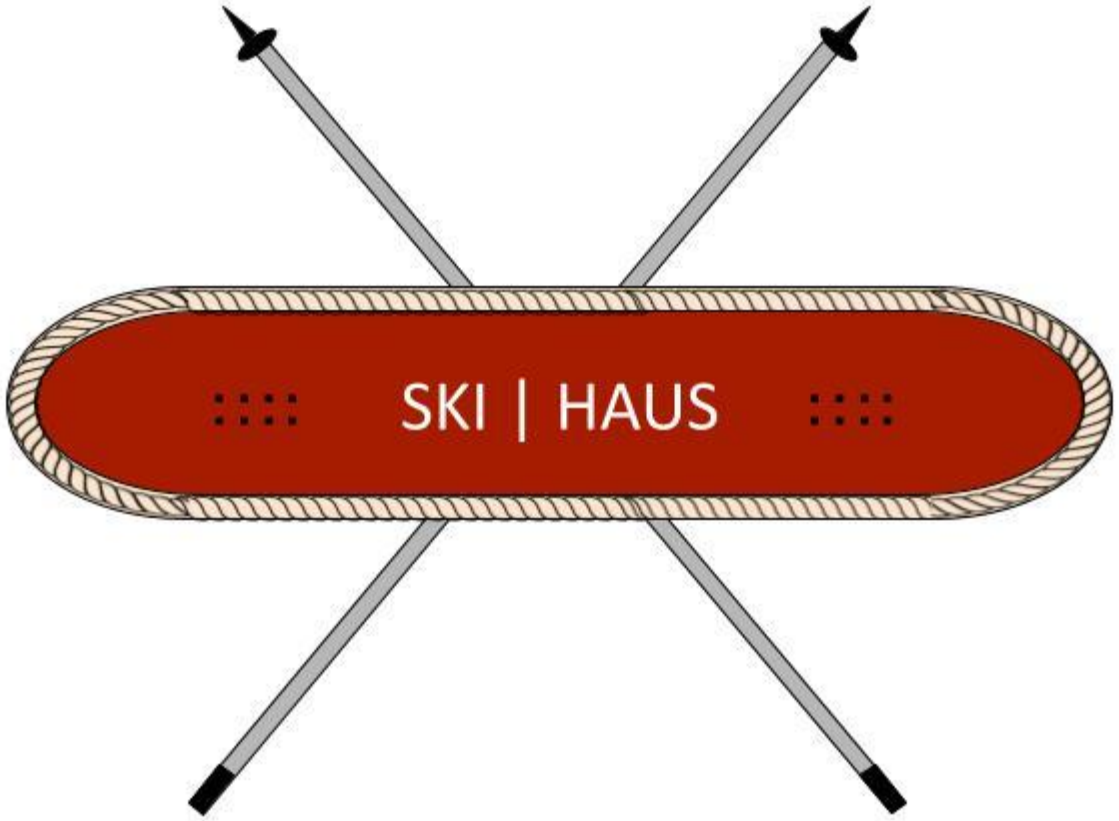


SKI HAUS TOW ROPE

Team Members:

