unique foot anatomy.

[Fischer](#) pioneered moldable shell technology with the Vacuum Fit. Fischer makes a great product, but retailers focus towards on high-end, race oriented product and the technology requires highly trained techs to carry out the process. Salomon and Atomic offer complete shell and liner anatomic adaptability across a variety of applications and last sizes, at a range of price points and performance levels, while making the process less demanding and reducing the margin for error.

The shell is simply place in an oven and heated for a few minutes. Take the shell out of the oven, insert the liner, step in, buckle, and allow to cool for about six minutes. At the same time a conformable liner is also being shaped to your individual foot anatomy. It's a complete adaptation of the boot shell and liner.

Like Fischer's Vacuum fit, Salomon and Atomic are molding the foot section of the boot since there is little need for the cuff. Salomon's and Atomic's process allows for about 6mm of width expansion in the forefoot and 10mm in the ankle.



# Hike & Ride hybrids are a trending technology.



Crossovers between downhill and alpine touring (AT) boots designed to meet the demands of the new generation of backcountry skiers.

Benefits Include:

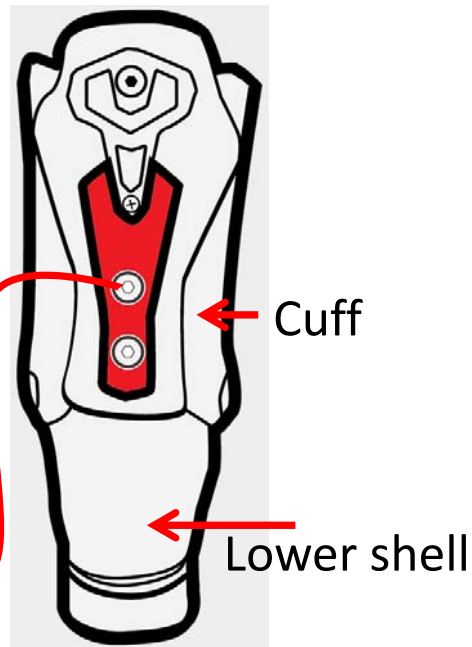
- Greater range of motion for hiking and touring without sacrificing downhill performance.
- Non-skid sole for superior grip.
- Great for walking on hard surfaces like to and from parking.



Ski boots are designed to transfer body movements to your skis, while supporting and protecting your feet, ankles, and lower legs. In order for the boots to transfer forces well, they have to be stiff, lean forward, and restrict the movement in your ankles. This stiffness, forward lean, and lack of movement make it a lot harder to walk in ski boots than normal shoes. Because of this, a number of boot models have a mode that makes it easier to walk in the boots. In the past walk modes were aimed at lower level skiers, but with the increasing popularity of backcountry, walk modes come in all performance models.

Ski boot walk immobility comes from the cuff being anchored to the lower shell. This is where forward flex resistance (stiffness) results from. Un-anchoring the cuff allows the cuff to swing forward unencumbered by flex resistance and swing further backwards. Walk modes are chiefly operated by a lever on the back of the boot and they make ski boots a whole lot easier to tromp about. The adequacy of anchoring mechanisms, in regards to the demands of advanced skiing, is rapidly becoming a past concern. [Lange's](#) updated V-Lock sets a new standard.

Traditional cuff anchoring



Posted binding contact ensures negligible energy transmission loss with non-skid soles



