Project Statement and Specifications

Go Kart
Date: 9/10/08

Team Members
James Paolino
Eric Leknes
Alexander Jadczak
Tarek Tantawy
**Statement of Need**
The purpose of this project is to provide a recreational go-kart for Sean Stenglein, a 10 year old male with Cerebral Palsy. Sean has limited motor skills, enjoys the outdoors, and anything that has to do with driving. He has had a hard life and wants a release from his daily hardships. A go-kart would allow him to interact with his surroundings, which he is isolated from. His condition is a result of oxygen deprivation at birth causing limited fine, and to an extent, gross motor skills which are amplified when he has no restraint.

The goal is to devise a device that will allow Sean to safely enjoy driving and pursue his love for the outdoors. The device must be easily operated by Sean, given his limited mobility. The device must also provide the proper support for Sean required by his CP.

**Introduction and Overview**
The proposed device is a go-kart that will address Sean’s interest in motor vehicles and act as a release. The controls for the device must be simple and robust. The device must be safe for Sean, given his sporadic motor skills. The go-kart needs to go fast enough to be fun for Sean, but not so fast as to be dangerous. The steering should be powered, since Sean lacks the strength to control a vehicle. The device needs to be able to be controlled remotely, by electronic input, and by mechanical input. The go-kart will be gas powered, and the color will be blue. The driver will be restrained by the waist, and held at a 90 degree angle, for proper blood circulation. The device will differ from a normal go-kart because all of its interface will be monitored by a system that will prevent the machine from going out of control. There will be fail-safe implementation in all of the control systems.

This device needs to be fun. The main point is recreation. Sean’s mother, Brenda, has stipulated that the go-kart should have normal controls as well as practical controls. The ultimate goal is that Sean will someday be able to drive the go-kart without the special provisions that we will be integrating for practicality. The special provisions that we will be integrating will ensure that Sean can safely use the Go-Kart and have fun while doing so.

**Realistic Constraints**
For a project of this scale, money is a big factor. Needing three independent and unique control methods will require a big budget. Also, due to the sheer size of the device, raw material cost will be significant. The engine, transmission, and safety equipment will make up the bulk of the budget. Since it was requested that we use a gas motor simply for the novelty of having one, the device will produce exhaust, will cost money to operate, and will require oil changes. The device needs to be robust enough so that it will not break for years to come under normal use. The device, if it does fail, needs to fail safely in all cases, since Sean will not be able to handle an out of control vehicle. The device does not need to be manufacturable, since it is a specific project for a specific person with specific needs. There are no
significant ethical, political, or social issues associated with the building of a go-kart. The go kart will need to have all moving parts and pinch-points clearly labeled, and the hot parts on the engine and clutch will need to be identified so that injury is prevented. Proper maintenance of the engine and bearing must be conveyed to the owners so that the device can last and be safe. The maximum speed needs to be able to be set by the parents of Sean, and certain safety checks need to be observed before the device is operated. The go-kart will rip up the terrain it drives on, and possible oil/gas leaks could lead to minor environmental concerns.

Other Data
The client is located in a rural setting with a large field that will be perfect for driving the go-kart around.

Questions
What kind of controls are necessary for Sean to safely control a vehicle of any kind? Is it possible to have three separate kinds of controls that are wired in a hierarchy? What will our budget be? What kind of controls/circuits need to be put in place? What should the top speed be? What should the turning radius be? What should the vehicle weigh? How big should the vehicle be? How far will the operating range for the remote control system be? Will the device look cool enough for Sean? How long/far can it be operated without refueling? What kind of driver interface will we use? What kind of gauges will there be? How responsive will the controls be? How dangerous is it to have a 10 year old with CP operate a go-kart using a steering wheel and pedals?

Operational Specifications:
The device needs to be a gas powered go-kart controlled electronically by 1) steering wheel and pedals 2) long-range remote control 3) a right-handed joystick and buttons. The remote control must supersede the on-board controls. The driver needs to be constrained, bent at the waist at 90 degrees. The seat needs to be adjustable in order to accommodate growth of the client. The go-kart needs to be blue, and provide joy for Sean Stenglein. The go-kart must be able to handle off-road conditions while providing the client with a relatively smooth ride. The go-kart needs to be able to withstand adverse weather conditions without shorting out the sensitive electronics on-board. The go-kart needs to have all proper safety equipment.

Technical Specifications:

Physical: Type of Material: Steel chassis
**Mechanical:**

Size: 8x 4 x 4 feet (L x W x H)
Weight: 590 pounds (lbs)
Speed: 5-25 mph
Power: 8 HP

**Electrical:**

Maximum Input Voltage: 12 Volts DC (VDC)
Maximum Input Current: 80 Amps (A)
Maximum Output Voltage: 12 Volts (V)
Maximum Output Current: 10 Amp (A)

**Wireless:**

Frequency: 2.4 GHz
Range: 30-50 meters
Protocol: RF

**Environmental:**

Storage Temperature: -20 – 150 ºF
Operating Temperature: 0 – 100 ºF
Operating Environment: (outdoors, dirt, rain, snow)

**Software:**

User Interfaces: Joy Stick
Hardware Interfaces: PIC24 series
Communication Protocols: RF, USB
Features: Proprietary navigation controls

**Safety:**

90 degree bucket seat with racing harness
Waist Restraint
Roll Cage
Engine and braking failsafe (software and mechanical)

**Maintenance:**

Refueling
Oil changes
Cleaning