Alpine Tetra Ski

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Objective
The objective of the Alpine Tetra Ski project was to modify a Tessier paraplegic kart ski with electronic actuators and controls that would enable a person with tetraplegia (a person without use of arms or legs) to use it comfortably. The project had three main tasks to modify the kart ski into the Alpine Tetra Ski:

1. Actuate and control the skis electronically
2. Increase turning ability of the kart ski
3. Improve upon the present braking system

1 – Actuation and Control
Method – Linear Actuators Controlled by Sip/puff and joystick

Use: To electronically move the skis and brake faster than a human can move the skis and brake manually.
Metric: Actuate at 1 in/sec or faster.
Result: Actuates faster than 2 in/sec under necessary loads.

Use: Some people with tetraplegia have limited use of their biceps, which enables them to use a joystick. Other riders may only be able to control the ski with a Sip and Puff Switch.
Metric: Integrate Sip and Puff Switch and Joystick into Alpine Tetra Ski
Result: Persons with varying severity of tetraplegia will be able to use the Alpine Tetra Ski

2 – Increase turning ability of the kart ski
Method – Change actuation method

Use: The old method of steering involved pulling on a 3’ long lever arm, which interfered with the seat of the kart ski. Actuators remove this interference.
Metric: Improve the steering angle of the unmodified kart ski.
Result: Angle improved from 20° to 25°, an improvement of 25%.

3 – Improve upon the present braking system
Method – Brake system redesign

Use: The braking system is mounted underneath the kart ski in a position where it won’t interfere with the skis or escort skier.
Metric: Increase braking surface area
Result: The Alpine Tetra Ski’s braking area is 25 times the unmodified kart ski’s braking area.

Conclusion
The Alpine Tetra Ski team was able to meet all of its original objectives of 1 in/s linear actuation speed, increasing braking area, matching or increasing steering angle and successfully integrating a joystick and sip/puff control system. The Tessier Kart Ski has been fitted with electronic equipment that allows a person with tetraplegia to actively control their direction, speed and braking without any outside help or interference. The Alpine Tetra Ski team is proud to have produced a high quality sit ski that will allow persons with spinal disabilities to enjoy alpine skiing.