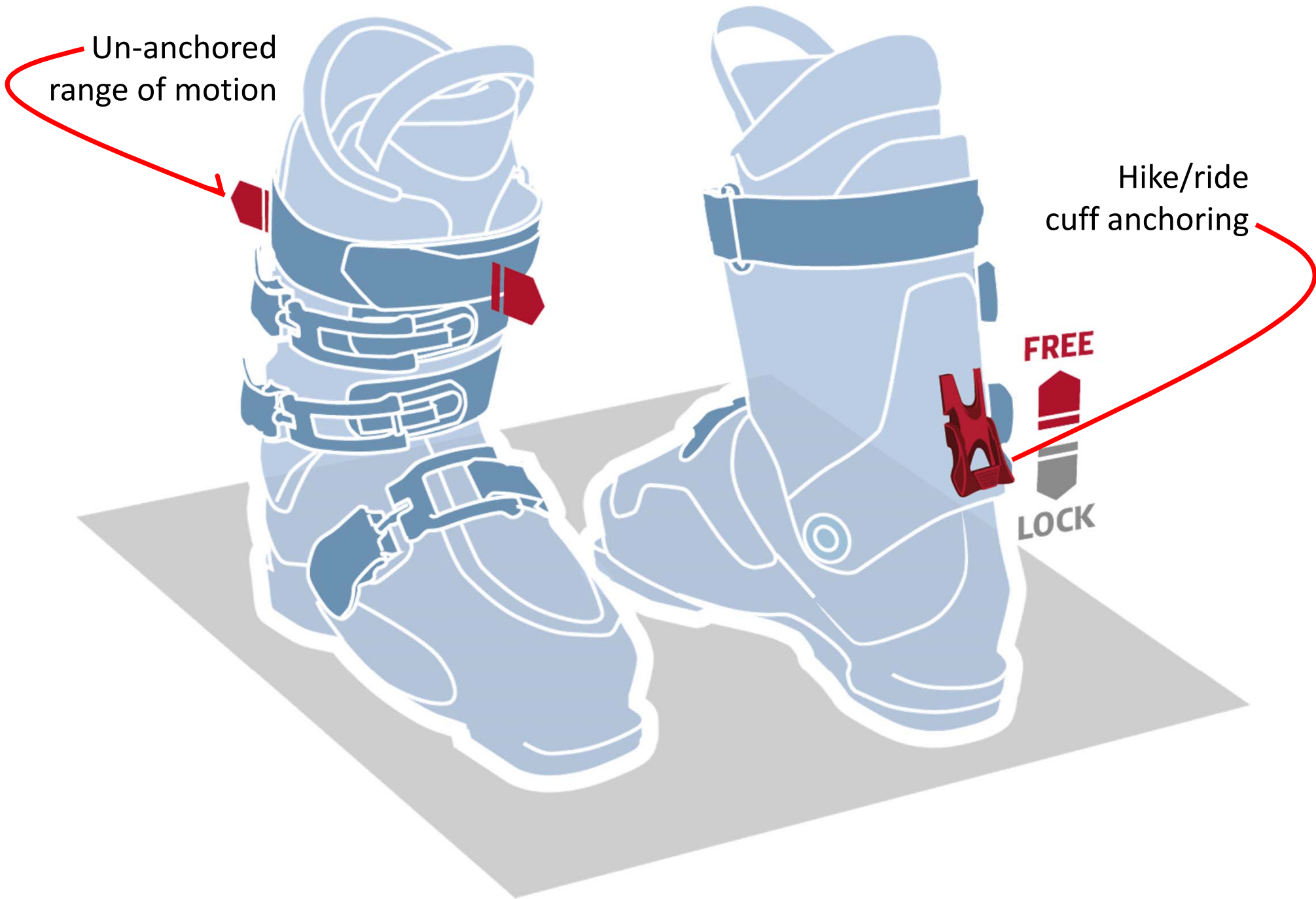


Un-anchored  
range of motion

Hike/ride  
cuff anchoring

**FREE**

**LOCK**



# Versatility is another trend.

Making a boot that perform across a wide spectrum of terrain and conditions

## THE PARADOX



Hard snow and hard boot



Soft snow and soft boot

Nothing replaces the pure performance of a race boot when ridden for that specific application. Contrary, a race boot inhibits powder performance by delivering too much precision and power transmission for the medium.

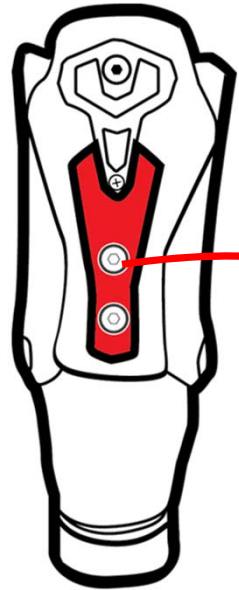
Skiing is constantly adjusting to the terrain below our feet – weight distribution and pressure changes to counter snow surface inconsistencies. Unpredictable conditions like powder benefit from a more balanced or upright stance and a greater range of fore / aft movement.

# Boot Flex



There is a relationship to consider between the amount of stiffness and the type of terrain or snow conditions skied. People who ride irregular terrain, powder and varying snow, or steeps gain an advantage from a softer flex and greater range of fore/aft cuff mobility; whereas hard and uniform surfaces like a race course, front-side groomers, and East Coast hard-pack get a boost from stiffer-flexing/faster rebounding boots that apply greater and more instantaneous tip pressure. Skiers today are adventurous and will often bounce among a broad range of terrain and snow types, so there's a dedicated trend in making boots that are more flex-versatile.

