The S-90 Go-Kart
Alternative Design Report 3

By
James Paolino, Alexander Jadczak, Eric Leknes, and Tarek Tantawy
Sean Stenglein. NSF Projects.
Ashford, CT. 860-429-1059
Design 3 is based around a longer front chassis and shorter rear chassis with an open roll cage and no side supports. Electrical systems are used to control steering, braking, throttle, and forward/reverse selection. The control software is embedded C based, and electric motor switching systems will be designed. A specially designed seat will be modified to accommodate the client’s needs.

This design implements a single roll bar mounted to the chassis so the client can get in and out easily. This design has a shortened rear chassis that is just big enough for the engine, drive train, brake, and battery. The front chassis is extended 8 inches longer than design 2’s. The supports for the roll bar are mounted off to the side, allowing plenty of room for seat clearance on the sides and providing room for electrical components. This design has the lowest center of gravity of the three designs. This design implements independent front suspension and semi-independent rear suspension, using the roll bar as a pivot point for the rear suspension. Due to the shortened rear chassis, this design will have a slightly stiffer rear suspension. This design uses an independent front bumper to protect the vehicle’s delicate steering system and linkage. This next picture better shows the front suspension system that will be common to all three designs.
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 come from a Microchip PIC microcontroller that is programmed using embedded C code. The software is responsible for taking the various input signals from the selected method of control, processing the data, and outputting the proper signals based on those inputs.

Two main loops will be present in the software code at all times. The first main loop is the primary main loop which controls inputs and outputs during normal circumstances. The other main loop is the emergency main loop which is engaged by the activation of a kill switch. Each main loop will contain other loops and functions required to carry out all of the necessary tasks for operation of the go-kart.

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 the dashboard of the vehicle. No gauges will be implemented in this design.

The steering wheel will be mounted on the chassis of the go-kart on a telescoping 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. Springs will be used to return the steering wheel to a centered position when no other forces are applied to it. The joystick will be attached to a telescoping pole attached to seat of the go-kart.

Magnets will be placed on a front wheel hub and read by a transducer mounted on the steering linkage that is tangent to the hub. Software will be used for determination of the go-kart’s speed.

Sean has a seat that the family uses when he is in the car. He is very comfortable with this seat. The seat makes him sit at the angle that he prefers. This angle gives him extra control over his extremities. The seat also has a mounting bracket attached to its bottom. A possible seating solution would be to design and build a coupling mounting bracket on the go-kart’s seat plate. The chair also has seat belts built onto it, so Sean will be safely strapped-in while driving the go-kart. This would allow Sean’s family to utilize their own seat for the go-kart and whatever uses they may use it for. Also, the cost of making a coupling seat bracket would be small and insignificant.

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