



### Success story

## Optimization Wins the Race Against Time at Polestar

Improvements in weight, aero-dynamics and brake distribution led to a lap time reduction ranging from 0.19 to 0.50 seconds.

*Polestar Racing has been using modeFRONTIER in different steps of the development of the “Polestar Performance” concept. The software is used both as a tool for **driving the aerodynamics, multibody and structural analysis** process, and to improve the **real lap time simulation**. In 2012 Touring Car Team Association (TTA) championship, **Polestar Racing won the first prize** for the Drivers, Teams and Manufacturers categories with their innovative car design.*

### Challenge

The 2012 season of the Racing Elite League run by TTA introduced **new rules** leaving little room for engineering design changes. Therefore, the Polestar Racing vehicle model had to be modified without considering the chassis design parameters, which were previously the core of the optimization analysis. **Design simulation acquired an even greater importance** as the best combination of the Front-to-Rear weight, aerodynamics and brake distribution in less time (track testing was limited to three days) became the new target.

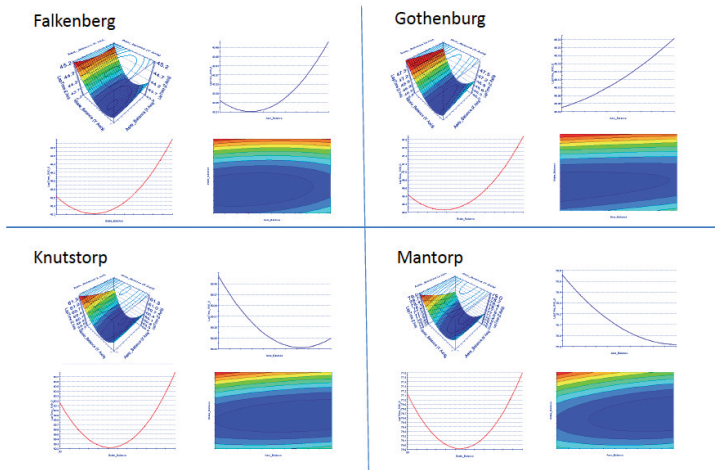
“

**modeFRONTIER capability to extend simulation analysis made possible the interrelated parameter study.**

## Solution

The simulation tools used - Adams.Car by MSC Software and the Lap Time Simulation (LTS) in-house code - were **easily integrated** into the

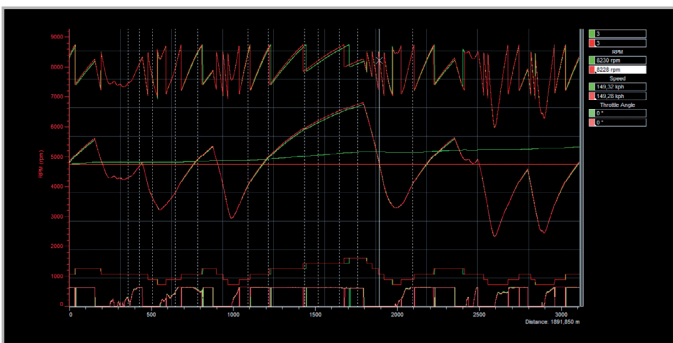
modeFRONTIER optimization workflow, to **optimally tune** the Front-to-Rear weight distribution parameters. “Considering the limited amount of time we have had for testing in this championship” – says **Per Blomberg, Manager of Chassis Development** – “this kind of interrelated parameters study would not have been possible without the capability of modeFRONTIER to **extend the simulation analysis**”. Improvements in weight, aerodynamics and brake distribution **led to a lap time reduction ranging from 0.19 to 0.50 seconds.**



Results in different track races.

## Benefits

In only a **few hours of simulation** time modeFRONTIER piloted the evaluation of **parameter combinations** that might have never been tested, leading to enhanced configurations. The **optimization framework** initially set up for the TTA championship can be promptly adapted to the typical circuits of the STCC championship. Repeating the study considering different conditions is now “something that we can do even **overnight on a weekend race**, once we have completed the trial session and gathered some data about the track model”. Similarly, **it is rather easy to run a new optimization cycle** even with modified conditions, such as the driver, tires, and so forth: once the relevant parameters in the LTS vehicle model (e.g. engine or track model) are set, modeFRONTIER performs a robust sensitivity verification of the output (lap time) in relation to different vehicle parameters.



Telemetry software analyzing results.

		Track 1	Track 2	Track 3	Track 4
Initial Configuration	Weight Balance	0.750	0.550	0.650	0.650
	Aero Balance	0.400	0.200	0.200	0.600
	Brake Balance	0.383	0.433	0.433	0.383
	Lap Time	<b>43.57</b>	<b>46.08</b>	<b>59.42</b>	<b>76.01</b>
Optimized Configuration	Weight Balance	0.300	0.300	0.550	0.650
	Aero Balance	0.060	0.000	0.800	0.960
	Brake Balance	0.333	0.383	0.400	0.483
	Lap Time	<b>43.07</b>	<b>45.89</b>	<b>59.15</b>	<b>75.76</b>
Lap Time Diff		<b>-0.50</b>	<b>-0.19</b>	<b>-0.27</b>	<b>-0.25</b>

Start vs Optimised Settings.

## About Polestar Racing

**Polestar** was founded in **1996** in collaboration with Volvo in order to **drive forward Volvo's investment in racing**. Since then, Polestar has competed with the 850, S40, S60 and now the **C30 Volvo** models. The company's core business is focused on **development and competition** in racing. In addition to racing, the company's activities are organised into two further business areas, Performance and Services. [www.polestar.com](http://www.polestar.com)



ESTECO is an independent software company, specialized in numerical optimization and simulation process and data management. With a 20-year experience, ESTECO supports over 300 international organizations (such as Ford Motor Company, Honda, Lockheed Martin, Toyota and Whirlpool), accelerating the decision-making process and reducing development time. [esteco.com](http://esteco.com)

modeFRONTIER

VOLTA