Project proposal

Project title	Sustainable design of internal combustion engines
First Supervisor	Dr — Konstantin Volkov
Second Supervisor	tbc
School	Aerospace and Aircraft Engineering
Other member of supervisory team (no more than three KU supervisors in total)	
Specific requirements beyond 2:1 degree	

Project summary

(max 4,000 characters)

Internal combustion engines (ICE) play a dominant role in the fields of power, propulsion and energy. Sustainable design of ICEs is strongly linked to the fuels burnt and the overall efficiency, and reliable injection and ignition are required for relevant system performance. Ignition and combustion processes strongly affect the formation of pollutants and the extent of fuel conversion.
Even a slight improvement contributes to considerable reduction of pollutant formation and
emissions, and environmental impact due to widespread of ICEs.
Car usage has a significant impact on climate change, with about 12% of the overall EU emissions of carbon dioxide (CO2), the main greenhouse gas, coming from the fuel consumed by passenger cars. Regulations have been proposed to reduce the emission of this gas from the fuel consumed by combustion engine vehicles. In Europe, the target to be achieved by 2012 is 120 g CO2 1/km for the average new car fleet. The expected dramatic worldwide increase in the number of combustion engine vehicles (compared with 2000, the number of vehicles could more than double by 2050) is another reason to promote energy conservation efforts and research in this area.
The project aims to apply the principles of engineering sciences (thermodynamics, fluid mechanics, heat transfer, chemistry and combustion) to the analysis and improvement of processes and operating characteristics of ICE cycles, and environmental and technological issues related to the future wide-spread use of ICEs. In the project, different computational technologies are used together to analyze and investigate the parameters and processes that controls ignitibility, mixture formation, combustion stability and pollutant emissions. The objective of the project is to develop the model of full cycle (intake, compression, combustion, expansion and exhaust) and apply this model to analysis of operating characteristics of ICEs. The computational results are compared with the experimental data measured in automotive laboratory.