Hallie Eha

CAD Engineer and Financial Manager

Kailey Lewis

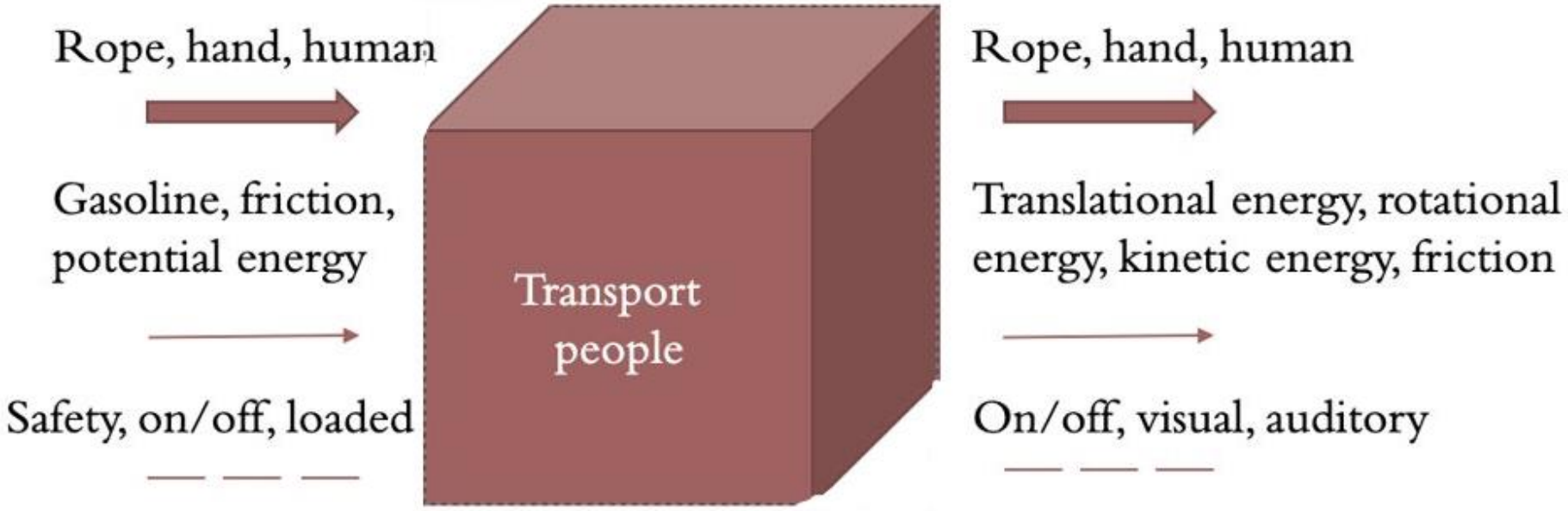
Project Manager and Test Engineer

Jesse Wells

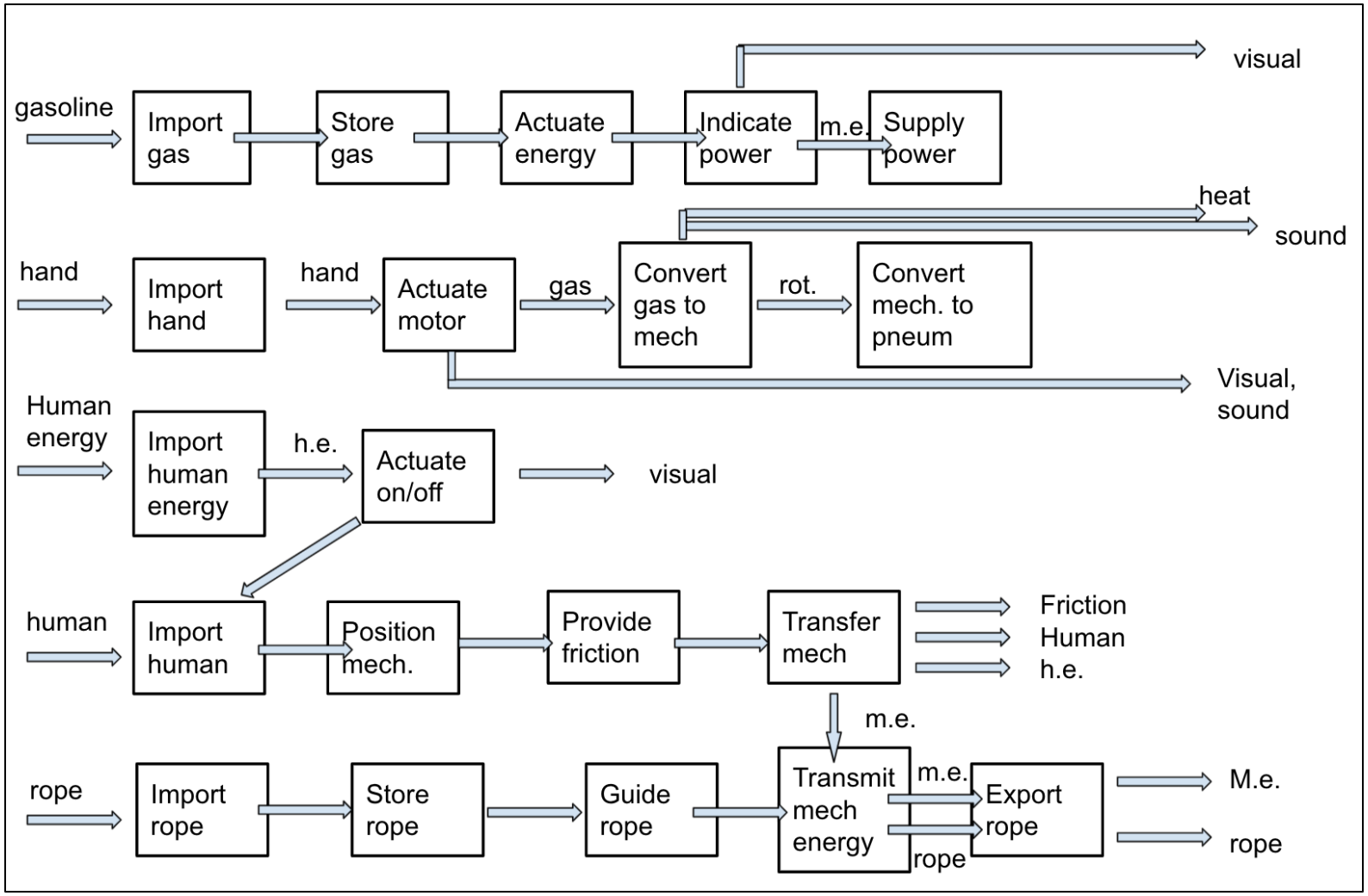
Manufacturing Engineer and Logistics Manager

