Politecnico di Torino

DIMEAS SEMINAR

FORMULA1 AERO PERFORMANCE – METHODS AND CHALLENGES

SPEAKER

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Flexcompute

Abstract

Aerodynamic performance is the dominant contributor to lap time in modern Formula1, governing downforce generation, drag, balance, and vehicle stability across a wide range of operating conditions. As a result, Formula 1 teams typically invest up to 70% of their technical resources in aerodynamic development.

This talk examines what aerodynamic performance means in Formula 1 and why it plays such a central role in car performance. The aerodynamic development tools available to an engineer—CFD, wind tunnel testing, and on-track measurements—are introduced, together with their respective strengths, limitations, and correlation challenges.

A particular focus is placed on CFD methodologies used in Formula 1 to deliver fast and robust simulations, often prioritizing consistency and trend reliability over absolute accuracy, while operating under the computational and regulatory constraints imposed by the FIA.

The flow field and vortex dynamics of a modern ground-effect Formula 1 car are then discussed, with emphasis on the most challenging regions to simulate. The implications of modelling uncertainty in these areas on aerodynamic performance prediction and development decision-making are finally addressed.

BIO

Roberto Della Ratta Rinaldi is a senior aerodynamicist with a PhD in Fluid Dynamics from Politecnico di Torino, with a strong background in computational aerodynamics, and high-fidelity CFD methods.

He has over ten years of experience working at the highest level of motorsport and high-performance automotive engineering, including Formula 1, where he focused on aerodynamic performance prediction and correlation between CFD, wind tunnel, and track data.

His career includes senior technical roles at Williams Advanced Engineering and McLaren Automotive, contributing to advanced aerothermal, cooling, and external aerodynamics development for both racing and road-car applications.

His work combines rigorous theoretical foundations with practical engineering judgement, addressing the challenges of accuracy, turnaround time, and correlation that define modern aerodynamic development.

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2.30 p.m

Sala Ferrari, II floor,
DIMEAS – Politecnico di Torino