SKI BRAKE DESIGN PROJECT

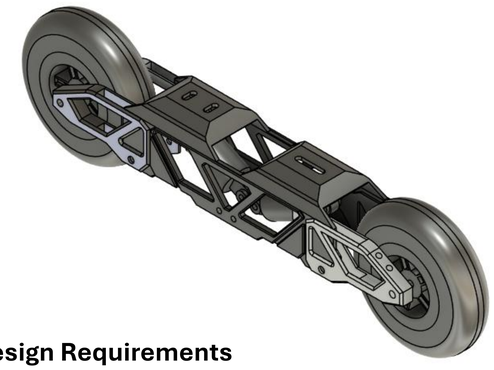
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Project Scope

Develop a braking system for an off-road ski

Constraints

- System must integrate with chassis
- System must allow locking of wheels
- System must provide safe and reliable stopping power under off-road conditions



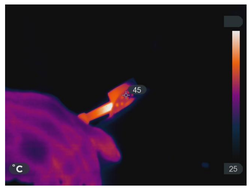
Design Requirements

No.	Specification	Unit	Value
1	Full Stop	ft	125
2	Weight of Rider	Lb	<250
3	Slope	Degrees	15
4	Dirt/wet Trail Condition Efficiency Loss (EL)	%	<15
4 B	Dirt/Wet Brake Conditions EL	%	<15
4C	Combined Dirt/Wet Trail/Brake Conditions EL	%	<20
5	Continuous Brake Use (5-min)	C	<200
6	Main Frame Width	in	3.25
7	Total mass	kg	<0.5
8	Tire Tread (Dynamic)	mu	<.5
9	Maximum tire width	in.	<2.2
10	Unit manufacturing cost	US$	<125
11	Operator Use & Ski Alignment	lb/s	5<x<15
12	Response Time	s	<.75
13	Operating Speed	Mph	30

Test Ride



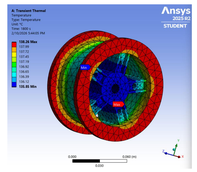
Thermal Experiment



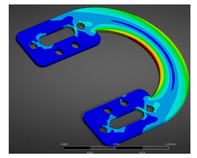
Testing

Experimental validation was performed through thermal testing to measure heat generation during braking. And finally, the skis were tested in off-road conditions

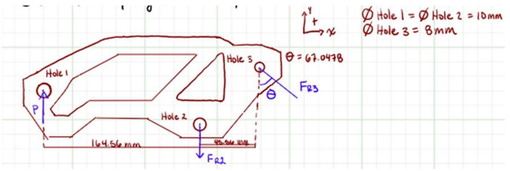
Transient Thermal Analysis



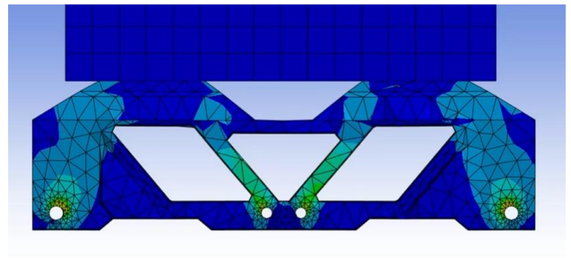
Arch Structural Analysis



Triangle Structural Analysis



Frame Structural/Impact Analysis

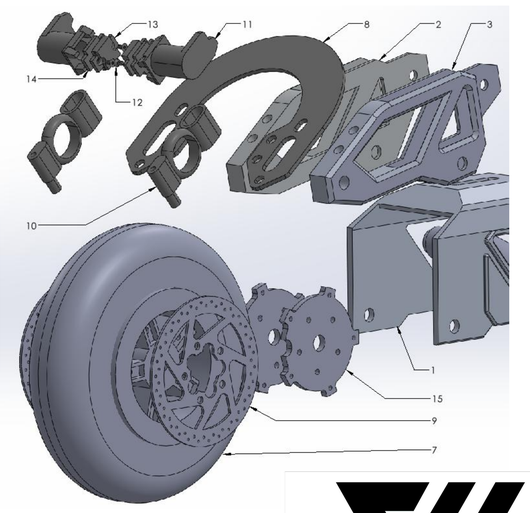


Results



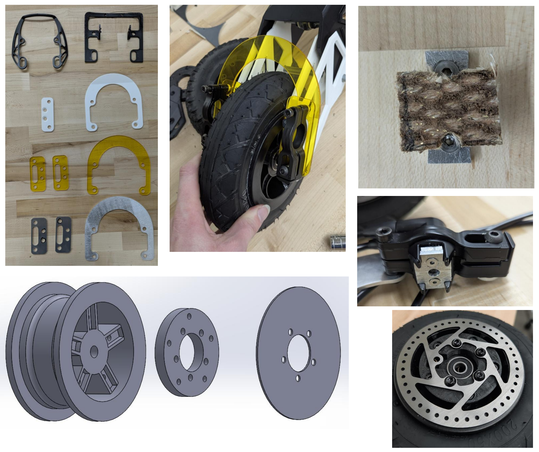
Analysis

Engineering analyses were conducted to evaluate structural integrity and thermal performance.



Prototyping

Physical components were designed and fabricated to validate the braking system concept. This includes the arch, adapters, brake pads, thermal barrier, and rotor, ensuring proper fit and functional integration



Design

A complete system layout of the braking assembly was developed. Each component is involved with the actuation of a hydraulic brake. The design justifies alignment and thermal management.

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