



PSIA-AASI National Adaptive Academy Extended Session

January 6-8, 2021

Clinic Reminders

Clinic Topic: Monoski Design: Matching Body and Machine

"Design is the balance of elements necessary for a certain function."

- Certain function = what does this skier need from this ski?
- Balance = compromise
- This presentation will examine the balance / compromises that are made in mono ski design.

Part 1: Ride Height

Stability vs. responsiveness

- By lowering the center of gravity, a ski remains balanced longer. This is forgiving to form flaws and unintentional input. It increases stability for novice skiers.
- By raising the center of gravity, a ski initiates on edge sooner. This increases responsiveness for advanced skiers.

Edge angle

- Raising ride height improves the angle before the seat hits the snow which is necessary for advanced skiers.

Suspension travel

- Ground clearance at bottom out + the amount of suspension travel = minimum ride height. Advanced / extreme skiers need more suspension travel and therefore will have a higher ride height.

Part 2: Body position

Position vs. ability

- Disabilities are unique and each will benefit differently from different body positions.
- A tight body position aids skiers with high level injuries by bracing their core.
- An athletic body position provides a neutral position that works well for most skiers.
- A relaxed body position aids novice skiers looking for comfort and skiers with restrictive flexibility.

Fixed position vs. adjustable

- Fixed position designs are stiffer and can better control motion, flex patterns, and suspension efficiency. This is ideal for advanced skiers prioritizing performance.
- Adjustable designs provide flexibility for a larger range of skiers. This is ideal for novice and intermediate skiers where comfort inspires confidence. It is also ideal for unique disabilities where the benefit of body position outweighs the performance benefits of a fixed design.

- Adjustability adds product complexity and cost.

Performance

- Energy not sent through the shock can cause the ski to flex before or after the boot. This is "foot bob."
- Compact body positions transfer energy more efficiently than relaxed body positions.

Suspension path

- Able-bodied skiers lean forward to initiate a turn and transition weight back to neutral to finish a turn.
- Sit skiers can not transition weight with their lower body.
- Fore-aft center of gravity adjustment is used to help improve the efficiency of upper body movement.
- A-Arm geometry is used to mimic lower body movement.
- Balancing the center of gravity for the chairlift and skiing positions is a compromise. Foregoing a chairlift system allows the design to focus more on the center of gravity position while skiing.

Part 3: Suspension

- By varying the amount of spring used per portion of travel we can engineer the feel of the suspension.
- A progressive curve uses less force during initial travel which improves small bump sensitivity and ramps up at bottom out to absorb large impacts. This emulates how able-bodied skiers finesse the use of their leg muscles.
- Progressive suspensions typically add complexity and cost. We need to weigh performance vs. cost.

Part 4: Conclusion

- The final design is a balance of the goal ride height, body position choices, and suspension characteristics we desired.
- Recognizing how these elements affect the characteristics of a ski can help us improve a skier's experience.