PROJECT DESCRIPTION

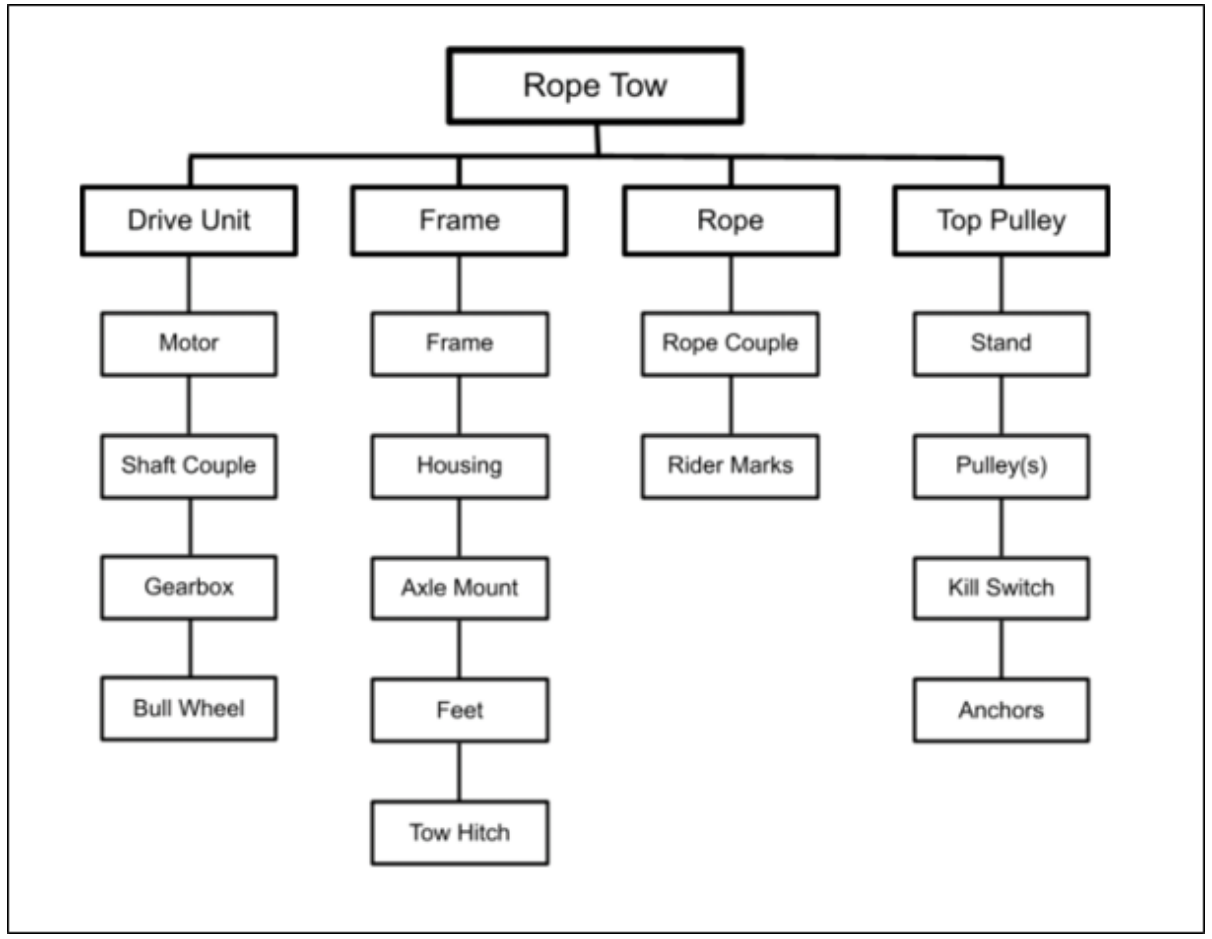
The Ski Haus tow rope is a portable motorized transportation device for ski resort use to pull riders back up the mountain. It's use in rail jam competitions hosted by Ski Haus at Arizona Snowbowl will ensure the safety of riders, reducing the fatigue caused by hiking. The design will cost about $2000, weighing less than 300lbs.



