

ECARA Award 2007

Design and Development of PAC-Car II, the world's most fuel efficient vehicle

Laudatio

Dr. Jürg Wildi, RUAG Aerospace *

It is a great honour for me to present the second ECARA award to Mr. Nicolas Weidmann. I had the privilege to accompany a very special project with a touch of a technical adventure. PAC Car is the name of the project which was a joint undertaking of the ETH Zurich and a number of partners. Nicolas Weidmann was a member of a student team which developed the world's most fuel efficient car.

PAC Car II stands for design and construction of a completely new vehicle, an exciting and challenging task, calling for serious management skills and technical expertise. A number of students worked for the project for a short or long period, four of them formed the core team, among them Nicolas Weidmann.

The goal of the PAC Car II project was to build a vehicle powered by a hydrogen fuel cell system driving an electric motor that uses as little fuel as possible. The work had to be performed in a given financial budget and time frame.

The team started work in 2002 and participated in 2005 at the Shell Eco marathon contest at the Nogaro motor circuit in France where they set a record of 3'836 km/l (the distance that would have been covered with one litre of petrol, equivalent consumption calculated using the lower heating values of hydrogen and gasoline) and attained finally in Ladoux (France) on June 26, 2005 a new world record distance in fuel efficient driving with the equivalent of 5'385 km per litre of fuel.

Nicolas Weidmann was – next to many other tasks – in charge of the aerodynamic development of the car, starting with the overall outer shape evaluation, conducting CFD and windtunnel investigations, verifying the vehicle performance and handling characteristics during road tests and supporting the race team at the Nogaro and Ladoux events.

Aerodynamic drag is responsible for approximately half of the power demand of a fuel economy vehicle cruising on a flat, level road. High quality aerodynamics are therefore

essential to vehicle success. The team spent a tremendous effort to optimize aerodynamic performance and behaviour. The body design is influenced by a number of sources such as race regulations, ergonomics and – of course – aerodynamics. Several iterations of the body development were performed with the help of wind tunnel tests and CFD to find the ideal shape.

PAC Car II demonstrates the limits of road vehicle fuel economy. The vehicle is an excellent breadboard for testing and integrating latest technologies in materials, structures, systems and other disciplines into one system. Some of the ideas developed during this project may eventually show up on in future on the road – in order to support one of the most important future challenges, to save fuel and reduce the harmful pollution emitted by cars.

This success is on one hand a team effort and in the same time the merit of individuals. Nicolas Weidmann managed to implement low drag aerodynamics resulting in a drag coefficient of 0.075.

I congratulate the team and Nicolas Weidmann for putting an educational project together and for achieving their task with technical excellence and a lot of fun.

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