

P13045

Mobile Pediatric Stander

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Final Review Agenda

Topic	Time
Project Summary	10:00 am
Customer Needs	10:02 am
Engineering Specifications	10:04 am
Work Breakdown Structure	10:05 am
System Architecture	10:07 am
Design Summaries	10:09 am
Testing	10:20 am
Weight Tracking	10:22 am
BOM and Budget	10:23
Recommendations	10:24
Questions/Comments	10:25 am

Project Description

- Motorize a Pediatric Stander to increase independence and mobility for user
 - Add ≤ 20 lbs.
 - Incorporate Training Mode
 - SAFETY
 - Versatile Controls



Updated Customer Needs

Customer Needs--P13045

	Customer Need #	Importance	Description	Comments/Status
Functionality	CN1	5	Mobilize existing stander	PRP
	CN2	5	Reliable/Chargeable Power Source	PRP
	CN3	5	Training Mode/Controller for Trainer	PRP
	CN4	5	Move at a brisk walking pace	PRP
	CN5	3	Removable tray/as much as possible behind child	Customer Request
	CN6	5	Add no more than 20lb to device	PRP
	CN7	5	Able to be used left handed or right handed	Site Visit
	CN8	5	Able to function with a range of children with different abilities	Customer Request
	CN9	5	Be able to function in a school environment	Customer Request
	CN10	3	Stander should be made in the USA and use standard parts	Site Visit
Safety	CN11	5	Must provide as much stability as off the shelf stander	PRP
	CN12	5	Electrical Components must be protected	Site Visit
	CN13	5	Restraints/Straps must remain in current arrangement	PRP
	CN14	3	Collision Detection	Customer Request
Cost	CN15	5	Proposed budget of \$6000	PRP

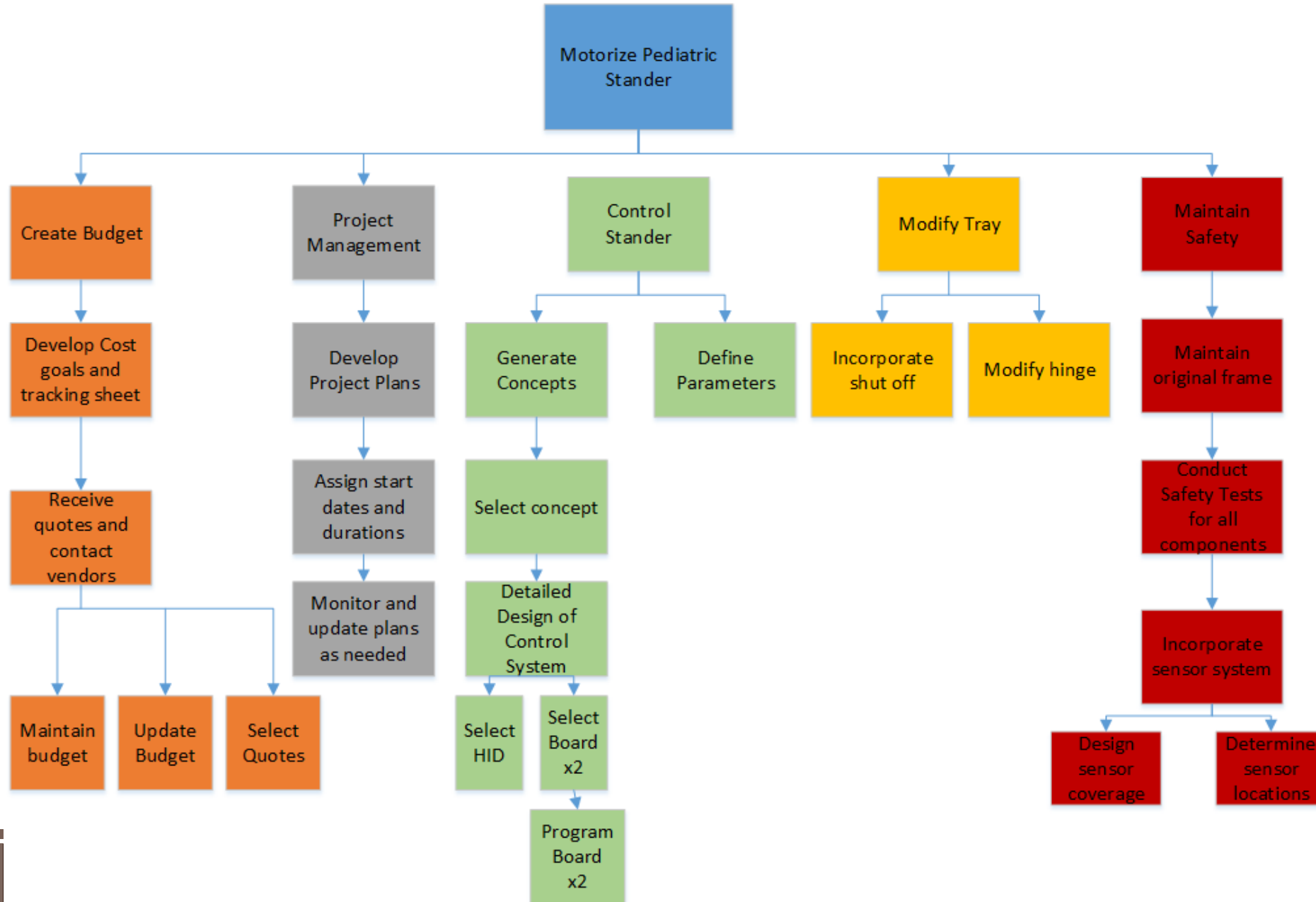
Importance: Sample scale (5=must have, 3=nice to have, 1=preference only).