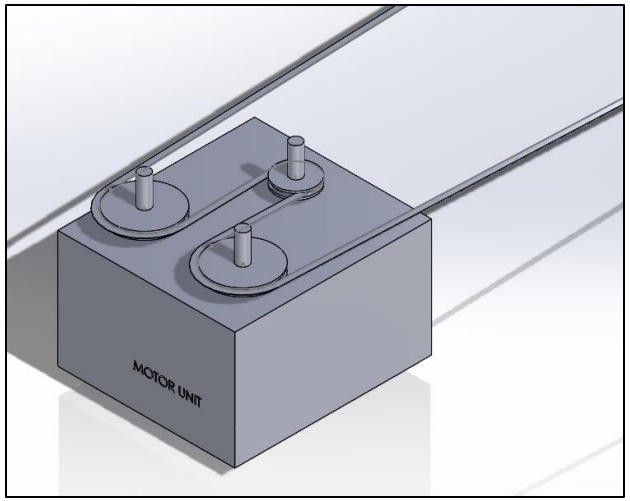
DECOMPOSITION MODEL



DECOMPOSITION MODEL

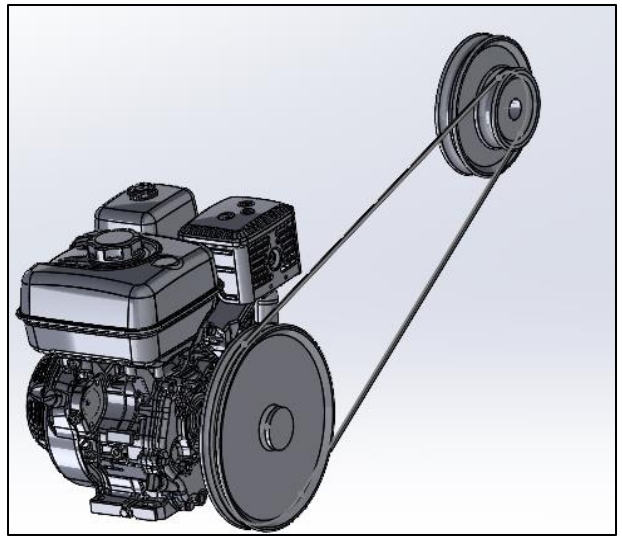


CONCEPT GENERATION- SUBASSEMBLY 1 (DRIVE UNIT)



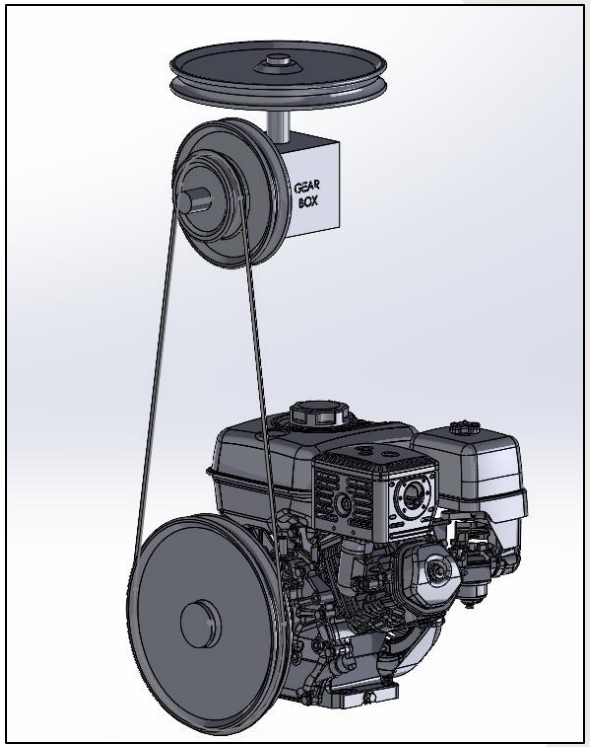
Advantages
- Compact pulley design
- Horizontal rope position
- Moderate amount of parts/sheave wheels

Disadvantages
- Attaching rope during use is difficult
- Difficult to create tension on rope during use



Advantages
- Easy setup when used
- Compatible with horizontal drive shaft (no need for gear box)
- Easy/simple repair

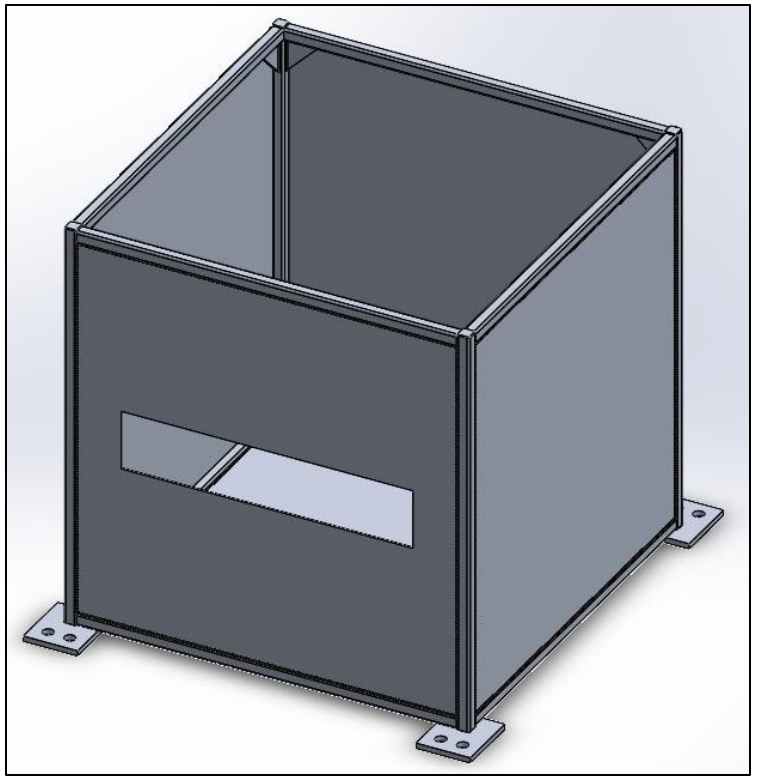
Disadvantages
- Larger frame required
- Less torque produced
- Vertical rope placement



