ME 1.06:ActuLiftX Sit-to-Stand Trainer

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STS-T
TEXAS STATE UNIVERSITY
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Meet the Team

(Left to Right): Alexandra Gilmore, Fatima Hassan, Grace Schmitt, & Isabela Willis

Mission Statement

Design a safe, durable, and user-friendly trainer capable of rehabilitation for patients to regain the ability to perform the sit-to-stand motion.

Why this Matters

Sit-to-Stand is a daily movement that is critical for everyday life and is one of the hardest movements for physical therapists to train.

They need a device that:

- Supports patients in learning the correct STS motion
- Has adjustable assistance for various abilities
- Improves recovery outcomes
- Tracks progress
- Reduces physical strain on PT and/or caregiver

Biomechanics Background

Major muscles and joints involved: quadriceps, gluteus maximus, core, hip, knees, and ankles

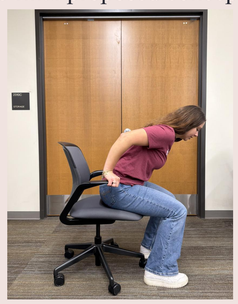
The body's center of mass shift forward and upward during transition

Example of User Sit-to-Stand Motion

The following images demonstrate the sequence of steps in the sit to stand motion that the team considered during their research, study, concept generation, and the final proposed concept.

Seated Upright

Flexion Momentum

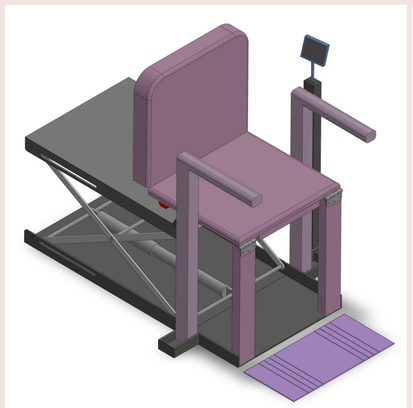


Momentum Transfer

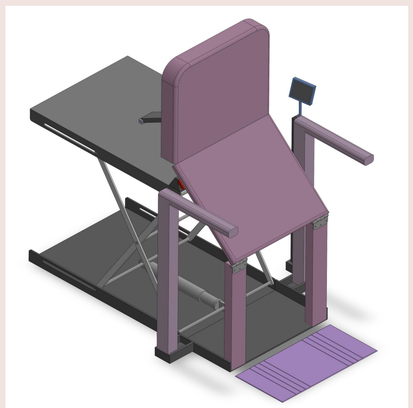
Extension

Stabilization/Standing

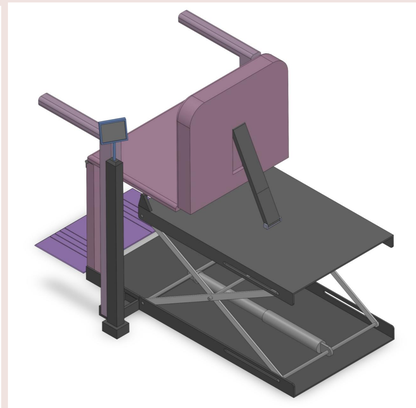
Proposed Design - ActuLiftX



Starting Seated Position



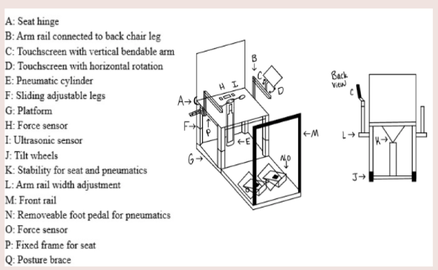
Ending Standing Position



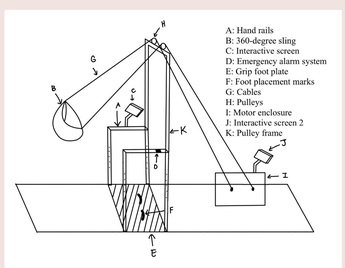
Starting Position – Back View

The ActuLiftX STS-T is a compact electromechanical sit-to-stand trainer that uses an electric linear actuator and single scissor-lift mechanism to provide controlled vertical assistance along a natural motion path. A microcontroller-driven touchscreen allows user-specific input (weight and assistance level) to deliver precise, adjustable support.

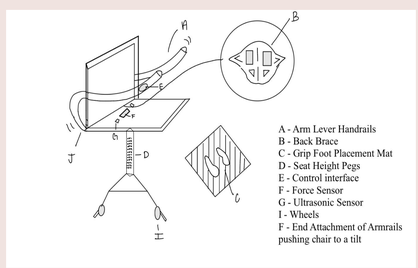
Other Concepts Generated by the Team



Pneumatically Assisted Lift with Foot Pedals

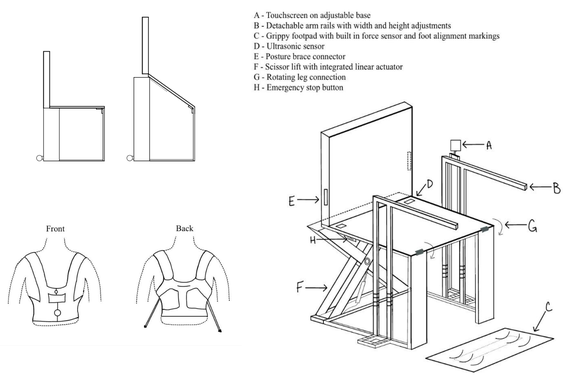


360-Degree Sling Pulley STS-T



Arm-Lever Assisted STS-T

Final Concept Sketch



Target Markets

Primary Markets:

- Physical Therapy Clinics
- Nursing Homes/Assisted Living Spaces
- Hospitals
- Rehabilitation centers

Secondary Markets:

- Gym/Fitness Centers
- Sports Teams
- Home Health

Product Stakeholders

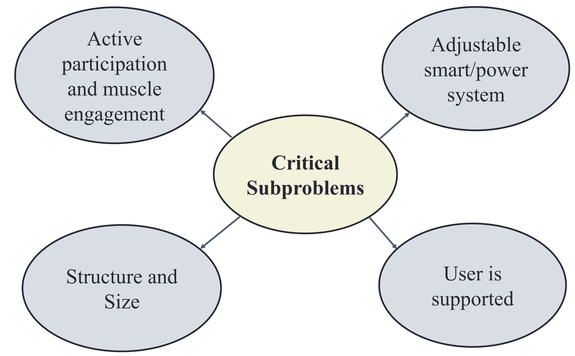
- Physical Therapists
- Patients
- Nursing Homes
- Caregivers
- Sponsors, Manufacturing, and Sales

Target Specifications

Examples of target specifications deemed essential by the team (out of 50 total):

Metric	Metric	Units	Marginal Value	Ideal Value
1	Required force to move device	lbf	<55	< 30
2	Has an interactive surface	Binary	Yes	Yes
3	Max supported user weight	lb	<= 290	<=250
4	Supported user height range	ft, in	<= 6'0	<= 6'4
5	No. of adjustable assistance levels	Integer	3	5
6	Retail price	$USD	< 2000	< 1000
7	Modular components	Binary	Yes	Yes

Critical Subproblems



What's Next?

Work on a system level design and detail design

- Perform a Stress Analysis – FEA

Develop a physical comprehensive prototype

- Customer testing and product refinement