Updated Engineering Specifications

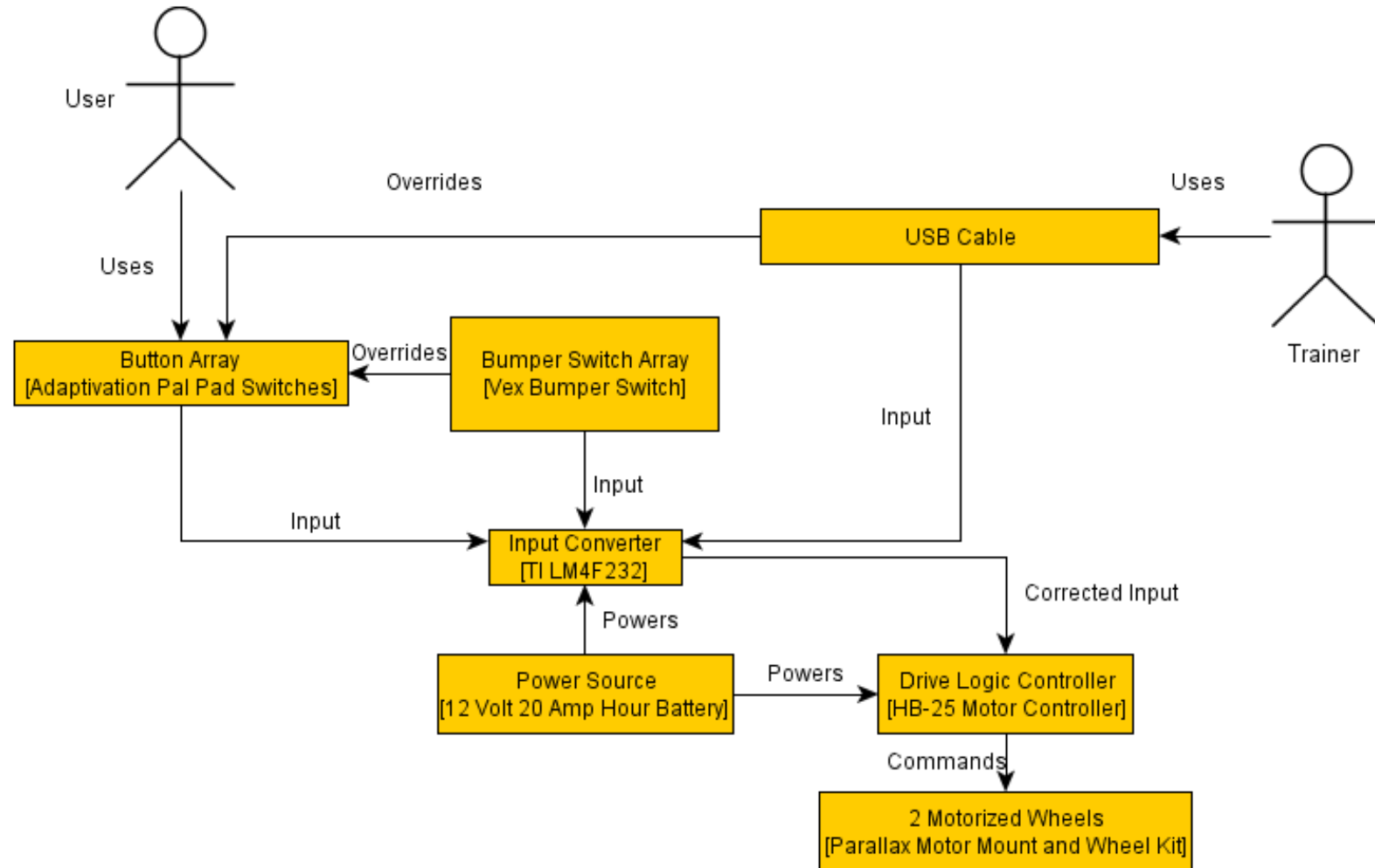
Engineering Specifications

Eng. Spec #	Importance	Source	Description	Units	Ideal Value	Comments/Results
1	5	CN1,CN5	Motor Power	Torque		Be determined through research
2	5	CN7	Additional Weight	lbs	< 20	PRP
3	5	CN1,CN5,CN10	Speed	mph	3	Based on wheelchair research
4	5	CN1,CN2	Battery Voltage	Volts	12V	Based on wheelchair research
5	5	CN2	Battery Duration	Hours	4	Length of School Day
6	4	CN2	Battery Charge Duration	Hours	8	Overnight
7	3	CN9	Options for Controls	Count	2-4	Joystick, goal post, buttons, etc
8	5	CN4,CN10	Max Distance that the Training Mode would be Functional	in	6	Wired Connection
9	1	CN6,CN9	Minimum distance between object and user	in	4	Tray Redesigned
10	3	CN6,CN10	Time it takes to Put Away/Put Up Table	secs	30	
11	5	CN15	Stopping Distance when obstacle detected	meters	<1	Only using bump sensors
12	3	CN11	Where the stander is made	country	USA	If metric, make tools available
13	5	CN8	Placement Options for Controls	Count	2 (R/L)	Used with various children
14	5	CN13	Cable management system	Method	Routed through stander	Alternative was duct tape
15	5	CN14	Percent Change in Straps/Restraints from Original Stander	%	0%	
16	5		Amount of Weight Tray can hold	lbs	20	
17	5	CN12	Percent Change in Stability from Original Stander	%	0%	
18	5	CN16	Cost	\$	6000	Budget

