



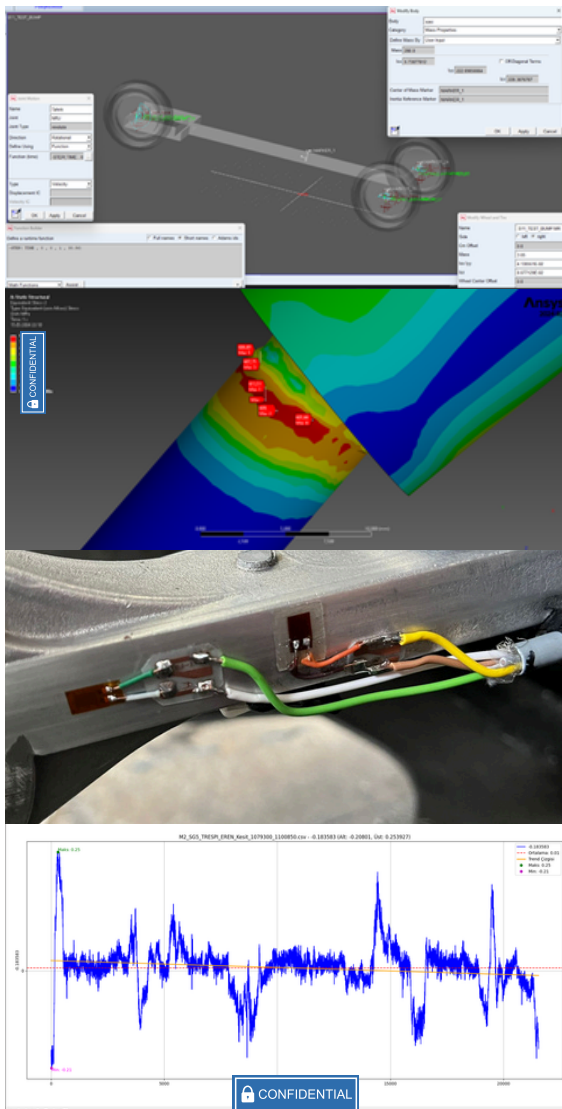
# Yağız BALUN

## Mechanical Engineer

yagizbalun2001@gmail.com

Driven by a deep passion for motorsports, my engineering focus centers on vehicle dynamics and suspension systems. This portfolio presents a selection of my key projects, blending structural analysis with practical track validation. I welcome the opportunity to discuss these works in further detail.

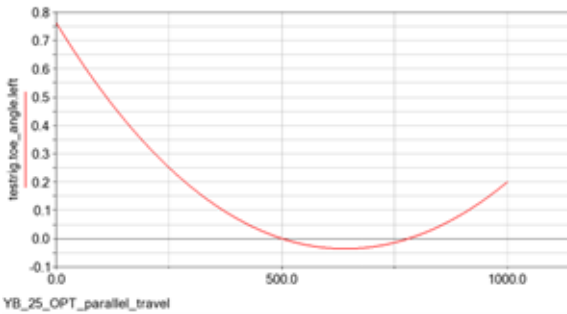
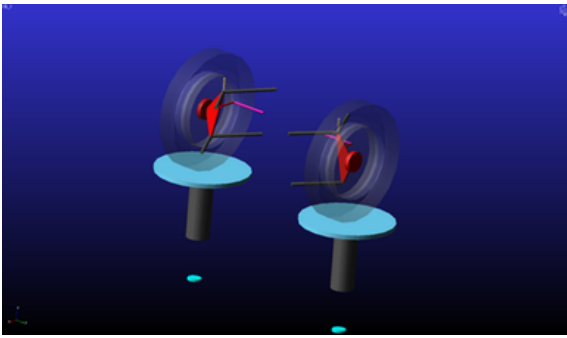
Note: Some technical visuals are stamped to maintain project confidentiality.



