Market

- 500,000 people a year are injured by ladders
- Approximately 300 ladder related deaths a year
- In 2006, there were 732,175 construction companies in the US
- In 2006, over 126 billion households in the US

Sources:
Customer Needs

- Safe alternative to a ladder
- Ability to be up high and move around
  - Painting
  - Decorating
  - Cleaning windows
  - Reaching elevated ceilings
  - Cleaning gutters
- Rentals for a one time job (painting outside of house)
- Lightweight and easy to store away
Technical Feasibility

Basic Dimensioned Design:

Person: 6ft male, 120 kg
\( \text{COM}_{\text{person}} = 3.36 \text{ ft} \)

\( \text{COM}_{\text{system}} = 8\text{ft} \)

Linkages are Al box extrusions

2” x 54” X 0.8” bar
cutout 0.2” in from each side
Torque = pull * height – weight of structure * COM

Height = 8 ft
Weight of structure = 75 kg
COM = 2.63 ft

Maximum Force = 52.6 pounds force
Technical Feasibility B

What would happen if we used supports?

Variable pull force \( F \)

Variable distance \( x \)

150 pounds force

100 pounds force

200 pounds force

Distance (ft)

Torque (lbs force*ft)

Torque (COM)

Torque (pull)
Illustration of Model