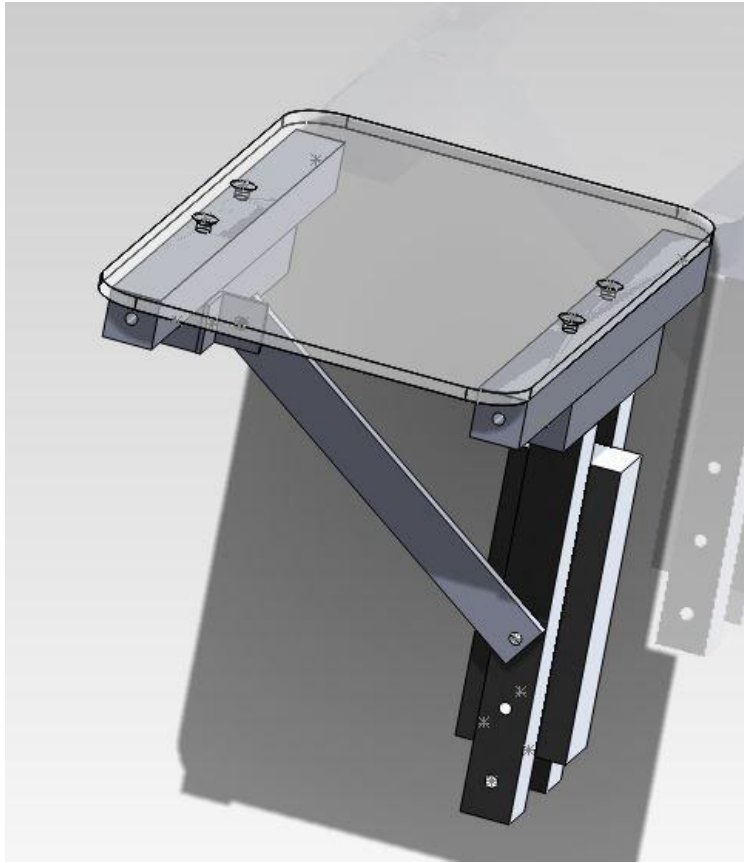
Work Breakdown Structure



System Architecture

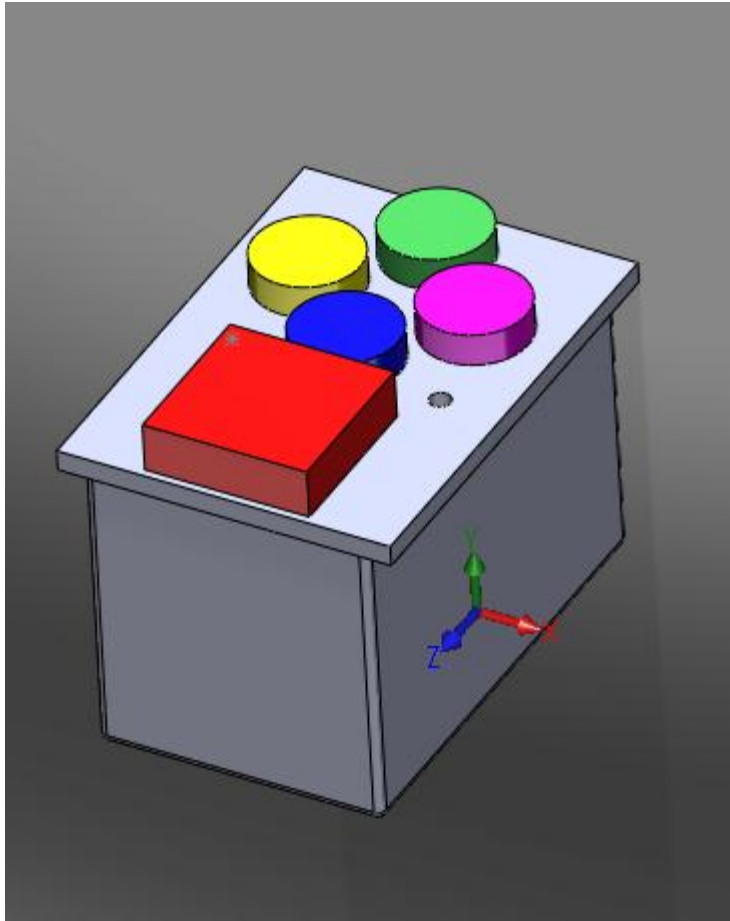


Design Summary – Tray Mount

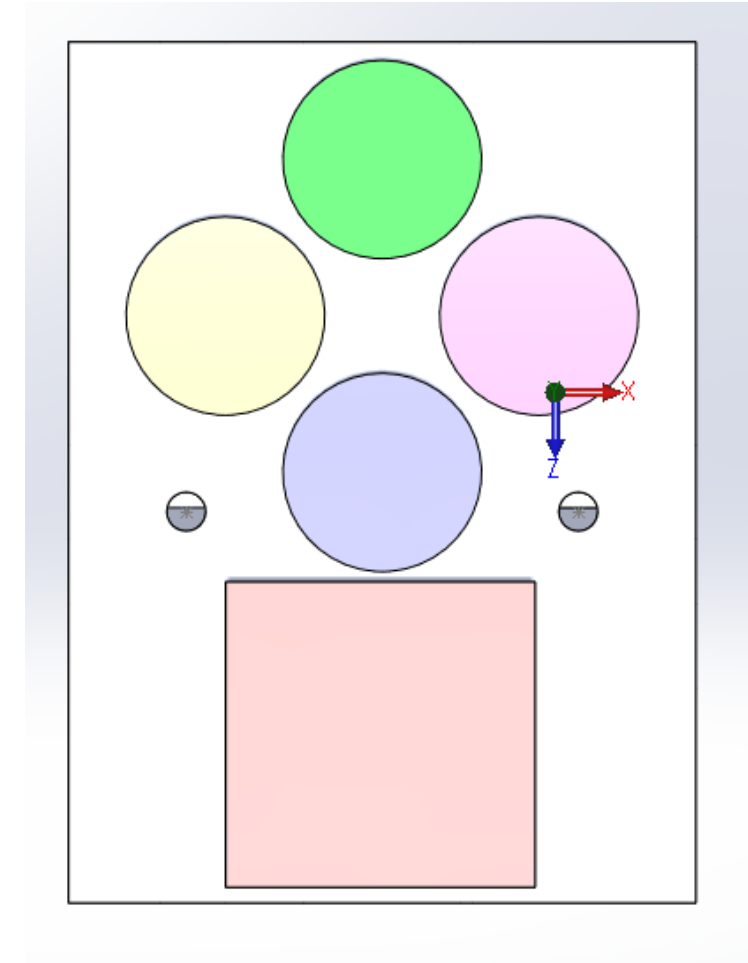


- Utilization of slot system on original frame
- Hold 20+ pounds
- Adjustable up/down, left/right
- Constructed out of aluminum bars and 80/20

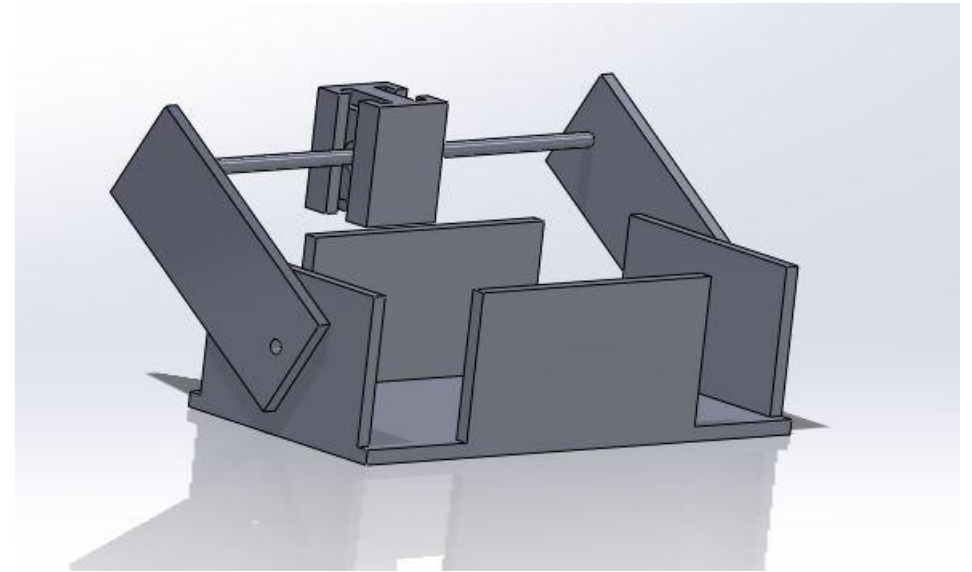
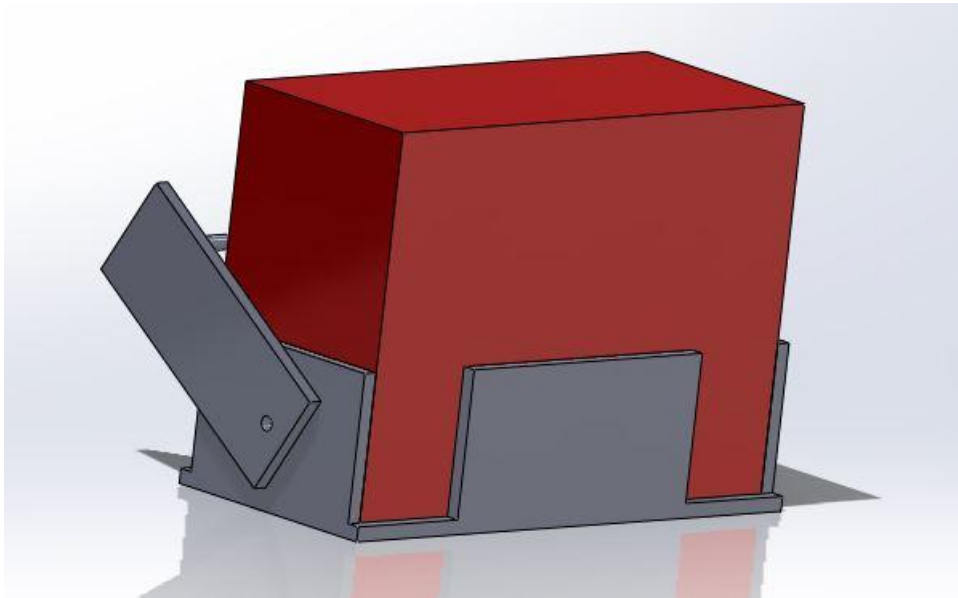
Design Summary – Remote Control



