Terrapin Ingenuity: Slope Strider Pro

Objective
To increase the retention rate of new skiers by improving the comfort of alpine ski boots

Perceived Market:
- Maryland: 163,216 alpine skiers
- $229.5 million in revenue due to equipment, apparel, and accessories
- Maryland and Virginia Resorts: 6 in the area, approx. 635,000 ski visits per season

Constraints:
- Boot size
- Can be made in multiple sizes
- Fully enclosed
- Existing binding system
- Waterproof
- Withstands loads

Customer Requirements:
- Retains ski boot feel while skiing
- Little additional set-up time
- No bulky construction
- Fully enclosed
- Can be made in multiple sizes
- Comfortable and easy to use

Prototype and Testing

Engineering Characteristics:
- Degrees of Freedom
- Rotational Angle
- Time to Turn Ski Mode On and Off
- Force to Activate Transition Mode
- Weight
- Number of Irritation Zones
- Physical Envelope

Physics:

Prototype and Testing

FEA Testing:
- Used to identify high areas of stress and effects of parameter variation

Prototyping Process:
- Simplified locking assembly milled from aluminum for easier prototyping
- Inner skeleton bent and hand fit from 4230 steel and then welded together
- Plastic part versions rapid prototyped for tests of user interaction

Rapid Prototype Parts

Milled Parts For Prototype

Prototype and Testing

Physical Testing:
- Using Metal Parts
- Stress
- Torsion
- Comfort and Walking Speed
- Speed of Putting Boot On
- Using Rapid Prototype Parts
- Speed of Changing Mode

Test Results and Future Work

Concept Generation

Pivot and Latch

Passive Toe

Provides increased mobility in toebox without need for a locking device.

Slope Strider Pro Concept

Provides increased mobility at ankle which requires a locking device.

Justification:
- Significantly improves comfort while walking
- Intuitive and quick latching mechanism
- Passive toe design scored highest in Pugh Matrix

Analysis
- Slope Strider Pro improves comfort with 95% certainty
- Passes strength testing

Future Work
- Further safety testing
- Real world trials
- Fatigue and life cycle testing
- More integrated design
- Weather proofing
- Aesthetics