## S11 Suspension Revision & Track Data Validation (2025)

Tools: SolidWorks, ADAMS View, ANSYS, Strain Gauges, MATLAB, Python

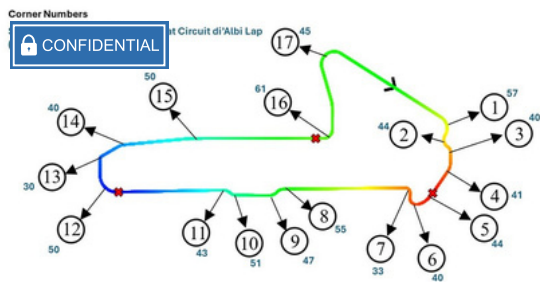
- **Dynamic Loading & FEA:** Following a structural vulnerability, I analyzed the static strength and fatigue life of the S11's upper A-arm. Dynamic load cases were extracted using Multibody Dynamics (MBD) simulations in ADAMS.
- **The Redesign:** Based on these extracted forces, I executed a structural redesign in SolidWorks, optimizing the stress distribution and significantly improving the component's lifetime performance.
- **Experimental Track Validation:** To represent actual operating conditions, the revised A-arm was instrumented with strain gauges during the Albi Eco Race.
- **The Result:** By processing the live telemetry data, experimental measurements were successfully correlated with numerical FEM results. This validated the model's accuracy, establishing a reliable engineering methodology for improving suspension durability.



## S14 Suspension Kinematics R&D for Solar Endurance Racing (2025)

Tools: SolidWorks, ADAMS Car

- **The Objective:** Designed the S14 suspension kinematics specifically for the strict energy demands of international solar endurance racing.
- **Kinematic Optimization:** Performed extensive MBD simulations in ADAMS Car to precisely tune suspension hardpoints.
- **Target Metrics:** Minimized toe angle change and optimized dynamic camber across the full wheel travel.
- **The Impact:** Prevented tire scrubbing and drastically reduced rolling resistance, maximizing overall vehicle energy conservation.



## Electric Hub Motor Bearing Life Assesment (2025)

Tools: OptimumLap, SKF Simpro, Matlab

- **Modeling & Track Validation:** Evaluated electric hub motor bearing life using ISO 281 standards and OptimumLap simulations, then validated theoretical models against live strain gauge telemetry from the Albi Eco Race.
- **Findings & Optimization:** Real-world data revealed critical dynamic load spikes missed by simulations, leading to the proposal of hybrid ceramic bearings to minimize rolling resistance and extend service life.



## Wheel Hub Design & Efficiency Test Rig (2023)

- **Experimental Optimization:** Developed a custom drum test rig to acquire live power data. Tests proved that applying a slip-fit bearing tolerance to the existing hub drastically reduced rolling resistance.
- **Strategic Pivot:** Despite designing a completely new lightweight hub, the efficiency data drove a strategic decision: prioritizing the slip-fit revision over new manufacturing. This maximized energy conservation while strictly meeting project timeline and budget constraints.



## 6-DOF Modular Stewart Platform Prototype

### BSc Senior Project (2024)

Grant: TÜBİTAK 2209-A National Research Fund

Role: *Project Team Leader*

- **Funded R&D & Leadership:** As the Project Team Leader, I authored the research proposal and secured the prestigious TÜBİTAK 2209-A national grant to develop a modular 6-DOF platform.
- **Kinematics & Execution:** Developed the mathematical inverse kinematics in MATLAB and modeled the control architecture via Simulink. Directed the complete physical realization, from conceptual SolidWorks design to final manufacturing and assembly.

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## Academic Publications & Research Contributions

### Authored Research

**[Under Review] Experimental Validation of Service Life Prediction of Ball Bearings in Solar Radial Flux Hub Motors Using Real-Time Track Data**

Role: Corresponding & First Author Y. Balun | Co-Authors: B. Orhan, A. Gören (Supervisor)

**[Work in Progress] Dynamic Load Validation of Solar Electric Vehicle Suspensions Using In-Race Telemetry (Working Title)**

Role: Corresponding & First Author Y. Balun | Co-Authors: M. Kip, M. İzci, A. Gören (Supervisor)

### Technical Contributions

**[Published Article] Composite Leaf Spring Applications on Solar Vehicle (Putech Composites, Issue 75)**

Role: Formally acknowledged for technical contributions | Authors: G. D. Özdeniz, A. Gören

**[BSc Thesis Contribution] Solaris 13 Solar Vehicle Design and Energy Consumption Optimization**

Role: Developed and manufactured the custom physical test rig utilized for data acquisition, and provided design feasibility consulting. Formally acknowledged | Author: B. İpek | Supervisor: A. Gören