Lift Rails

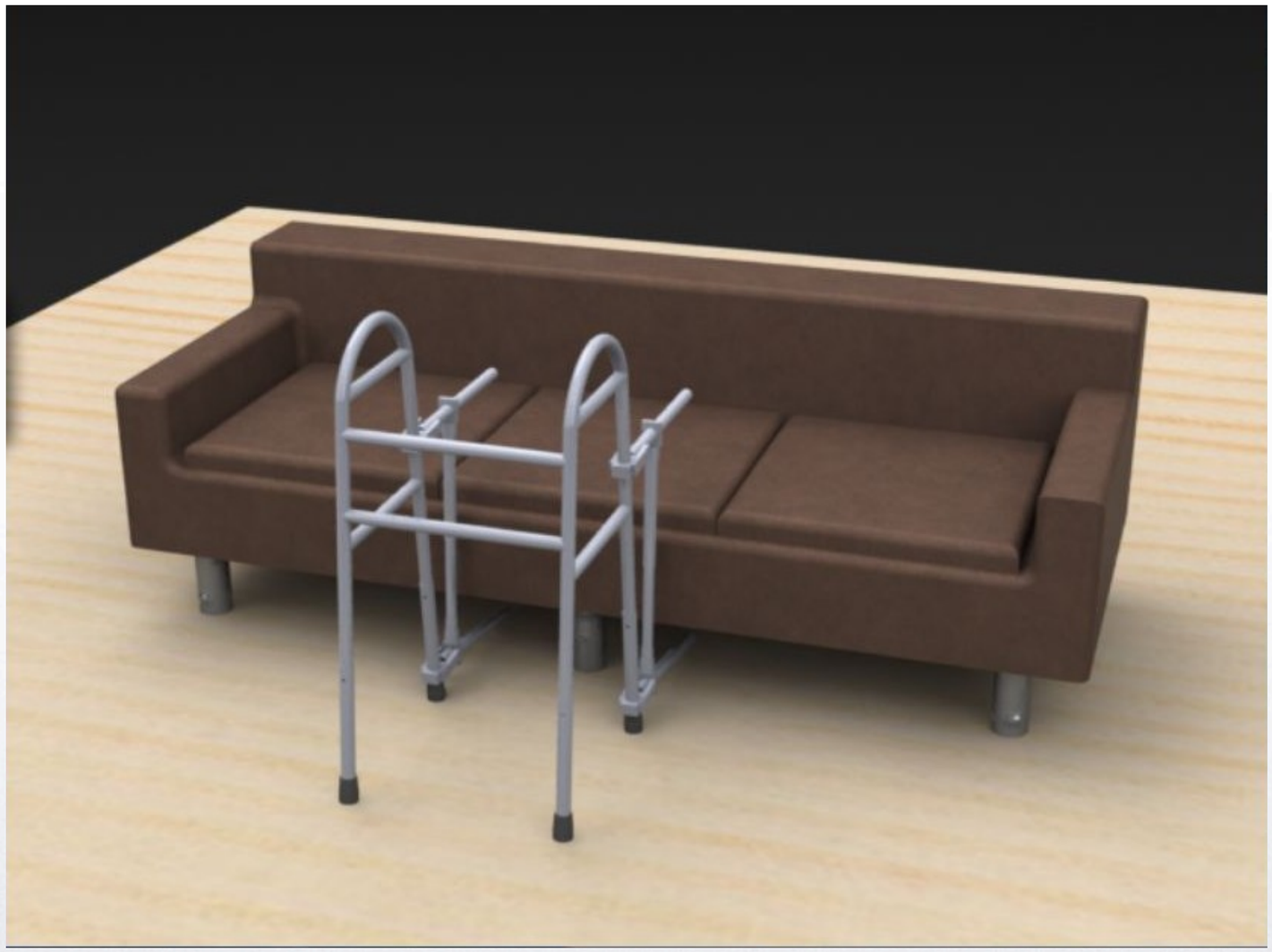
Purple B

Our Problem

I hate asking people to help me get up.

