Elk Ridge Ski Area: Poma Lift Stick

Progress Report

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Overview

- Problem Statement
- Constraints
- Design
- Continued Research
- Prototyping
- Testing
- Conclusion
- Gantt Chart

Problem Statement

- Issues:
  - Travel on snowboard not the same as on skis
  - Not the same support and comfort ascending the mountain
- "*The current Poma Lift stick does not accommodate skiers and snowboarders with equal support and comfort.*"
- Goal:
  - Design a transportation device that provides skiers and snowboarders with equal amounts of support and comfort.

Amy Cook

Amy Cook

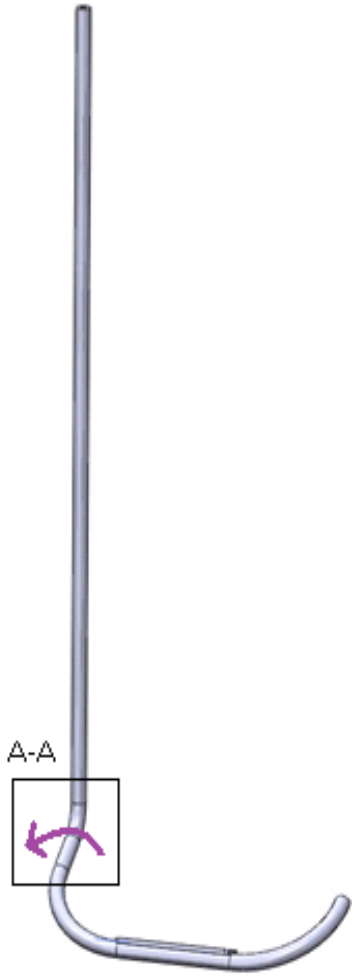
Constraints

- Must cost less than $200.00
- Dismount in less than 30 s
- No distance between snow and person
- Must vary in height 0.5 meters
- 1.5 m head clearance
- Hold 180 kg with less than 5 mm deformation.
- Must have a 40 year life
- New attachment configuration dimensions equal old

Amy Cook

Proposed Design

- Basic shape is U-hook
- Flat plate that acts a platform for riders to lean against
- Roller bearing to accommodate for straight and goofy snowboard riders
- Material is AISI 1030 Steel