# Variable Forward Flex



Traditional overlap boots

Manual flex adjustment



Variable forward flex is a way to make a boot more versatile. Some boots offer the ability to adjust the stiffness of the boot slightly, so that you can better tune the boot to what you want to do. This is normally adjusted by a bolt on the back of the boot. Some boots require a simple twist while others may require the bolt to be removed.

Progressive flex is a flex technology that begins soft and progressively get harder as ankles are pushed farther forward. Predictable progressive flex lays in the realm of 3-pieces boot designs.

## Cabrio / 3-piece design

Progressive flex  
20 point index range



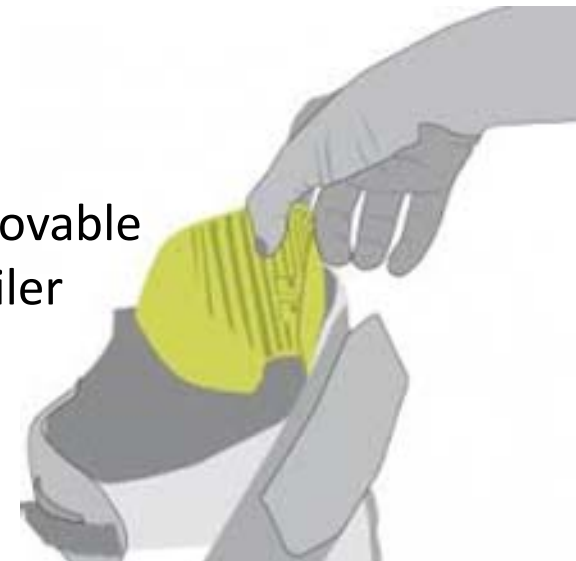
# Forward Lean

There is also a relationship to consider between forward lean and terrain or snow conditions. All ski boots tilt the lower leg forward, so that your ankles and knees are bent when you stand in ski boots. Forward lean is normally set at about  $14^\circ$ , but can be as far as  $17^\circ$ , or as little as  $11^\circ$ . The cuff of the boot will not let you straighten your ankle, but the flex of the boot will enable you to flex farther forwards by a few degrees.

It's common for boots to have removable spoilers that enable forward lean to be altered. When skiing hard snow and predictable terrain like race courses and groomed runs a higher amount of forward lean is preferable, so leave the spoiler in place. Skiing softer snow conditions, moguls, and all-mountain are better served by a more upright stance, so remove the spoiler.



Removable Spoiler





Adjustable  
forward lean

## Revelation from the AT community.

These are the people with heels that are not locked to the ski and wander the backcountry, uphill and down. There are trends emerging in AT (Alpine Touring) boots that will certainly jump to downhill boots imminently. La Sportive, for example, is making boots that have three conveniently adjustable cuff positions for forward lean (10°, 14°, 18°). Instead of a removable wedge behind the calf, the cuff offers different anchor positions. AT boot makers are coming up with other stirring innovations that are likely catching the attention of downhill boot brands.