- Vivien, *Elderly Resident of Somerville Home*

Our Solution



Customer Contract

User Need	Attributes	Success Criteria
Is easy to understand and use	**number of operations necessary to use is low**	**less than 2 actions necessary to fold in/out the arms**
Feels sturdy	deflection of beams	no deflection more than 5 mm when 300 lbs of vertical force is applied
Fits through doorways	horizontal dimensions	device fits within the width of an existing walker
Is usable even if user is short or tall	height of arm rails	arm rails' height adjustable to accommodate 95th percentile human height
User can get up nose-over-toes	**arm rail length**	**arm rails' length adjustable to accommodate 95% of elderly seat sizes**
Product will last a long time	cycle loading	no part will break under 10,000 cycles of 300 lbf load
Device leg won't hit couch	device foot length and orientation	foldout leg won't interfere with 95% of couches when it folds and unfolds
Event with attachment, walker still works	physical interference between parts	none of our device, when folded up, blocks access to actual walker
Device won't tip over	**force and moment balance**	**device does not tip more than 3° when 300 lbf applied vertically**
Device is light enough for comfort	**total weight**	**device weighs less than 12 lb**
Device doesn't feel like it's slipping	**horizontal displacement**	**device does not slide more than 5 mm when 300 lbf applied vertically**
Device joints won't break or break off	joint load limits	joints rated and tested to withstand user applying 300 lbf vertically
Device remains attached to user's walker	attachment strength	Attachments stay attached to walker even under 300 lbf vertical load
Arm rails stay oriented parallel to arms	arm rail deflection	arm rails do not bend more than 5° outwards when 300 lb applied outward on arms

Customer Contract

- Easy to understand and use
- User can get up nose-over-toes
- Won’t tip over
- Light enough for comfort
- Feels safe and sturdy

Customer Contract

User Need	Attributes	Success Criteria
Is easy to understand and use	**number of operations necessary to use is low**	**less than 2 actions necessary to fold in/out the arms**
Feels sturdy	deflection of beams	no deflection greater than 5 mm when 300 lbs of vertical force is applied
Fits through doorways	horizontal dimensions	device fits within the width of an existing walker
Is usable even if user is short or tall	height of arm rails	arm rails' height adjustable to accommodate 95th percentile human height
User can get up nose-over-toes	**arm rail length**	**arm rails' length adjustable to accommodate 95% of elderly seat sizes**
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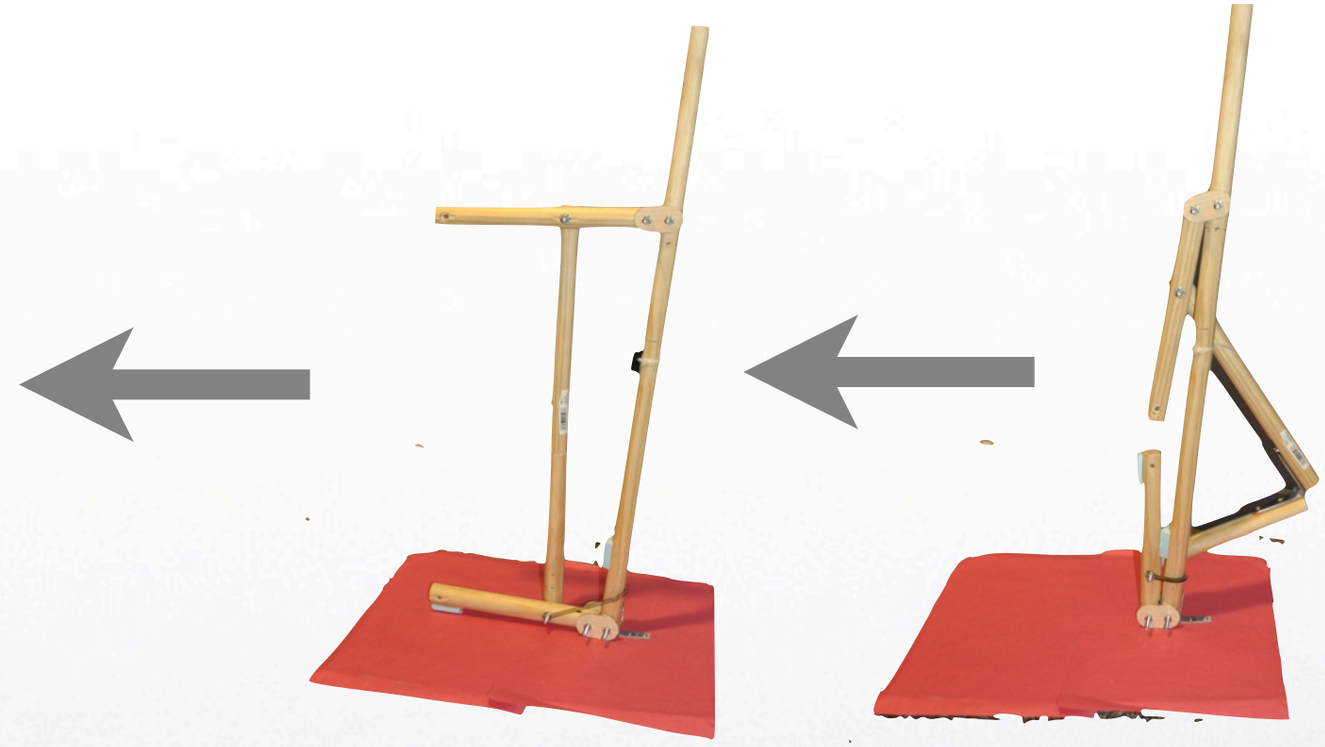
Human Factors

