

B Adrian Muelle, Sebastian Estrada, Nicholas Misiunas, Brian Iglesias, Enrique Groso

## 1) Problem Definition

Jorge grapples with the challenges imposed by Coffin- Syndrome (CLS), impacting his mobility, communication, and focus. His attention struggles to center on a singular focus, and it has become evident that his solace lies in a toy car. Unfortunately, existing vehicles in the market fail to meet his unique mechanical and physical requirements, consistent and reliable remote control, lacking nocturnal lighting, and providing inadequate space. To address these issues, we propose a custom modification kit with features that will prevent Jorge from steering on his own and that will prevent him from overriding parental controls. This specialized conveyance will possess the necessary power and suspension for traversing the challenging terrains around his home. Encouragingly, our efforts have garnered support from other families facing similar circumstances, who believe that this customized vehicle will provide comparable benefits to their children.

## 2) The Team

- Sebastian Estrada:
- Adrian Muelle:
- Nicholas Misiunas:
- Enrique Groso:
- Brian Iglesias:

## 3) Concept Development

1. Concept Design #1 Adrian Muelle
  - a. To fix the problem of Jorge steering on his own, we will create our own steering wheel and shaft.
  - b. The shaft will have a hole where a pin will be able to be removed. When the pin is removed, the steering wheel will have no function and will not be able to turn the car.
  - c. Additional Research

- i. “When you turn the steering wheel, it rotates the steering column. This column, in turn, moves the steering box or rack and pinion. As the steering box or rack and pinion moves, it causes the tie rods to push or pull the wheels, making them turn left or right, aligning the car's direction with your input.” (Autozone)
- d. The function of this concept is to prevent Jorge from steering on his own, eliminating the possibility of Jorge driving off into the road.
- e. This is a strong solution because the wheel will still be able to rotate, so Jorge will continue to have the entertainment of steering while staying safe.



## 2. Concept Design #2 Sebastian Estrada

- a. To fix the problem of the steering wheel, we decided to model the steering wheel and 3D print a piece to allow for a freely rotating wheel for him to fidget with.
- b. The steering wheel would need an extra piece onto the steering column in order for there to be a freely rotating steering wheel,
- c. This is a great way for Jose to prevent Jorge from taking control while he is controlling remotely as well as prevent the gears to break when Jorge is trying to take control

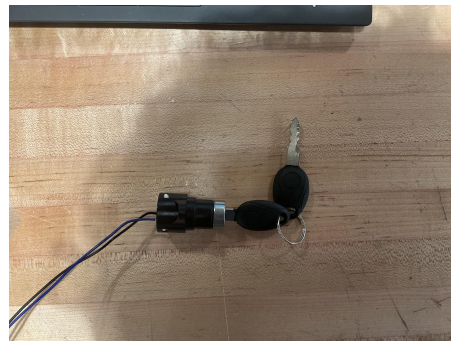


## 3. Concept Design #3 Nicholas Alexander Misiunas

- a. To relocate the switch that turns on the vehicle to a location the driver cannot access because if the driver turns off and on the start switch, the remote control

for the vehicle is no longer connected and the driver can operate the vehicle freely.

- b. To fix this issue, we will replace the start switch with a key switch to make the car more aesthetically pleasing, and place that key switch under the front hood of the vehicle so the driver is no longer able to access the switch, allowing the operator of the remote control to maintain control of the vehicle.
- c. This is a strong solution for the issue because it completely eliminates the drivers ability to reset the remote control from the driver seat when he is strapped in, while maintaining the functionality of the start switch and still giving the father easy access to turn the vehicle on and off.
- d. The keys are made of metal and plastic, and both function in the keyhole. The key switch is made of metal and plastic and is about 2 inches in diameter and will be wired into the vehicle's start switch and will be screwed into the bottom of the car's plastic tub.



#### 4. Concept Design #4 Enrique Groso

##### **Description of Concept:**

The concept focuses on creating a custom vehicle tailored for Jorge, who has Coffin-Lowry Syndrome. The vehicle will feature remote control operation, enhanced suspension for rough terrains, and nocturnal lighting for safe nighttime use.

##### **Additional Research on the Concept:**

- Research was conducted on remote-controlled cars with adaptive designs, including off-road RC vehicles and inclusive technology.
- Exploration of materials used for lightweight, durable builds, such as aluminum for the frame and shock-absorbing materials for suspension.

##### **Functionality and Operation Explanation:**

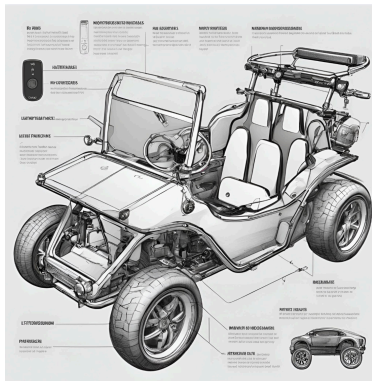
- **Remote Control:** Operates the vehicle from a safe distance, with intuitive controls tailored for ease of use by Jorge's family.

- **Enhanced Suspension:** Enables smooth operation on rough terrains, ensuring the vehicle is stable and safe.
- **Nocturnal Lighting:** LED lights provide visibility in low-light conditions, enhancing safety and usability.