Innovative new  
buckle design

# Advantageous Innovation



Ultra lightweight, close fitting, ergonomic boot technology

Enhanced cuff range of motion for better walk mobility

Articulation zone aides in walk/hike when cuff is un-anchored

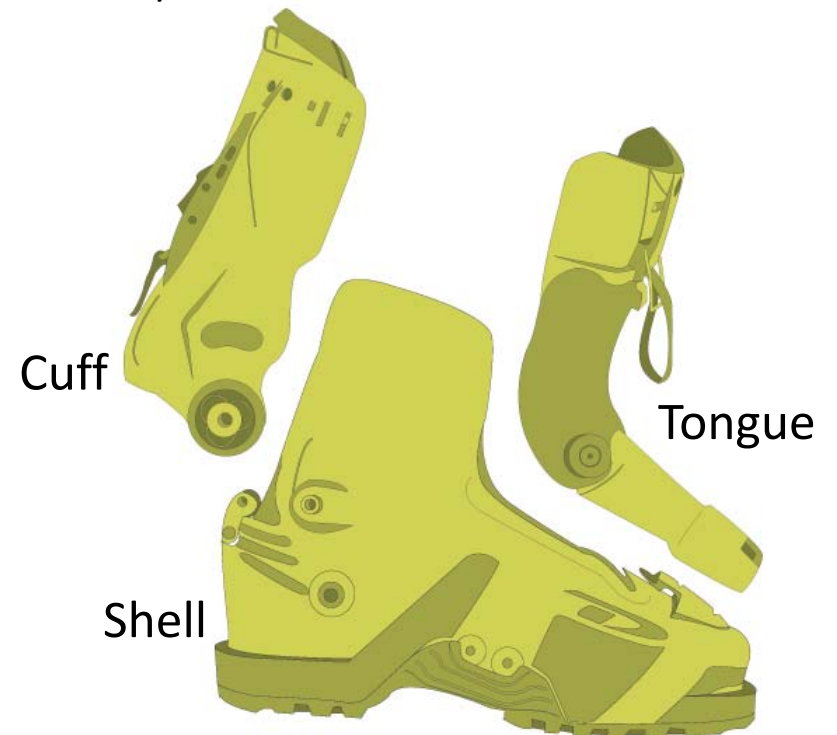
The 3-piece boot design is popular among AT skiers

Carbon reinforcement in places like the cuff and sole deliver reliable rigidity, power, and rebound needed for downhill performance while allowing for a reduction in both weight and mass.

Alpine touring (AT) boot builders come from the opposite side of the fence from downhill philosophy. They are interested in reduced mass and supple tour and hike congeniality, as opposed to power and rigidity that best serves downhill skiers. It's a growing freeride penchant that drives AT boot manufactures to stiffer and more powerful downhill performing boots and they're fashioning some cool technology. These guys are creating boots that morph between a touring boot and a downhill contender. They are laying the path to the next generation of downhill ski boots.

## 3-Piece Boots

Today's wide and soft flexing ski designs benefit from strong edge-to-edge energy transference but they do not respond favorably to high quantities of instantaneous forward pressure that are typically characteristic of overlap ski boots. The three-piece boot design technology optimizes a smooth and consistent progressive forward flex with a greater range of motion than the traditional boot design while preserving strong lateral energy transference. The design also prevents the lower shell from distorting and bulging as the boot flexes, making the boot more smooth and stable at high speeds on irregular terrain. Three-piece design technology is highly adaptable to different flex ranges. A single shell can be used with easily replaceable tongues to provide any needed flex pattern from racing-stiff to freestyle-soft. Three-piece boots offer a greater degree of fitting versatility than traditional ski boots, they are easy to get on and off, and they walk better.