- Used by therapist to control the stander
- Two Modes:
 - Override Mode
 - Assistive Mode
- Sends control signal to the stander using a wired serial connection
- Uses TI Stellaris Launchpad microcontroller

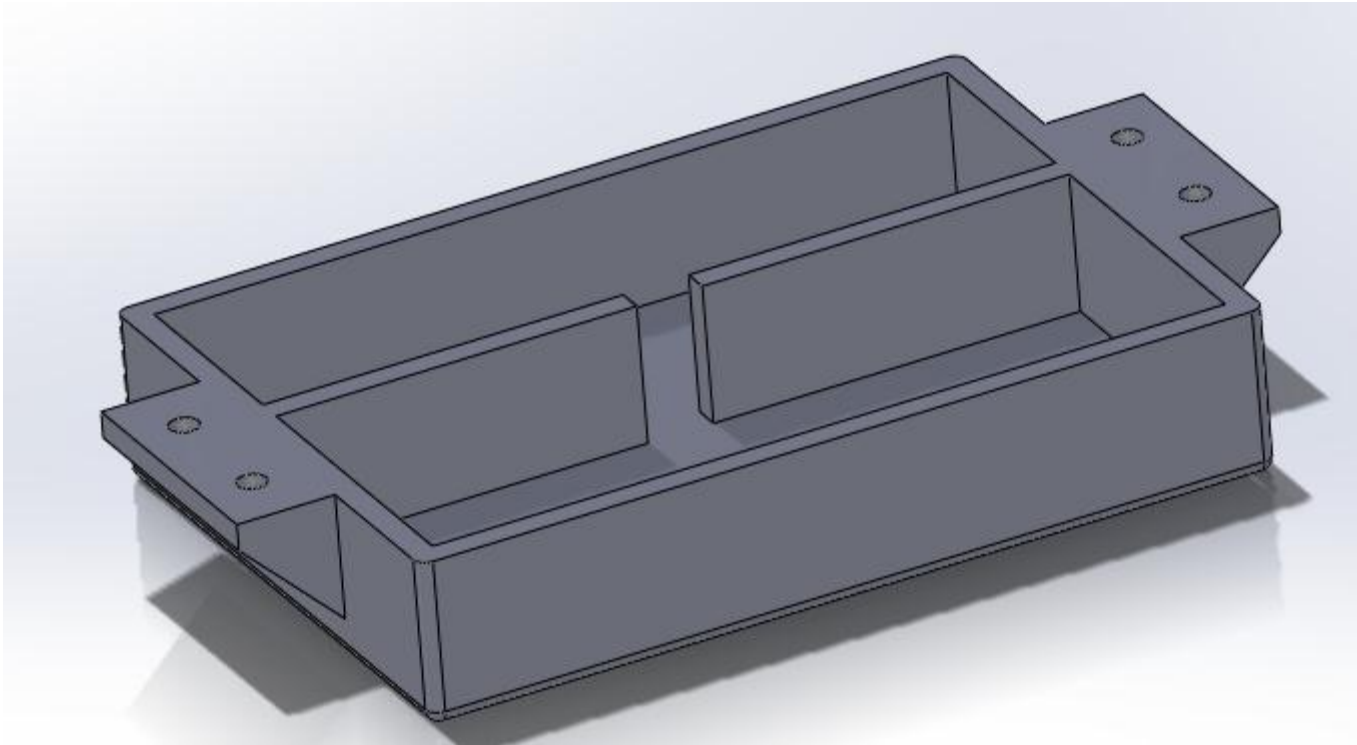


Design Summary – Battery Mount



- Used the existing frame to attach
- Bottom piece was cut and bent up
- Top pieces were cut and had a threaded rod welded in

Design Summary – Board Housing



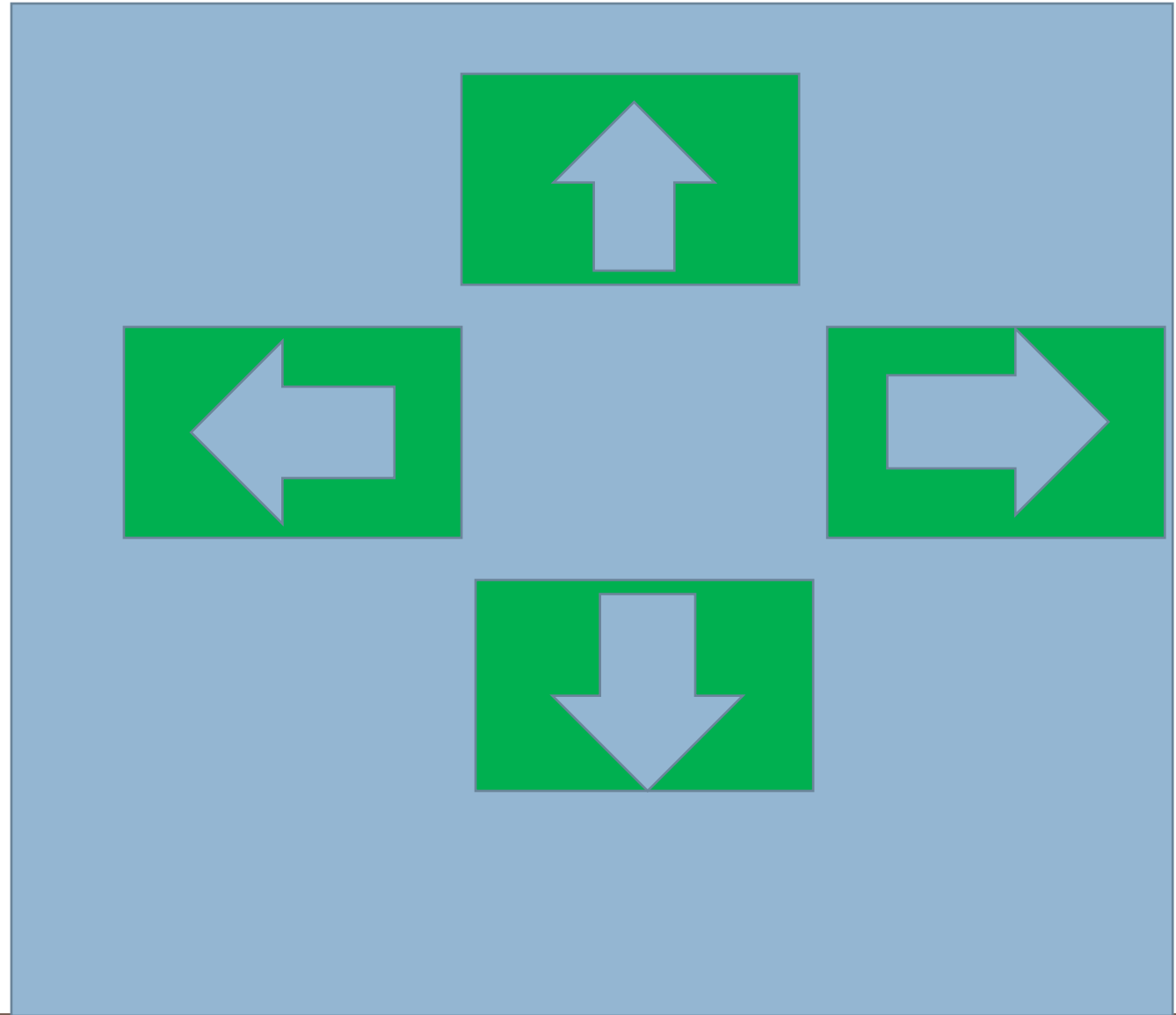
- Holds the LM4F232 evaluation board and voltage regulator
- Attaches to the bottom of the tray
- Ports for buttons are set in the wall of the housing

