

### INTRODUCTION

Georgina is a bright and joyful 19-month-old who loves the colors pink and yellow and has a special fondness for princesses. While her medical conditions present complex challenges, including the need for full trunk and head support and constant oxygen use, our team saw an opportunity to create something that goes beyond function—a mobility solution that reflects her personality and brings joy to her everyday life. With this project, we aimed to design a safe, supportive, and playful vehicle that allows Georgina to explore her world, interact with others, and feel like the princess she is.

### OBJECTIVES

Our objective was to create a safe and functional mobility device for Georgina, a 19-month-old child diagnosed with Trisomy 18, VACTERL association, VSD, global developmental delay, and respiratory issues. Due to her inability to walk or crawl, need for postural support, and dependence on an oxygen tank, our goal was to enhance her independence and quality of life through a customized vehicle that promotes safe mobility, social interaction, and caregiver ease.

### MATERIALS

- BCARORUR 2 seater 24V battery ride-on truck
- RGB LED lights
- Custom-built oxygen tank holder using 3D printed materials
- Adjustable trunk and head support system
- Reinforced seating harness
- Foam padding for added support and stability
- PVC pipes and connectors for structural support and frame customization
- Mounting brackets and hardware for secure attachment of components

### TESTING

We conducted thorough testing to evaluate:

- Load-bearing capacity under the combined weight
- Effectiveness of trunk/head/shoulder supports
- Stability of the oxygen tank holder during movement
- Overall comfort and safety of the seat and restraint system

We also incorporated feedback from Georgina's caregivers and therapists to make final refinements.



### CHALLENGES

One of the most significant challenges we encountered was designing a vehicle that could support the combined weight of the air tank (100 pounds) and Georgina's weight (20 pounds). We also needed to implement modifications to ensure the vehicle safely accommodated all of Georgina's requirements, including back support, equipment for holding the air tank, driving modifications, safety procedures, and easy access. That being said, we custom built a 3D prototype of the holder to better ensure the safety of the air tank while the car is in motion.

### CONSTRUCTION

We began with a ride-on vehicle base and made several critical modifications:

- Reinforced Frame to support the combined weight of Georgina (19 lbs) and her oxygen tank (~100 lbs)
- Custom Back and Head Support to stabilize posture, including support for shoulder horizontal adduction
- Secure 3D Oxygen Tank Mount Model with easy caregiver access
- Modified Seat Positioning for safety and comfort
- Padded Restraints and Harnesses to ensure she stays securely seated

These changes were designed to meet her physical limitations and medical needs while allowing playful engagement.

### RESULTS

Georgina was able to sit comfortably and safely in the vehicle after we made some adjustments with the personal trainer, which provided her with postural support and secure oxygen tank placement. The toy car performed well in testing, successfully supporting the combined weight of Georgina and her oxygen tank. Feedback from caregivers confirmed improved engagement and mobility. The final product was not only functional but also fun and visually appealing, tailored to Georgina's preferences and needs.