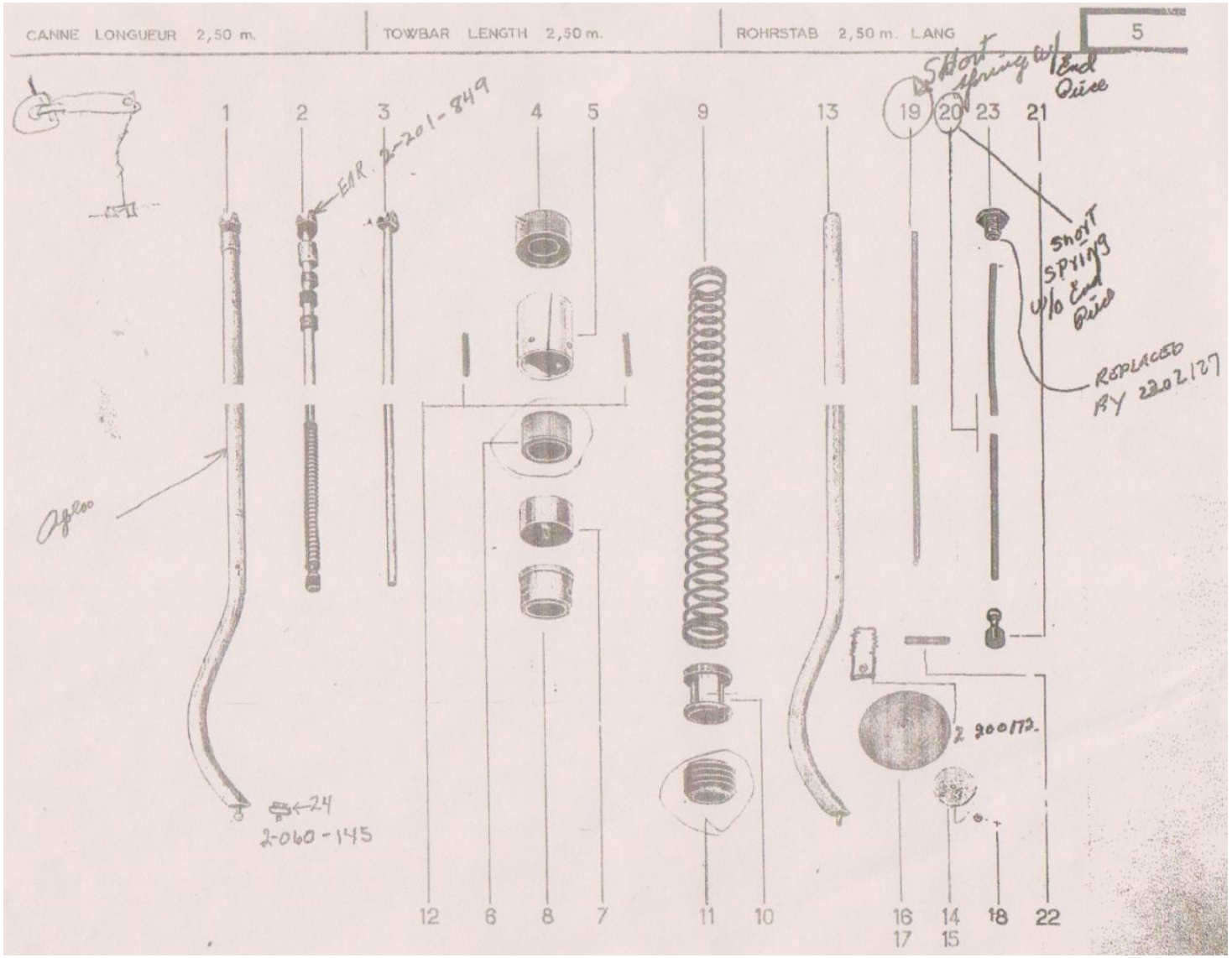
Modifications

- Analysis redone with AISI 1020 steel
- Roller bearing removed
  - Could not locate appropriate size bearing
  - Material wear due to weather
  - Pin Design considered - stresses too high
- Handle added
  - More stability needed with bearing removed
- Dimensions reduced to better match current Poma

Continued Research- Materials

- ASTM A53 Schedule 40 Piping
  - Lower yield strength than 1030 but still suitable
  - Priced between $5 - $10 per foot
- ASTM A53 Schedule 80
  - Too thick and heavy for design requirements
- Seamless Tubing
  - Possibly safer for stress loads
  - More expensive – possibly out of budget range

Continued Research- Inner Pole



Kristin Coady

Prototyping

- Creating prototype from one solid pipe bent to design shape
  - Handle and plate welded on
- Machining
  - NAU Machine Shop does not have the necessary machinery
  - Made contact with Scott of American Spring- full shop in Flagstaff
- Deadline: March 1st
  - Before snow melts

Shop Testing

- Engineering Analysis:
  - Large safety factor
  - 3D modeling showed low stresses at design loads
  - Minimal shop testing required
- Secure the outer pole assembly using weighted blocks and standing walls
- Weight will be applied to the areas that the pole has been machined (i.e. the bends/critical points)
- Mechanical Testing of upper spring assembly
  - True fixed point of the system – highest stresses

On Site Testing

Test at Elk Ridge Ski Area

- Test on the current Poma lift system
- Invite selected riders to try the prototype
  - People of extreme weights and heights
  - Without demonstration of use
- Question about the comfort of the design and its ease of use
- Modify prototype if needed

Conclusion

- Modified design
  - Modifications still meet engineering analysis and requirements
- Material to be purchased in next couple of weeks
- Inner pole to be disassembled to ensure that new outer pole design will be compatible
- Prototype to be manufactured at shop in town
  - NAU machine shop not able to
  - Deadline: March 1st
- Minimal shop testing based on engineering analysis
- On site testing
  - Test on current Poma lift system with a wide variety of riders
  - Use feedback to see if modifications need to be made

Spring Semester Gantt Chart