Trainer Mode

- Same board as stander
 - Ensure compatibility
- Wired Serial Connection
 - Matches the module on the Stander board
- Handheld remote control

Tray Layout 1

- Press to go
 - Must keep pressure to continue movement
- Tray: 13.75" x 8.75"
- Button: 2" x 2"

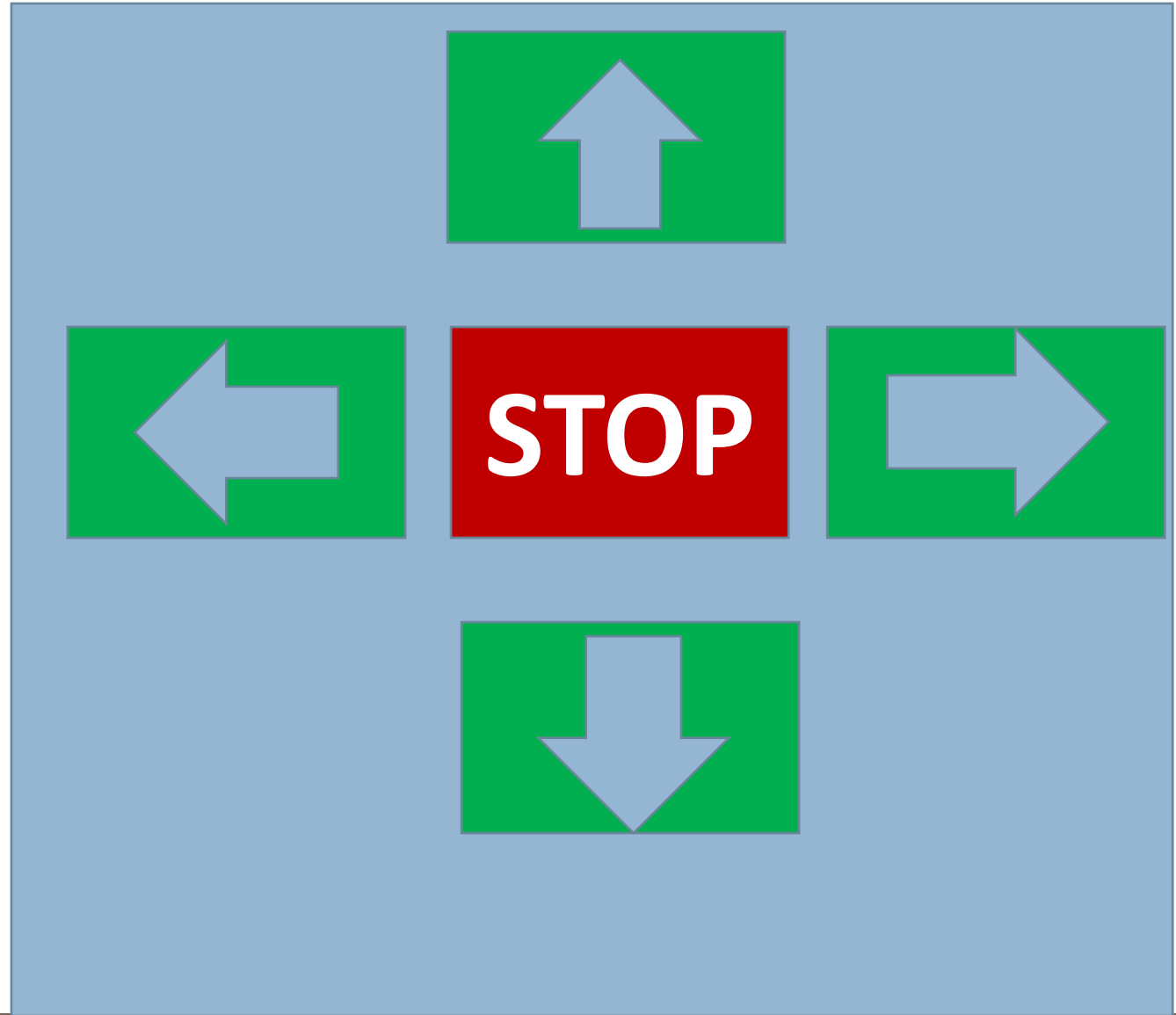


Required Tests – Button Scenario Mode 1

Buttons	Scenario	Desired Outcome - Software Interpretation	Desired Outcome - Stander Interpretation	Actual Outcome - Stander Movement	Comments
- Left	Press & Hold	Direction interpreted as left	Stander moves left	Stander moves left	
- Right	Press & Hold	Direction interpreted as right	Stander moves right	Stander moves right	
- Up	Press & Hold	Direction interpreted as forward	Stander moves forward	Stander moves forward	
- Down	Press & Hold	Direction interpreted as backward	Stander moves backwards	Stander moves backwards	
Left Right	Press & Hold	Direction = none	No movement	No movement	
Left Up	Press & Hold	Direction interpreted as forward/left	Stander moves forward to the left	Stander moves forward to the left	
Left Down	Press & Hold	Direction interpreted as backward/left	Stander moves backwards to the left	Stander moves backwards to the left	
Right Up	Press & Hold	Direction interpreted as forward/right	Stander moves forward to the right	Stander moves forward to the right	
Right Down	Press & Hold	Direction interpreted as backward/right	Stander moves backwards to the right	Stander moves backwards to the right	
Up Down	Press & Hold	Direction = none	No movement	No movement	
- Left	Press	Direction interpreted as left	Stander turns left	Stander turns left	
- Right	Press	Direction interpreted as right	Stander turns right	Stander turns right	
- Up	Press	Direction interpreted as forward	Stander inches forward	Stander inches forward	
- Down	Press	Direction interpreted as backward	Stander inches backwards	Stander inches backwards	
Left Right	Press	Direction = none	No movement	No movement	
Left Up	Press	Direction interpreted as forward/left	Stander turns forward to the left	Stander turns forward to the left	
Left Down	Press	Direction interpreted as backward/left	Stander turns backwards to the left	Stander turns backwards to the left	
Right Up	Press	Direction interpreted as forward/right	Stander turns forward to the right	Stander turns forward to the right	
Right Down	Press	Direction interpreted as backward/right	Stander turns backwards to the right	Stander turns backwards to the right	
Up Down	Press	Direction = none	No movement	No movement	

Tray Layout 2

- Press to go until another button is pressed
 - Stop button to stop
- Tray: 13.75" x 8.75"
- Button: 2" x 2"



Required Tests – Button Scenario Mode 2

Buttons	Scenario	Desired Outcome - Software Interpretation	Desired Outcome - Stander Interpretation	Actual Outcome - Stander Movement	Comments
- Left	Press	Direction interpreted as left	Stander moves left	Stander moves left	circle
- Right	Press	Direction interpreted as right	Stander moves right	Stander moves right	circle
- Up	Press	Direction interpreted as forward	Stander moves forward	Stander moves forward	circle
- Down	Press	Direction interpreted as backward	Stander moves backwards	Stander moves backwards	circle
- Stop	Press	Direction = none	No movement	No movement	
Left Right	Press	Direction = none	No movement	No movement	
Left Up	Press	Direction interpreted as forward/left	Stander moves forward to the left	Stander moves forward to the left	
Left Down	Press	Direction interpreted as backward/left	Stander moves backwards to the left	Stander moves backwards to the left	
