The S-90 Go-Kart
Alternative Design Report 1

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Design 1 is based around an elongated front chassis with a fully enclosed roll cage. Electrical systems are used to control steering, braking, throttle, and forward/reverse selection. The control software is LabView based, and commercial electric motor switching systems will be purchased. A racing seat will be modified to accommodate the client’s needs.

![Figure 1: Design 1](image)

This design implements a complete roll cage into the chassis of the vehicle. It has an extended overall length to allow for parts to be placed on the rear chassis. This extended design also allows for a lot of adjustment for the seat in the front chassis. Overall this design is very rigid and very safe, but is also more top-heavy as a consequence and perhaps too difficult to get our client in and out of. This design implements independent front suspension and semi-independent rear suspension, using the roll cage as a pivot point for the rear suspension. This design uses its stiff roll cage as a front bumper.

The electrical systems for the go-kart include: the remote control system, the joystick, and the steering wheel and pedals. Also included are the controlled components. This encompasses the steering motor and its non-software controls, the motor for controlling the throttle, the motor for switching between forward and reverse, and the motor for applying the brake. In addition the power supplies and various buttons are also electrical components for this vehicle.

The main software control will be based on the National Instruments LabView platform. LabView will run off of a laptop computer on the go-kart. Input signals from the selected method of control and other sensors will be processed by the LabView program, and the proper outputs will be modified. This approach requires a National Instruments data acquisition system to be on board as well. The LabView program would
be designed with two main loops, one for normal operation routines and another to send the go-kart into emergency shutdown.

Both the steering motor and the braking motor require control systems that can turn them both forward and reverse directions. To effectively accomplish this, the go-kart will make use of a motor speed controller for the steering motor, and a commercially available h-bridge for the braking motor. The speed controller takes a PWM input from the microcontroller, which, for the purposes of this design, designates forward or reverse directions. It is capable of switching up to 160A continuous current, and should not be taxed to that extent in this application.

The commercially available h-bridge is a simpler version of the speed controller for the steering motor. It takes a PWM signal from the microcontroller to switch the braking motor between forward and reverse. This application does not require as robust a circuit due to lower current draws, and this h-bridge is only rated at 25A continuous current.

Five switches shall be used in order to perform the following operations: Igniting the engine, selecting forward and reverse on the gearbox, engaging the speed limiter, selecting the method of control, and finally a kill switch to halt the engine and stop the go-kart. The kill switch will be a head switch, mounted on the seat of the vehicle. The remaining switches will be mounted on a frame along with the gauges.

The steering wheel will be mounted on a telescoping shaft protruding through the dashboard, allowing for adjusting the distance. Turning the steering wheel will adjust a variable resistor and will be read by software to determine the position of the steering wheel. The joystick will be mounted on the dashboard of the go-kart.

Magnets will be placed on the rear axle and read by software for determination of the go-kart’s speed. A gauge on the dashboard will indicate to the speed of the go-kart.

A high-quality racing seat is available for free by donation. This seat can be altered in order to accommodate for the needs of Sean. Ideally, Sean’s hip would be at an angle slightly greater than 90 degrees. This gives him extra control over his extremities. The racing seat can be modified in order to put Sean at this desired angle. Also, the seat can be altered in order to keep his back straight. The seat has a five-point safety harness. This allows for maximum safety. The seat needs to be attached to the seat plate. The disadvantage to this would be the need to buy materials for the seat.

This design meets all specifications from the project proposal, and should provide the client with the safe enjoyment he desires.