**ELECTRONICS DESIGN REPORT: ORION RACING INDIA**

**Team goal**

While designing the car for reliability, the team looks forward to testing the car extensively for performance. System designs will be validated using sensor data and components will be tested in fatigue. Additionally, the sensors will provide us with data which will help us to tune the car. With the aid of a dynamometer, the aim is to improve and further tune the map table. By physically recreating event specific tracks, the performance of the vehicle is being improved upon.By integrating the above, the team hopes to realize its goal which is to complete and to compete.The design of the car was started by selection of the following three parameters.

1) **Tire**

Tire has been selected based on the TTC tire data which had 3 tires to compare namely Goodyear D2607, Hoosier and Continental 34M. On comparing the cornering characteristics for the vertical load that was assumed, the Goodyear gave a peak lateral force of 3870 N at 10° slip angle as compared to the Continental which gave a force of 3680 N at 6° slip angle. Keeping in mind the transient response, the Continental tire was selected. On comparing the acceleration characteristics the Continental gave a peak force of 2600N at 5° slip ratio. The low cost and availability of the tires further helped in finalizing the Continental. The increased weight of the Continental tire was a compromise between performance and weight.

2) **Engine**

With the team goal in mind, the car weight was assumed to be 230 to 240 kg. Thus power to weight ratio was made a main consideration and a 4 cylinder engine with higher displacement became the natural choice. Main criteria while choosing amongst the 4 cylinder engines were availability, torque, familiarity and previous experience. The F4i has 46 Nm of torque (stock) @ 10000 rpm which is more as compared to rest of the engines. The GSX has 46.5 Nm of torque (stock) but at a slightly higher engine rpm i.e. 10750. The peak power of F4i is 109 hp (stock) @ 12500 rpm which is more compared to the other engines. The YR6 has power output of 118 hp (stock) @ 13000 engine rpm but the cost of the engine is more and the torque is less (44.7 Nm @ 11750 engine rpm) as compared to the F4i.

3) **Ergonomics**

An ergonomic set-up was designed for two purposes:

1) To reduce driver fatigue by selecting an ergonomic position

2) To find the forces which the driver can apply

Each drivers' inputs have been considered and a position comfortable to each driver has been selected. These values acted as an input for designing the cockpit, pedal box, shifter system, seat and steering system. We also consulted a musculoskeletal specialist who helped us select the position in which the driver can apply maximum force with ease.

**System Goal**

**Electronics**

The goal for the electronics team this year is to design, build and implement an efficient electronics system which not only ensures higher reliability but also aides in vehicle analysis and tuning. The MoTec M400 ECU is selected over the Stock ECU based on its availability of features like launch and traction control, gear change ignition cut, the use of closed loop lambda control for dynamic fuel saving and one of the best GUI available for easy tuning.

The centralised telemetry system is self-designed to provide a wireless communication at 60MB/s over a range of 1 km and unlimited logging using a video capture system. The MoTec M400 data logging system is used to log sensor data at 200 Hz and i2 Standard is used to analyse the data. A sensor hub is made to provide plug and play of 14 sensor logging.