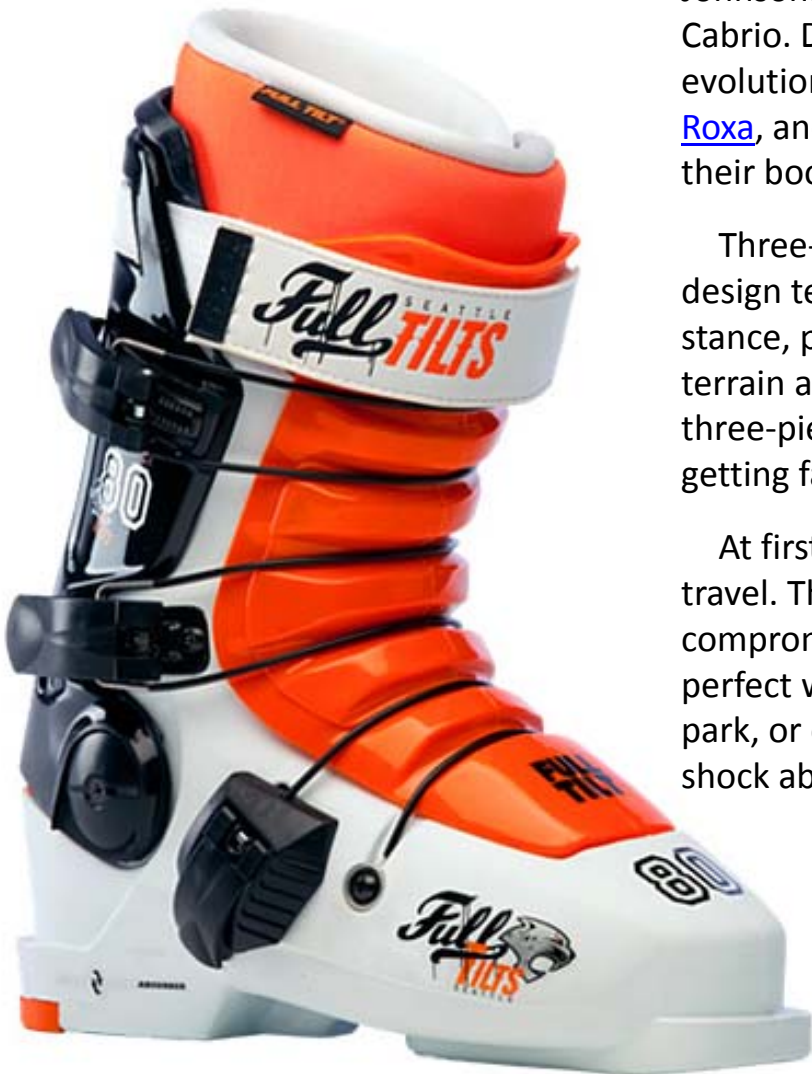




The three-piece boot design has been around a while. It was introduced in North America by Raichle in 1980, being a vision of Sven Coomer who was seeking a boot with better control of forward flex, easier to put on, and greater comfort. The Raichle Flexon enjoyed vast popularity among recreational skiers and pros alike, winning the downhill at the 84 Olympics under US skier Bill Johnson. In 2004 [Dabello](#) re-introduced the three-piece boot design labeling it Cabrio. Dabello manufactured for Raichle and their new designs represent an evolution. Several companies produce three-piece boots today like [Nordica](#), [Roxa](#), and a host of backcountry boot makers. Notable is [Full Tilt](#) who builds their boots from the original Raichle Flexon mold design.

Three-piece boots are not intended for race or race-like applications. The design technology seeks an optimal combination of support, stability, balanced stance, powerful edging control, and dynamic response across a broad range of terrain and conditions. A progressive flex and wider range of motion mean that three-piece boots ski a bit different than front-entry boots and they take some getting familiar with.

At first they may not feel as responsive – because they have a longer flex travel. The design permits some wiggle room for mistakes without compromising performance. It's a fact that you're not always going to ski perfect when riding the unpredictable conditions of all-mountain, jibbing in the park, or off-piste. The technology also alleviates shin bang, having superior shock absorption.



# Three piece boots are not everyone's cup of tea.

Three-piece boots lack the quick response and precision of high performance front-entry boots. The design doesn't load fast enough for the gates, nor do they deliver the pinpoint accuracy that racers and aggressive carvers seek.

Many seasoned skiers choose front-entry boots because they prefer the quicker response. Front-entry boots are superior in conditions like East Coast hard-pack and front-side carving; they are more responsive in every condition and terrain. But, this is not always a good thing. Front-entry boots can offer too much response and not enough forgiveness in irregular terrain like off-piste or with big air. This is why the three-piece design is the choice of the world's top freeskiers, slopestyle, and a growing number of mogul and aerial skiers.

Many skiers like the closer fit of front-entry boots and feel that they give a better sense of the ski. Front-entry boots can offer less liner between your foot and the boot shell. A closer fit generally means more efficient transmission of body forces and better feedback from the snow surface.

I wear both design profiles for big mountain riding and offer the following: The front-entry boot model that I use is a race boot modified to become freeride friendly. They are superior in quickness and response, as they are in discomfort – eventually they beat me up. I experience negligible discomfort with cabrio boots and a greater margin for error. A bit too much pressure or pressure in the wrong place on a high performance front-entry freeride boot like mine while off-piste and you're likely to go down. I adore the close fit handling of my front-entry boots; it's the eventual discomfort that I can't ski with and when I drop to a softer/lower performance model I lose the response I like. I side with the comfort and forgiveness of the three piece boot.

Which is the best choice for you depends on what you are looking to do. Ultimately it boils down to comfort, fit, and performance expectation.

# Liner Adaptability

Many ski boots these days come with some level of conformable liner.

## Salomon 3D Moldable Liner



The liner is the soft insert inside the shell that you slip your foot into. Its job is to provide a comfort and performance interface between your foot and the plastic outer shell. Ski boot liners keep your feet relaxed and toasty while securely holding your foot, heel, and lower leg in place. Optimally it's a full contact fit with no slop for your feet to bounce around or heel lift and no pressure points.