#### Justification for Why It's a Strong Solution:

- This concept directly addresses the needs outlined by Jorge's father, ensuring the vehicle is both functional and safe.
- Research-backed enhancements like suspension and lighting improve usability in various environments.
- The remote-control feature offers independence and ease of operation for Jorge and his family.

#### Annotated Sketches and Drawings:



#### Preliminary Ideas About Size, Shape, Materials, and Other Features:

- **Size:** Approximately 4 feet long, compact but spacious enough for Jorge's comfort.
- **Shape:** Streamlined for stability with a slightly elevated body for better clearance on rough terrains.
- **Materials:**
  - Aluminum frame for lightweight durability.
  - Rubber tires with enhanced treads for grip on uneven surfaces.
  - Polycarbonate body for impact resistance.
- **Additional Features:** Adjustable seating and harness for safety and comfort.

## 4) Concept Analysis

Jorge grapples with the challenges imposed by Coffin- Syndrome (CLS), impacting his mobility, communication, and focus. His attention struggles to center on a singular focus, and it has become evident that his solace lies in a toy car. Unfortunately, existing vehicles in the market fail to meet his unique mechanical and physical requirements, consistent and reliable remote control, lacking nocturnal lighting, and providing inadequate space. To address these issues, we propose a custom modification kit with features that will prevent Jorge from steering on his own and that will prevent him from overriding parental controls. This specialized conveyance will possess the necessary power and suspension for traversing the challenging terrains around his home. Encouragingly, our efforts have garnered support from other families facing similar circumstances, who believe that this customized vehicle will provide comparable benefits to their children.

	<b><i>Concept 1 (Sebastian Estrada)</i></b>	<b><i>Concept 2 (Nicholas Misiunas)</i></b>
<b>Problem Statement</b>	The car Jorge rides in has a remote control that Jose uses to control the car at times. Jorge is strong enough to override the remote controlled steering, and drives off on his own. This puts him in dangerous situations as he can drive off into the road.	Jose uses a remote control to steer the car. Jorge found the car's on and off switch, so he is able to reset the car and remote control by turning the car off and back on. Jose is no longer able to control the car with the remote control.
<b>Purpose/Function</b>	To fix the problem of the steering wheel, we decided to model the steering wheel and 3D print a piece to allow for a freely rotating wheel for him to fidget with. This still allows Jose to	To fix this issue, we will replace the start switch with a key switch to make the car more aesthetically pleasing, and place that key switch under the front hood of the vehicle so the driver is no longer able to

	control the car with the remote control.	access the switch, allowing the operator of the remote control to maintain control of the vehicle.
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## 5) Solution Selection

- Out of 10 Scale

Criteria	Idea #1	Idea #2
Cost	9	10
Durability	10	8
Function	10	7
Aesthetics	9	10
Skill Required to Operate	9	9
Safety	10	8
Total Score	57	52

## 6) Detailed Design

### 3D-Printed Freely Rotating Steering Wheel

- **Objective:** Design a steering wheel that rotates freely, allowing Jorge to engage with it without affecting the car's motion.
- **Design:** A 3D-printed attachment for the steering column, enabling the steering wheel to spin independently.
- **Implementation:** The freely rotating wheel will act as a fidget tool, meeting the sensory needs of Jorge without compromising parental control.
- **Materials and Tools:** 3D-printed attachment, screws, adhesive, and attachment tools.

Key Switch Relocation

- **Objective:** Prevent Jorge from accessing the vehicle’s power switch, ensuring that only his parents can control the car’s start and stop functions.
- **Design:** The switch will be moved under the car's front hood, secured with a lock-and-key system.
- **Implementation:** The switch wiring will be rerouted to the underside of the hood, integrating a metal key switch to prevent unauthorized operation.
- **Materials and Tools:** Key switch, mounting hardware, wire extension, and basic electrical tools.

7) Cost Estimation

1. Estimated Prototype Production Cost

The estimated total prototype production cost combines the base vehicle purchase, additional materials, and labor.

2. Research and Documented Costs of Each Component

Component	Function	Supplier	Unit Cost	Quantity	Total Cost
Base Car	Main vehicle frame	Amazon	\$379.99	1	\$379.99
Battery Pack	Power supply	[Supplier C]	\$24.24	2	\$48.49
Battery Holder	Battery Support	Amazon	\$7.99	2	\$15.99
Suspension Upgrade	Enhanced terrain handling	[Supplier F]	\$75.00	1	\$75.00
Additional Hardware	Screws, nuts, bolts	[Supplier H]	\$15.00	1	\$15.00

Total Materials Cost: \$575.00

3. Labor Time and Cost Estimation

Task	Estimated Time (Hours)	Hourly Rate	Cost
Frame Adjustments	1	\$20	\$20.00
Motor Installation	1	\$20	\$20.00
Battery Installation	0.5	\$20	\$10.00
Lighting Installation	0.5	\$20	\$10.00
Suspension Installation	1	\$20	\$20.00
Control Adjustments	1	\$20	\$20.00

**Total Labor Cost:** \$100.00

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#### 4. Total Prototype Production Cost (Materials + Labor)

- **Materials Cost:** \$575.00
- **Labor Cost:** \$100.00
- **Total Estimated Production Cost:** \$675.00

## 8) Presentation and Communication