Advantages
- Horizontal rope placement
- Compatible with horizontal drive shaft
- Easy setup when used

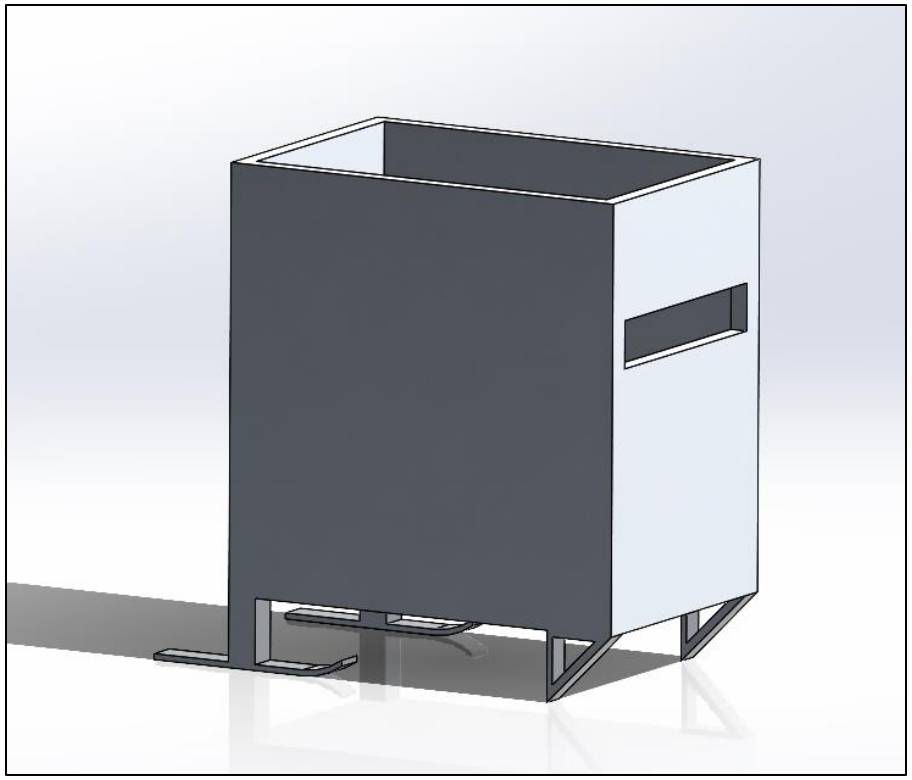
Disadvantages
- More complex frame needed (2-stage frame)
- Gear box required (increase cost)

CONCEPT GENERATION- SUBASSEMBLY 2 (FRAME)



Advantages
- Sturdy
- Secure tie downs
- Fits all motorized equipment
- Easy access for repair

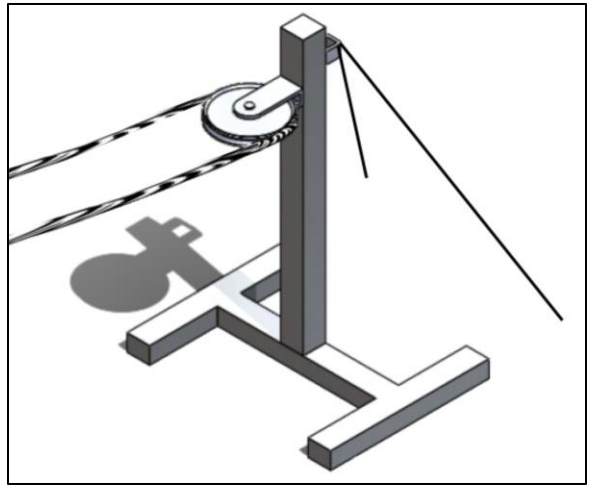
Disadvantages
- Bulky
- Expensive
- Not as maneuverable



Advantages
- Maneuverable
- Light
- Access for repair

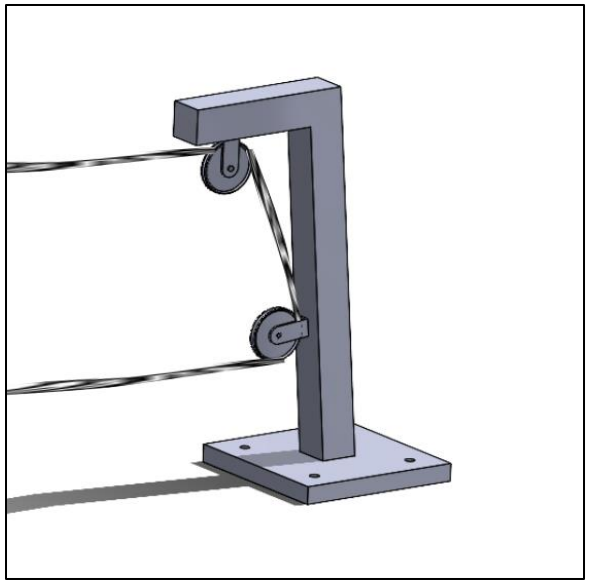
Disadvantages
- Expensive
- Harder to keep from moving on slope
- Equipment may need to be stacked