Liners vary a lot in comfort, thickness, thermal qualities, conformability, and performance. Beginner boots have thicker liners that promote comfort and warmth, and a looser fit to prohibit err movements to the ski. More advance boots have thinner liners for more acute movement transference. As a skier progresses, closer fitting liners that more efficiently transmit body movement to the ski become preferable.

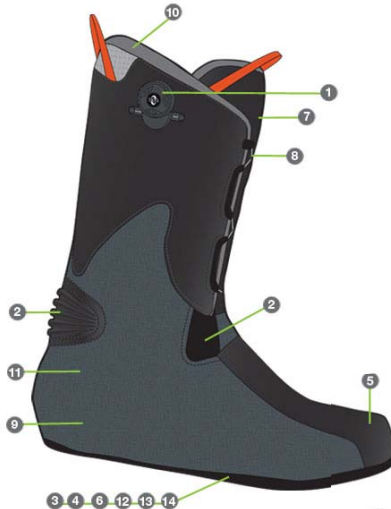
Elasticized toe areas are commonplace in liners. While it is important for the forefoot to be secure, toes can afford some liberty. Your piggies will thank you for the wiggle room and the added warmth.

Many stock boot liners these days contain regionally placed heat activated materials that adapt to the contours of your foot. The amount, thickness, and placement of this material varies among manufacturers and models. To mold the liners, hot air is normally blown into the liners to heat them up, and then the ski boots are put on for 5 to 10 minutes for the liner to adjust to the shape of your feet and , or ankles; wherever the moldable materials are.

A heat molded liner together with a custom insole and a molded shell yields a very precise and comfortable fit.

## POWER FIT

- 1 3:1 Freeride Series Boa closure system wraps the calf for full-length, power strap-style energy transfer as well as touring stability
- 2 New articulating zones for touring comfort and smoother ankle flex
- 3 Metalized foil in Strobel base for a reflective thermal barrier
- 4 Aerogel-insulated Strobel base for ultimate warmth
- 5 New toebox construction with seam taping for maximum toe warmth
- 6 102 mm last with a performance out-of-box fit
- 7 Plastic liner tongue distributes stiffness for an even, forward flex (Power Fit only, included with Factor 130 and Custom)
- 8 New tongue lacing guides help to free up ankle articulation and improve terrain sensitivity
- 9 New 2-way stretch outer fabric for easier thermoforming
- 10 Anti-microbial liner fabric is smooth, comfortable and easy in/out
- 11 Multi-density internal Achilles' pad insert
- 12 Zero-compaction Strobel liner for long-lasting volume
- 13 True-lasted construction for out-of-box performance fit or can be thermoformed for total customization
- 14 Performance footbed



Liner tech is a big selling point.



Innovative stuff and it all boils down to comfort.

# Out-of-the-box comfort can be misleading.

When we shop for new boots we typically try on several different pairs, narrowing the ones that are the most comfortable at first fitting. Manufacturers know this, so there's a lot of design emphasis on out-of-the-box comfort – both with feel and visual appeal. The problem is that stock liners do not last as long as promised. The unfortunate truth is 40 days or so. They pack out and your foot becomes sloppy. Not only does your skiing performance go by the wayside, so does initial comfort, which is the reason you purchased the boots in the first place.

The job of a ski boot is to transfer energy from the body to the ski. They are the control mechanism of the ski and they support your balance. The liner is the conduit between the lower leg and foot and the ski. Any slop in this transfer conduit results in more difficult turns, exhausted muscles, and often unpleasant pain.

For those of us who log a considerable amount of days in our boots whether it be over one season or many, for those with chronic foot or lower leg discomfort, and for those who want to get the most out of our boots in both comfort and performance, custom-fit aftermarket liners are the ticket. The goal of custom conformable liners is to fit in full contact with no pressure points, between the lower leg and foot and the boot shell. There are some really good products out there and once you try them you'll never go back.



Heat moldable cork in this Nordica NRGy yields superior power transmission over foam and cork does not pack out.

# EVA Liners

EVA foam liners are liners that are heated up, your foot inserted and then placed into the boot and buckled to cool. EVA liners are the lightest, have superior thermal qualities, and are very cost effective – about \$200. The EVA wrap liner design enhances stiffness over the tongue liners and hugs the leg more precisely delivering superior energy transference and protection with less opportunity for any slop between the shin and the shell that may result in shin bang.