Right Up	Press	Direction interpreted as forward/right	Stander moves forward to the right	Stander moves forward to the right	
Right Down	Press	Direction interpreted as backward/right	Stander moves backwards to the right	Stander moves backwards to the right	
Up Down	Press	Direction = none	No movement	No movement	
Stop Left	Press	Direction = none	Stander stops	Stander stops	
Stop Right	Press	Direction = none	Stander Stops	Stander Stops	
Stop Up	Press	Direction = none	Stander Stops	Stander Stops	
Stop Down	Press	Direction = none	Stander Stops	Stander Stops	

Weight Tracking

Component	Quantity	Weight (lb)	Total Weight (lb)
Battery	1	7.7 lb	7.7 lb
Battery Mount	1	1 lb	1 lb
Motorized Wheels	2	3.2 lb	6.4 lb
Motor Controllers	2	0.16 lb	0.32 lb
Sensor Bumper Mounts	2	0.5 lb	1 lb
Lego Tray	1	0.2 lb	0.2 lb
Tray Mount	1	3 lb	3 lb
	Total		19.62 lbs

Bill of Materials - 1

Motorized Pediatric Stander																		
Bill of Materials																		
	Part Name	Weight	Manufacturer	Manufacturer Part #	Distributor	Distributor Part #	Quantity Needed	Quantity Ordered	Unit Price	Actual Price	Expected Price	Expected Actual Price	Shipping Cost	Total Price	Lead Time	Owner	Status	Comments
Stander	Stander	34-16	Snugseat	86226	Southwest Medical	8622	1	1	\$1,755.00	\$1,755.00	\$1,755.00	\$1,755.00		\$ 1,755.00	2 wks	Kim	Arrived	Size 2
	Wheels		Snugseat	--	Southwest Medical	--	1	1	\$0.00	\$0.00	\$0.00	\$0.00		\$ -	2 wks	Kim	Arrived	Set of 26"
	Flip-up Foot Rest		Snugseat	861212	Southwest Medical	86121X	1	1	\$167.00	\$167.00	\$167.00	\$167.00		\$ 167.00	2 wks	Kim	Arrived	
	Hinged Sandals	34-16	Snugseat	861222	Southwest Medical	86122X	1	1	\$104.00	\$104.00	\$104.00	\$104.00		\$ 104.00	2 wks	Kim	Arrived	
	Hinged Knee Supports w/ Strap		Snugseat	861312	Southwest Medical	86131X	1	1	\$333.00	\$333.00	\$333.00	\$333.00		\$ 333.00	2 wks	Kim	Arrived	
	Rotational Hip Support		Snugseat	861612	Southwest Medical	861612	1	1	\$284.00	\$284.00	\$284.00	\$284.00		\$ 284.00	2 wks	Kim	Arrived	Size 2+3 - Height and Width Adjustable
	Size 2+3 Height and Width Adjustable Chest Support		Snugseat	861702	Southwest Medical	861706	1	1	\$167.00	\$167.00	\$167.00	\$167.00		\$ 167.00	2 wks	Kim	Arrived	Size 2+3
	3" Extension for Center Bar		Snugseat	861480	Southwest Medical	861480	1	1	\$63.00	\$63.00	\$63.00	\$63.00		\$ 63.00	2 wks	Kim	Arrived	
Tray w/ Storage Box		Snugseat	862501	Southwest Medical	862501	1	1	\$293.00	\$293.00	\$293.00	\$293.00		\$ 293.00	2 wks	Kim	Arrived		
Sensors	Vex Bumper Switch		VEX Robotic Design Systems	276-2159	Robot Shop	RB-Imm-08	2	2	\$12.99	\$12.99	\$25.98	\$25.98		\$ 25.98		Tom	Arrived	Contact Switch
	Devantech SRF04 Ultrasonic Range Finder		Devantech	SRF04	Robot Shop	RB-Dev-01	5	5	\$29.17	\$29.17	\$145.85	\$145.85	\$0.00	\$ 145.85		Tom	Arrived	Ultrasonic
	Hagisonic AniBat UltraSonic Sensor HG-M40DAI		Hagisonic Co. LTD.	HG-M40DAI	Robot Shop	RB-Hag-04	5	5	\$25.54	\$25.54	\$127.70	\$127.70		\$ 127.70		Tom	Arrived	Ultrasonic
	ASTM A193 Grade B7 Alloy Steel Threaded Rod Plain Finish, 1/4"-20 Thread, 2' Length		McMaster Carr	98957A801	-	-	1	1	\$2.62	\$2.62	\$2.62	\$2.62		\$ 2.62		Heather	Arrived	
	Type 316 SS Pan Head Phillips Machine Screw 1/4"-20 Thread, 1/2" Length, packs of 25		McMaster Carr	91735A537	-	-	1	1	\$3.83	\$3.83	\$3.83	\$3.83		\$ 3.83		Heather	Arrived	
	Type 316 SS Flat Head Phillips Machine Screw 1/4"-20 Thread, 1/2" Length, packs of 25		McMaster Carr	91500A537	-	-	1	1	\$6.35	\$6.35	\$6.35	\$6.35		\$ 6.35		Heather	Arrived	