CONCEPT GENERATION- SUBASSEMBLY 3 (TOP PULLEY)



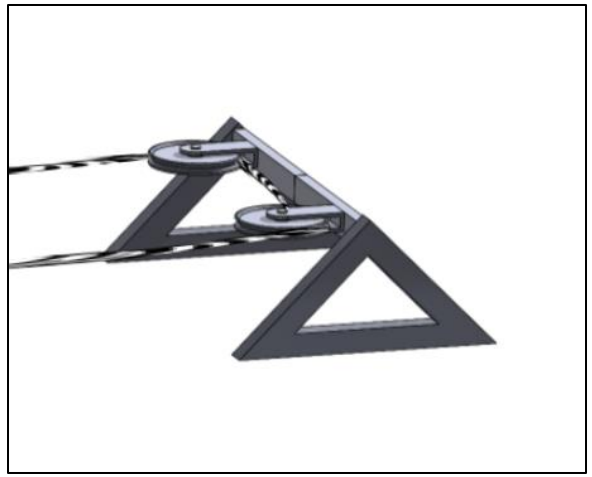
Advantages
- Affordable
- Compact/collapsible
- Simple installation

Disadvantages
- Small wheel diameter
- Not as durable
- Safety concerns



Advantages
- Keeps rope out of the way
- Durable
- Heavy for anchoring

Disadvantages
- Expensive
- Difficult transportation/installation
- Safety concerns of tipping



Advantages
- Affordable
- Compact/collapsible
- Simple installation
- Keeps ropes separate

Disadvantages
- Lightweight difficult to anchor
- More difficult to fabricate
- Center connection could be flimsy

CONCEPT EVALUATION-PUGH CHART

Criteria	drive unit	Design Alternative #1	Design Alternative #2	Design Alternative #3	housing	Design Alternative #1	Design Alternative #2	Design Alternative #3	top pully	Design Alternative #1	Design Alternative #2	Design Alternative #3
Compactness		+	D	+		-	D	+		S	D	-
Cost		-		-		+		S		+		S
weight		S	A	S		S	A	S		S	A	S
ease of operation		S		S		S		S		S		+
safety		+	T	-		S	T	S		S	T	+
Σ+		2		1		1		1		1		2
Σ-		1	U	2		1	U	0		0	U	1
ΣS		2		2		3		4		4		2
Score		**1**	**M**	**-1**		**0**	**M**	**1**		**1**	**M**	**1**

Drive unit - 1st design

- Application of multiple sheave wheels increases safety

Housing – 3rd design

- Smaller housing decreases weight and skis increase maneuverability

Top Pully – 3rd design

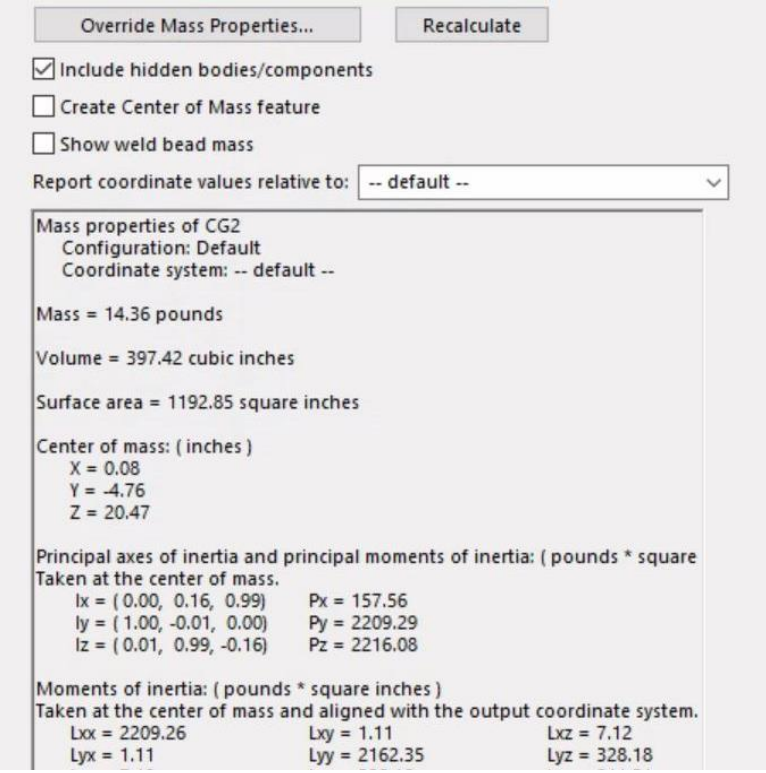
- Two sheave wheels at the top separate input from output rope, increasing safety. Also has more tie down points