Structural Integrity

Human Factors

- Physical limitations of User
  - Strength
  - Flexibility
  - Balance
  - Height
- Resistance to complicated technology

Human Factors



- Easy to understand and use
- Users can get up nose-over-toes

Structural Integrity

- Collapsing or tipping over
- Perception of instability

Structural Integrity

- Device won't tip over
- Light enough for comfort
- Doesn't feel like it's slipping

New Customer Contract

User Need	Attributes	Success Criteria	Achieved?
Is easy to understand and use	number of operations necessary to use	less than 2 actions necessary to fold in/out the arms	√
Feels sturdy	deflection of beams	no deflection more than 5 mm when 300 lbs of vertical force is applied	
Fits through doorways	horizontal dimensions	device fits within the width of an existing walker	√
Is usable even if user is short or tall	height of arm rails	arm rails' height adjustable to accommodate 95th percentile human height	
User can get up nose-over-toes	arm rail length	arm rails' length adjustable to accommodate 95% of elderly seat sizes	
Product will last a long time	cycle loading	no part will break under 10,000 cycles of 300 lbf load	
Device leg won't hit couch	device foot length and orientation	foldout leg won't interfere with 95% of couches when it folds and unfolds	√
Event with attachment, walker still works	physical interference between parts	none of our device, when folded up, blocks access to actual walker	√
Device won't tip over	force and moment balance	device does not tip more than 3° when 300 lbf applied vertically	√
Device is light enough for comfort	total weight	device weighs less than 12 lb	√
Device doesn't feel like it's slipping	horizontal displacement	device does not slide more than 5 mm when 300 lbf applied vertically	
Device joints won't break or break off	joint load limits	joints rated and tested to withstand user applying 300 lbf vertically	
Device remains attached to user's walker	attachment strength	Attachments stay attached to walker even under 300 lbf vertical load	
Arm rails stay oriented parallel to arms	arm rail deflection	arm rails do not bend more than 5° outwards when 300 lbf applied outward on arms	
Device doesn't pinch user	pinch points	Pinch points identified and blocked off to hands	
Device folds up with minimal effort	friction in all joints	Friction in joints is low enough for user to fold device up with no more than 5 lbf	
Device leg won't get stuck on ground when unfolding	friction between leg and ground	Friction between leg and ground is low enough for user to fold device up with no more than 5 lbf	
Looks Good	Astheticly Please	Percievced as pleasing to the user	

What We Learned

- Pinch Points
- Mechanism jamming
- Importance of aesthetics

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