Bill of Materials - 2

Mounting Components	Type 316 SS Flat Head Phillips Machine Screw 1/4"-20 Thread, 1/2" Length, packs of 25	McMaster Carr	91500A537	-	-	1	1	\$6.35	\$6.35	\$6.35	\$6.35		\$ 6.35	Heather	Arrived
	Type 316 SS Machine Screw Hex Nut 1/4"-20 Thread Size, 7/16" Width, 3/16" Height, packs of 25	McMaster Carr	90257A029	-	-	1	1	\$4.38	\$4.38	\$4.38	\$4.38		\$ 4.38	Heather	Arrived
	Compact Head End-Feed Fastener, for 1" & 2" W, Aluminum Inch T-Slotted Framing System, Packs of 4	McMaster Carr	47065T139	-	-	4	4	\$1.85	\$1.85	\$1.85	\$1.85		\$ 7.40	Megan	Arrived
	Aluminum Inch T-Slotted Framing System, Extended Plate, Single, 4-Hole, for 1" Extrusion	McMaster Carr	47065T173	-	-	2	2	\$6.05	\$6.05	\$6.05	\$6.05		\$ 12.10	Megan	Arrived
	Standard Zinc-Plated Steel End-Feed Fastener, for 1", Aluminum Inch T-Slotted Framing System, Packs of 4	McMaster Carr	47065T142	-	-	2	2	\$2.30	\$2.30	\$2.30	\$2.30		\$ 4.60	Megan	Arrived
	Aluminum Inch T-Slotted Framing System, Four-Slot Single, 1" Solid Extrusion, 4' Length	McMaster Carr	47065T121	-	-	2	2	\$14.20	\$14.20	\$14.20	\$14.20	\$19.03	\$ 28.40	Megan	Arrived
	Fluted Knob Extended (Dog) Point Thumb Screw, Black-Oxide Steel, 1/4"-20 Thread, 2" Length	McMaster Carr	33005A581	-	-	10	10	\$8.43	\$8.43	\$8.43	\$8.43		\$ 84.30	Megan	Arrived
	Aluminum Inch T-Slotted Framing System, 90 Degree Bracket, Single, 2-Hole, for 1" Extrusion	McMaster Carr	47065T223	-	-	2	2	\$3.98	\$3.98	\$3.98	\$3.98		\$ 7.96	Megan	Arrived
	Aluminum Inch T-Slotted Framing System, 90 Degree Bracket, Single, 2-Hole, for 1-1/2" Extrusion	McMaster Carr	47065T224	-	-	2	2	\$4.06	\$4.06	\$4.06	\$4.06		\$ 8.12	Megan	Arrived

Bill of Materials - 3

	Multipurpose Aluminum (Alloy 6061), 1/4" Thick X 1" Width X 6' Length	McMaster Carr	8375K24	-	-	1	1	\$16.02	\$16.02	\$16.02	\$16.02	\$	16.02		Megan	Arrived		
	Metric Low Head Socket Cap Screw Class 8.8 Steel, M12 Size, 20mm Length, 1.75mm Pitch, packs of 10	McMaster Carr	93070A241	-	-	1	1	\$8.48	\$8.48	\$8.48	\$8.48	\$	8.48		Heather	Arrived		
HID	Seedstudio Serial Bluetooth Module LM4F232 USB+CAN Evaluation Kits	Seed Studio	WLS123A1M	Robot Shop	RB-See-14	2	2	\$19.50	\$19.50	\$39.00	\$39.00	\$0.00	\$	39.00		Steve	Arrived	Bluetooth Module Microcontrollers/ Board
	Stellaris® LM4F120 LaunchPad Evaluation Comprehensive MJ-CM 3.5mm Female Audio Jack Chassis Mount	Texas Instruments	EK-LM4F232	-	-	1	1	\$139.69	\$139.69	\$139.69	\$139.69	\$35.00	\$	139.69		Steve	Arrived	
	Adaptivation Pal Pad Switches; Blue Mini	Texas Instruments	EK-LM4F120XL	-	-	1	0	\$12.99	\$0.00	\$12.99	\$0.00	\$	\$	-		Steve	Arrived	Microcontrollers/ Board
	Adaptivation Pal Pad Switches; Purple Mini	Comprehensive	B&H Photo Video			5	5	\$0.99	\$0.99	\$4.95	\$4.95	\$5.15	\$	4.95	7-14 Days	Steve	Arrived	
	Adaptivation Pal Pad Switches; Yellow Mini	Adaptivation	PAL-MINI-BU	Enablemart	85045	1	1	\$41.00	\$41.00	\$41.00	\$41.00	\$	\$	41.00	5 Days	Steve	Arrived	Color: Blue
	Adaptivation Pal Pad Switches; Green Mini	Adaptivation	PAL-MINI-PU	Enablemart	85051	1	1	\$41.00	\$41.00	\$41.00	\$41.00	\$	\$	41.00	5 Days	Steve	Arrived	Color: Purple
	Adaptivation Pal Pad Switches; Red Mini	Adaptivation	PAL-MINI-YW	Enablemart	85057	1	1	\$41.00	\$41.00	\$41.00	\$41.00	\$12.06	\$	41.00	5 Days	Steve	Arrived	Color: Yellow
	FLEXBAR,16",MAG BASE, w/FINE ADJUSTOR	Adaptivation	PAL-MINI-GN	Enablemart	85048	1	1	\$41.00	\$41.00	\$41.00	\$41.00	\$	\$	41.00	5 Days	Steve	Arrived	Color: Green
	LEGO Green Building Plate	Adaptivation	PAL-MINI-RD	Enablemart	85054	1	1	\$41.00	\$41.00	\$41.00	\$41.00	\$	\$	41.00	5 Days	Steve	Arrived	Color: Red
	Flat Tile 2X2	Flexbar	18028	-	-	1	1	\$39.50	\$39.50	\$39.50	\$39.50	\$8.58	\$	39.50	5 Days	Steve	Sending Back	Trying to get a refund
	Flat Tile 6X6	Lego	-	Amazon	-	2	2	\$7.11	\$7.11	\$14.22	\$14.22	\$4.16	\$	14.22	5 Days	Heather	Arrived	10" x 10"
	Aluminum Stock	Lego	306823	-	-	5	5	\$0.10	\$0.10	\$0.50	\$0.50	\$	\$	0.50		Kim	Arrived	Lego
	SPDT ON-ON MINI TOGGLE SWITCH	Lego	6014617	-	-	5	5	\$0.50	\$0.50	\$2.50	\$2.50	\$4.95	\$	2.50		Kim	Arrived	Lego
	DUTY TOGGLE SWITCH	Mcmaster	8375K562	-	-	1	1	\$23.41	\$0.00	\$23.41	\$0.00	\$0.00	\$	-		Megan	Arrived	
	All electronics corp	-	-	-	1	1	\$1.25	\$1.25	\$1.25	\$1.25	\$	\$	1.25		Heather	Arrived	Remote Switches	
	All electronics corp	-	-	-	1	1	\$2.00	\$2.00	\$2.00	\$2.00	\$7.00	\$	2.00		Heather	Arrived	Remote Switches	