CONCEPT EVALUATION: DECISION MATRIX

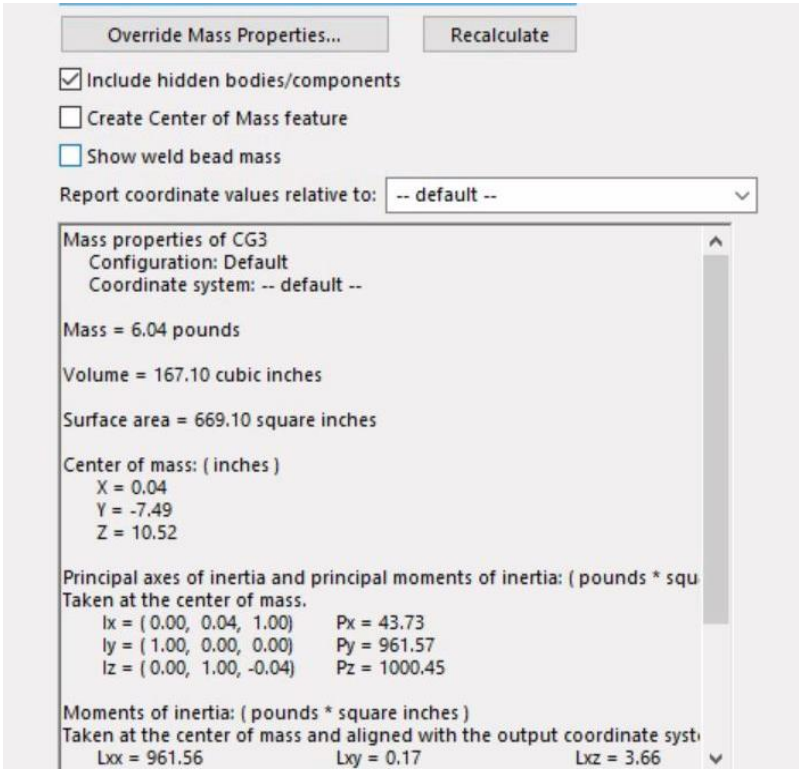
Score: 1-5																			
Design Criteria	Weight	Drive unit	Design Alternative #1		Design Alternative #2		Design Alternative #3		Housing	Design Alternative #1		Design Alternative #2		Design Alternative #3		Top Pulley	Design Alternative #1		Design Alternati
			Rating	Weight Score	Rating	Weight Score	Rating	Weight Score		Rating	Weight Score	Rating	Weight Score	Rating	Weight Score		Rating	Weight Score	Rating
Compactness	15%		4	0.6	4	0.6	3	0.45		2	0.3	4	0.6	5	0.75		3	0.45	
Cost	20%		3	0.6	3	0.6	2	0.4		3	0.6	2	0.4	3	0.6		3	0.6	
Weight	20%		3	0.6	3	0.6	3	0.6		3	0.6	3	0.6	4	0.8		2	0.4	
Ease of Operation	15%		3	0.45	3	0.45	3	0.45		3	0.45	3	0.45	3	0.45		3	0.45	
Safety	30%		5	1.5	2	0.6	2	0.6		3	0.9	2	0.6	3	0.9		2	0.6	
SUM				3.75		2.85		2.5			2.85		2.65		3.5			2.5	

Drive unit: Design #1
Housing: Design #3
Top Pulley: Design #3

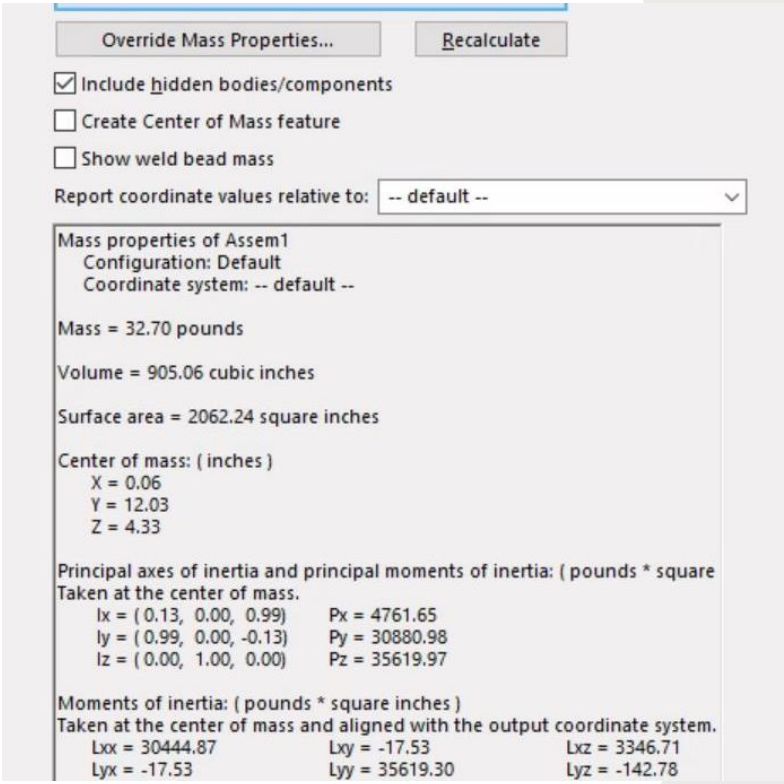
CONCEPT EVALUATION: WEIGHT ANALYSIS FOR DRIVE UNIT