[Intuition](#) is the leader in moldable EVA liners and offers a complete line of wrap and tongue liners that come in all sorts of densities, volumes, and configurations. Contrary to some opinion, Intuition's liners do not pack-out nor can they be molded by body heat; the liner requires 245° for molding. Intuition life expectancy is about 200 days and they can be re-molded a handful of times sans breakdown; so if you don't get it right the first time, your foot changes over time or, you buy new boots, just remold. Intuition's EVA wrap is the choice of the world's best freeskiers, slopestyle, and a growing number of mogul and aerial skiers. EVA liners are a young technology that is still gaining acceptance and they can be tricky to mold correctly.



# ZipFit

[ZipFit](#) is the brain of child Sven Coomer. Sven is the guy responsible for the modern front-entry ski boot and came up with the 3-piece boot design. ZipFit is a liner based on unique temperature sensitive dynamic molding technology. A stiff viscous cork and ceramic cocktail, which is placed in specific pockets about the foot and ankle, is “alive;” in that the liner adapts to maximum comfort and support in relation to what you are doing. For example, the material packs in tight for a firm hold when making short turns on hard snow, maximizing pressure to the ski. But, when you’re standing in the lift line, the material relaxes to a soft and very pliable fit. The material is always adapting.

Although warming is suggested at first fitting, heat molding in the sense of other custom liners is not required. The liner is warmed and then skied, since warming helps the material flow faster from its manufactured state to where it needs to be in relation to the morphology of your foot. Zipfit liners are not static molded to a specific shell, so they are easily transferable to new boots with no concerns. Other benefits are ZipFit liners automatically adapt to foot changes and longevity is unmatched.



# Foam Injection

Foam injection delivers the most precise fit possible. Liquid chemicals are injected into an empty boot liner with your foot in and placed inside the shell. The resulting Polyurethane foam expands to fill every nook and cranny between your foot and the boot shell, effectively creating a perfect mold of your foot interfaced to the boot shell. The end result is a light, snug, high performance fit. The downside of foam injection liners is they are notoriously cold and stiff, but recent advances are addressing thermal quality and pliability that is more aimed at recreational skiers.

The polyurethane injected liner is a specialty at [Surefoot](#), the nation's most prevalent boot fitter. Surefoot has the technology dialed for both racers and recreational skiers and makes custom liners to match fit and performance needs for all skiers. Surefoot delivers a very comprehensive experience with their computer foot scanning and custom milled orthotics, backed by a depth of knowledge and know-how. This level of comfort and precision comes at a price, which is the same with all shops that provide this level of service.



Intuition's technology also puts different densities and materials where it's needed





# Custom Insoles



Off-The-Shelf



Heat Molded

The job of the insole or “footbed” is to hold your feet in their strongest most stable/balanced position. Balance is a most important ingredient in skiing and that can’t happen without a proper foundation upon to rest your foot.

It’s wise to replace stock insoles with a custom insole (also known as an orthotic), at minimum a higher quality off-the-shelf insole. A proper foundation to support your foot is imperative for both comfort and balance, and thus efficient power transmission. Much of the discomfort with ski boots is because the insoles that come with the boots generally don't provide much support. The result is pitiable control, strained ligaments, tender arches, sore legs, and back pain.

None of us are physically perfect in respect to the most efficient balance for skiing, thus lots of things drive the need for a custom insole. Most everyone has some sort of balance determinate irregularity such as one leg being slightly longer than the other or consequences from broken bones. Arch architecture, pronation / supination control, and being bowlegged or knock-kneed are prevalent concerns.

Custom insoles are insoles that are specially shaped to match the bottom contour of your feet. There are a few differing types.