Bill of Materials - 4

	12V LIGHTED PUSHBUTTON, 1" GREEN LENS		All electronics corp	LPS-1B	-	-	4	4	\$3.75	\$3.75	\$15.00	\$15.00		\$ 15.00	Heather	Arrived	Remote buttons
	12V LIGHTED PUSHBUTTON, RED 1.5" SQUARE		All electronics corp	LPS-5R	-	-	1	1	\$4.75	\$4.75	\$4.75	\$4.75		\$ 4.75	Heather	Arrived	Remote buttons
	3D PrintSrSLS Lot charge: 2 Total		Finnovation Product Development LLC	N/A	-	-	1	1	\$275.00	\$275.00	\$275.00	\$275.00	\$10.00	\$ 275.00	Heather	Arrived	
	Impact-Resistant Polycarbonate		McMaster	8574K55	-	-	1	1	\$43.78	\$43.78	\$43.78	\$43.78	\$6.29	\$ 43.78	Megan	Arrived	New Plastic Tray 24x24, 1/4"
Motorized Wheels	HB-25 Motor Controller	2.5oz	Parallax, Inc	29144	-	-	2	2	\$43.99	\$43.99	\$99.98	\$99.98		\$ 99.98	Heather	Arrived	Motor Controllers
	Motor Mount and Wheel Kit	3.2-lb/wheel	Parallax, Inc	27971	-	-	1	1	\$299.00	\$299.00	\$299.00	\$299.00	\$35.71	\$ 299.00	Heather	Arrived	Motorized Wheels
Battery	12V 20AH Lithium Ion Battery	7.7 lbs	Smart Battery	SB20	-	-	1	1	\$259.99	\$259.99	\$259.99	\$259.99	\$45.99	\$ 259.99	Heather	Arrived	Battery
	Single Bank 6 Amp Charger		Smart Battery	DP-RS1	-	-	1	1	\$99.99	\$99.99	\$99.99	\$99.99		\$ 99.99	Heather	Arrived	Battery Charger
	30 Amp Permanently Bonded Red/Black		Power Werx	WP30-10	-	-	1	1	\$11.99	\$11.99	\$11.99	\$11.99	\$6.95	\$ 11.99	Heather	Arrived	
ection Components	Stranded Single-Conductor Wire UL 1007/1563, 12 A/WG, 300 VAC, Black		McMaster	7587K212	-	-	1	1	\$3.42	\$3.42	\$3.42	\$3.42		\$ 3.42	Steve	Arrived	6 ft
	Stranded Single-Conductor Wire UL 1007/1563, 12 A/WG, 300 VAC, Red		McMaster	7587K226	-	-	1	1	\$3.42	\$3.42	\$3.42	\$3.42		\$ 3.42	Steve	Arrived	6 ft
	Stranded Single-Conductor Wire UL 1007/1563, 22 A/WG, 300 VAC, Purple		McMaster	7587K076	-	-	1	1	\$0.96	\$0.96	\$0.96	\$0.96	\$4.80	\$ 0.96	Steve	Arrived	10 ft
	Stranded Single-Conductor Wire UL 1007/1563, 22 A/WG, 300 VAC, Blue		McMaster	7587K48	-	-	1	1	\$0.96	\$0.96	\$0.96	\$0.96		\$ 0.96	Steve	Arrived	10 ft
	Stranded Single-Conductor Wire UL 1007/1563, 22 A/WG, 300 VAC, Orange		McMaster	7587K939	-	-	1	1	\$0.96	\$0.96	\$0.96	\$0.96		\$ 0.96	Steve	Arrived	10 ft

Bill of Materials - 5

Wiring/Connectio	Conductor Wire UL 1007/1563, 22 AWG, 300 VAC, Orange	McMaster	7587K339	-	-	1	1	\$0.96	\$0.96	\$0.96	\$0.96		\$ 0.96	Steve	Arrived	10 ft
	Stranded Single-Conductor Wire UL 1007/1563, 22 AWG, 300 VAC, Green	McMaster	7587K45	-	-	1	1	\$0.96	\$0.96	\$0.96	\$0.96		\$ 0.96	Steve	Arrived	10 ft
	D-Sub Crimping Tool	Radioshack	2761595	-	-	1	1	\$9.99	\$9.99	\$9.99	\$9.99		\$ 9.99	Kim	Arrived	
	Heat Shrink Wiring	Radioshack	2781610	-	-	2	2	\$4.99	\$4.99	\$9.98	\$9.98		\$ 9.98	Kim	Arrived	
	Female Molex	Radioshack	2740234	-	-	8	5	\$2.49	\$2.49	\$19.92	\$19.92	\$6.99	\$ 12.45	Kim	Arrived	**
	Male Molex	Radioshack	2740224	-	-	8	3	\$2.49	\$2.49	\$19.92	\$19.92		\$ 7.47	Kim	Arrived	**
	Heat Shrink Wiring	Radioshack				2	2	\$3.30	\$3.30	\$6.60	\$6.60	\$6.99	\$ 6.60			
	Tripp Lite U050-003 3ft USB2.0 A to Micro-USB B Device Cable A Male to Micro-B Male, 3'	MacConnection	-	-	-	2	2	\$5.95	\$5.95	\$11.90	\$11.90	\$12.88	\$ 11.90	Steve	Arrived	
	Integy UBEC 5V3A Output (Input: 6V-8V) INTC23301	Amazon	-	-	-	2	2	\$10.14	\$10.14	\$20.28	\$20.28	\$4.02	\$ 20.28	Steve	Arrived	
	TURNIGY 3A UBEC w/ Noise Reduction	UBEC	-	HobbyKing	-	2	2	\$4.42	\$4.42	\$8.84	\$8.84	\$3.34	\$ 8.84	Steve	Arrived	

The Bottom Line

- Budget: \$6,000
- Current Total: \$5,622.86
 - Includes shipping costs
- Remaining Budget: \$377.14

Recommendations

- Encompass wiring within the stander structure
- Reduce the size of the trainer remote
- Add ultrasonic sensors to prevent collisions while allowing stander movement
- Incorporate Bluetooth to the Remote Control System