Concept#1:14.36lbs



Concept#2:6.04lbs



Concept#3:32.7lbs

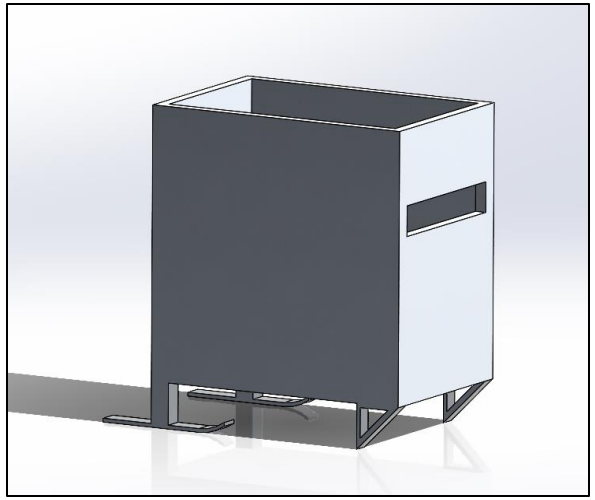
CHOSEN DESIGN

Customer Needs

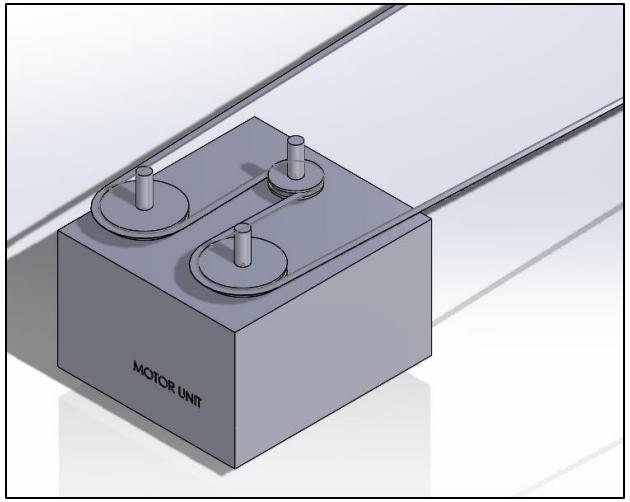
- Affordable
- Compact
- Lightweight
- Easy maintenance
- Easy transportation
- Safe
- Efficient

Engineering Requirements

- 5-10 Riders
- 15 Horsepower
- Under 300 lbs
- 60 people/hour
- Encased mechanical parts
- Separation of input and output rope
- Steady anchorable frame



Design and 3



Design 1

Design 3

BUDGET PLANNING

Budget Summary

Budget	Actual	Under(Over)
$ 1,785	$ 1,888	$ (103)

	Labor		Materials		Fixed Costs					
Expenses	Hrs	Rate	Units	$/Unit	Material	Travel	Other	Budget	Actual	Under(Over)
Part								$ 1,635	$ 1,642	$ (7)
motor			1	$300.00				300.00	300.00	-
rope			400	$1.72				500.00	688.00	(188.00)
snow stakes			8	$2.95				50.00	23.60	26.40
gear box			1	$60.00				100.00	60.00	40.00
housing unit									-	-
aluminum sheets			6	$25.54				200.00	153.24	46.76
aluminum frame			50	$4.80				250.00	240.00	10.00
pully			1	$21.49				50.00	21.49	28.51
screws			50	$0.18				10.00	8.98	1.02
top pully			2	$21.49				50.00	42.98	7.02
frame stands			2	$18.40				50.00	36.80	13.20
frame			2	$5.57				15.00	11.14	3.86
ratchet straps			4	$14.00				60.00	56.00	4.00
come along			1	$30.00				30.00	30.00	-
gasoline			5	$3.09				20.00	15.45	4.55
labor								$ 100	$ 200	$ (100)
Welding	10	$20.00						100.00	200.00	(100.00)
prototyping	25	$0.00						-	-	-

Projected budget of $3000

Estimated amount based on bill of materials: **$1888**

Assuming total $3000 is fundraised - **excess of $1000**

Manufacture costs would be minimal as most would be done by the team. Welding may be done by sponsor: **$100-$200** max

Excess money would be used for:

- More material for framing and top pully based on redesign
- Emergency and safety features
- Wheels and transportation devices
- Additional tie downs and mounting hardware

QUESTIONS???