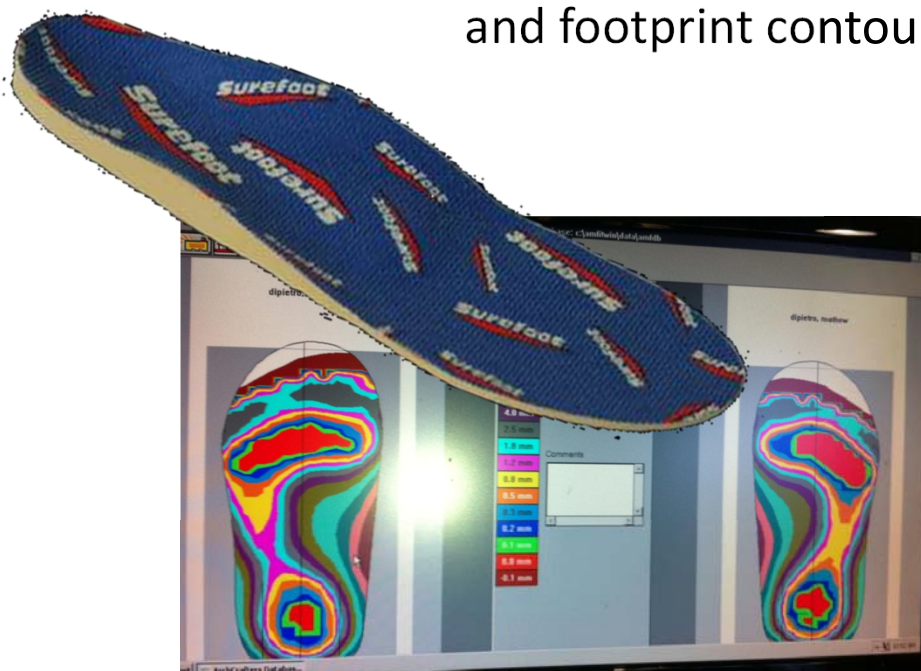
# Heat Molding

Some insoles are heated and molded directly to your feet. Usually you stand upon a formable pad that makes a mold of the bottom of your feet. A moldable insole blank is placed in an oven and heated. The blank is then placed atop the foot impression and you stand on top to mold the heated insole. Next they are hand shaped to your foot and boot.

The process requires a skilled artisan and is rather subjective. Basically, the outcome is based on what the sole maker feels will best serve your needs and his/hers ability to translate that information into a hand fabricated product. Some people are exceptionally good at this; however there are relatively few Picassos, Monets, or Rembrants among us. Therefore, heat molded insoles tend to have a huge margin for human error.

# Computer Milled

Surefoot computer scan shows a person's inherent weight distribution and footprint contour



Computer milling is the more reliable method for creating accurate footbeds. This type of insole is computer carved from a solid block of material and is available in various performance and comfort densities. The process begins with a 3D scan of the bottom of your foot. While scanning, the computer is also measuring weight distribution and displaying that information on a screen so that the technician can adjust you into your strongest, most balanced stance. The scanning process is a fairly efficient tool in identifying inherent balance inefficiencies. Corrections for pronation, supination, uneven leg length, fore/aft irregularities, bowleggedness, or knockknees can be designed into the milling process.

For the most efficient transfer of energy, footbeds sit flat and secure in the bottom of your boot with the heel anchored. Allowing for some roll to enhance ankle articulation merely weakens a link in an already tenuous linkage from your foot, to your sock, to the boot liner, to the boot shell, to the bindings, to the screws anchoring the binding to the ski.

Custom insoles provide the closest fitting, best supporting, and most comfortable foundation for your feet. They are a must for every skier and if you don't do anything else, at least have custom insoles. As a result you'll be able to ski better and with less effort, fatigue, or injury. Insoles made by a podiatrist for general use may not best suit skiing application, but if your podiatrist doubles as boot-fitter, you're in a spot of luck.

# Shock Absorption



Several ski boots these days incorporate shock absorption qualities. Generally this means that the boot board (aka zappa) in the bottom of the boot under the liner is made of a shock damping material. Shock absorption may also be addressed by a custom insole. Shock Doctor, for example, is an off-the-shelf aftermarket insole aimed at precisely that and Surefoot offers a more custom product.

Liners sometimes have added shock absorbing padding to the shin, toe, heel, or upper calf areas. However, what works well at first, wears out quickly, and is no substitute for a custom liner.

While shock dampening is a need for those who regularly catch air, it softens the ski to boot connection. You'll notice a softer, less precise ride carving on hard snow. Soft snow conditions will not be as noticeable. If you like bouncing in-and-out of features in the park or huck big air, your feet and joints will thank you.

Shock absorption is a trade-off; less precise control for an easier ride. This may be worthwhile for those of us with aging joints too.

# Comfort is #1. If your feet are not happy performance won't be either.



When choosing new ski slippers:

- Proper sizing is critical, both length and width.
- So is the unique anatomy of your foot (high instep, wide forefoot, narrow heel, ankle location, etc.).
- Budget for an orthotic.

Add to the equation:

- Where do you ski?
- Terrain preference?
- How long have you been skiing and ability level?

And it's time to pick an appropriate shell.  
This is where a competent boot fitter is invaluable.