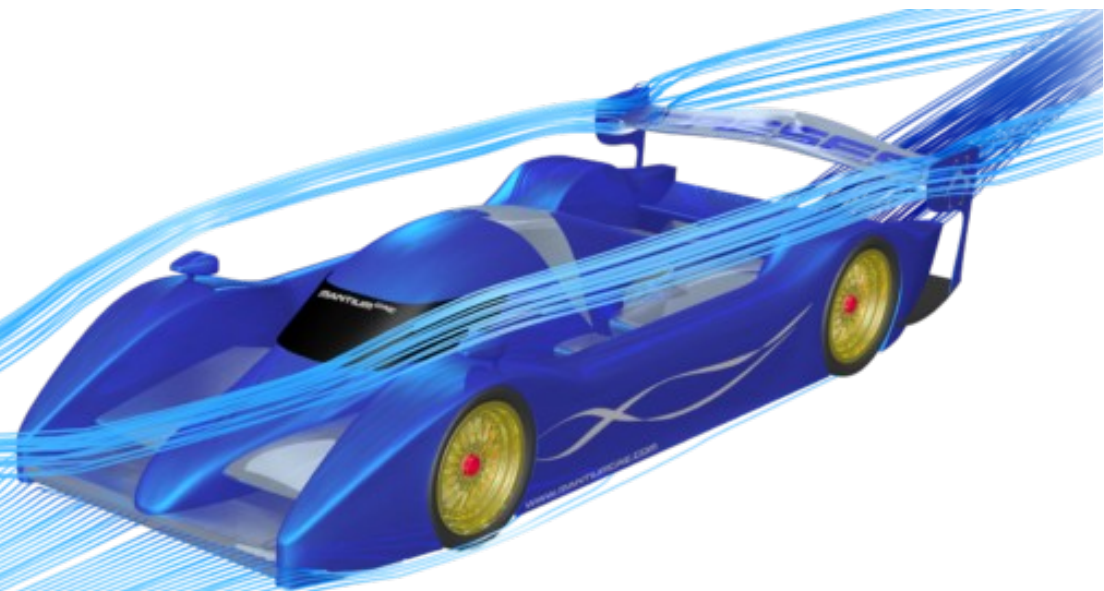


# MANTIUM CAE

## MVRC & CAESES

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[www.MantiumCAE.com](http://www.MantiumCAE.com)

# INTRODUCTION

What is MVRC:

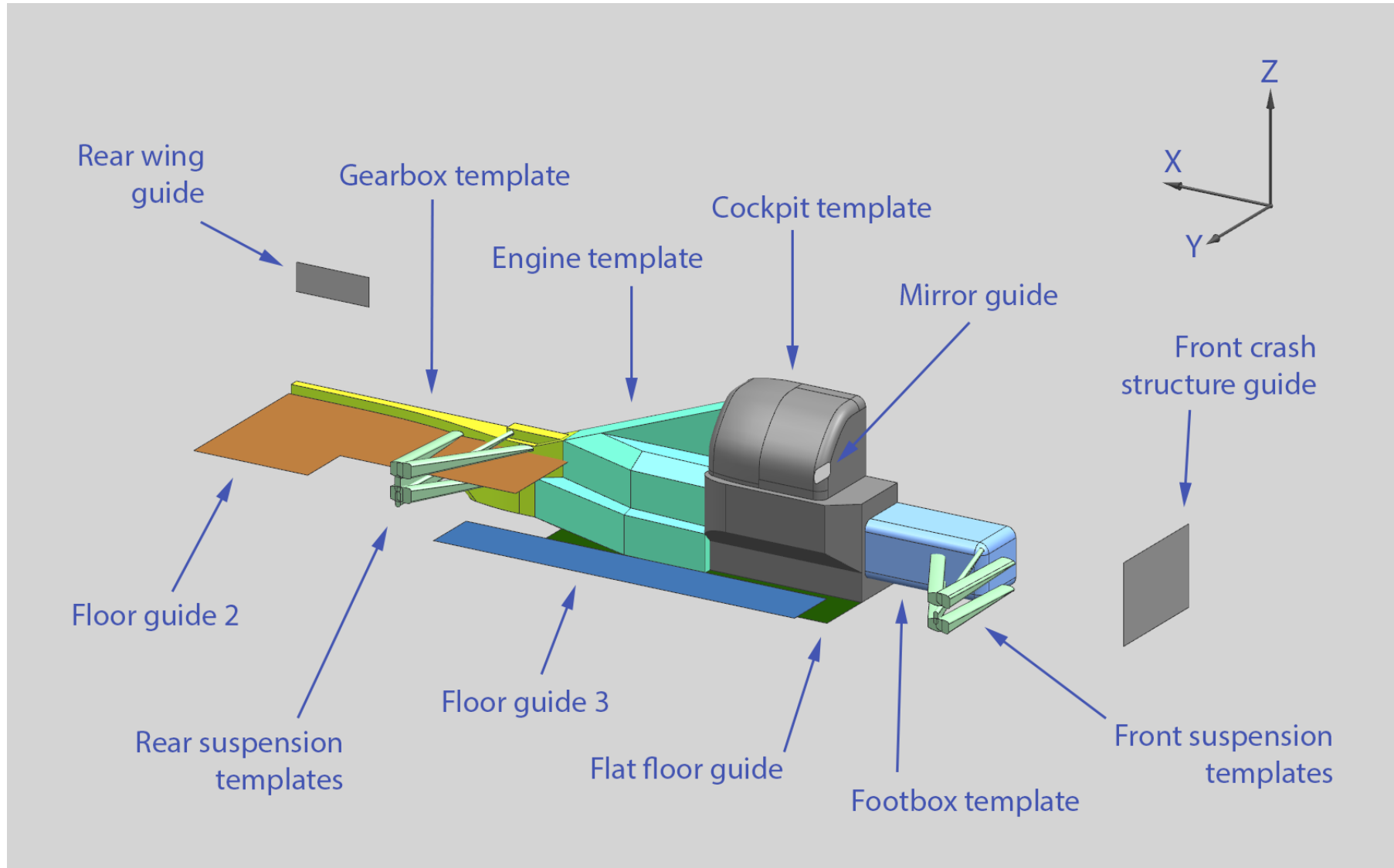
- The Mantium Virtual Race car Challenge
- CAD models are submitted for each race by each team
- CFD simulations of the cars are run
- A lap time simulator is used to determine the fastest car
- The fastest car wins

[WWW.MANTIUMCHALLENGE.COM](http://WWW.MANTIUMCHALLENGE.COM)

# MVRC RACE CALENDAR

DATE	RACE
JULY 23 - AUGUST 6	MONACO
AUGUST 20 - SEPTEMBER 3	NÜRBURGRING
SEPTEMBER 17 - OCTOBER 1	SEPANG
OCTOBER 29 - NOVEMBER 12	SÃO PAULO
NOVEMBER 26 - DECEMBER 10	LE MANS

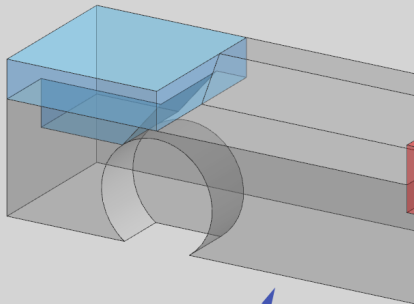
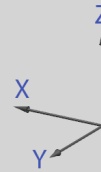
# RULES



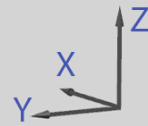
# RULES

Rear wing volume

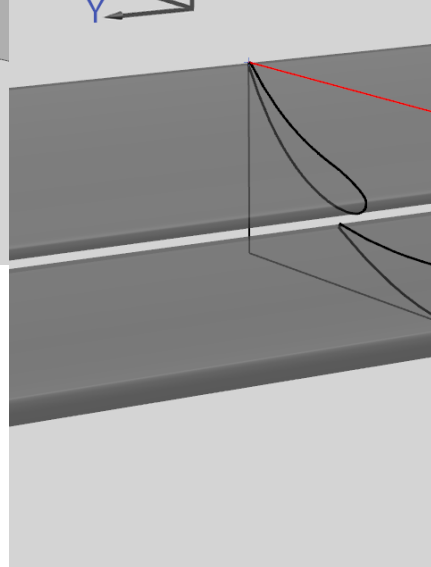
Visibility volume



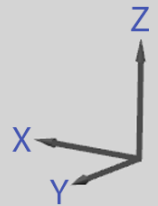
Bodywork volume



$\leq 400\text{mm}$



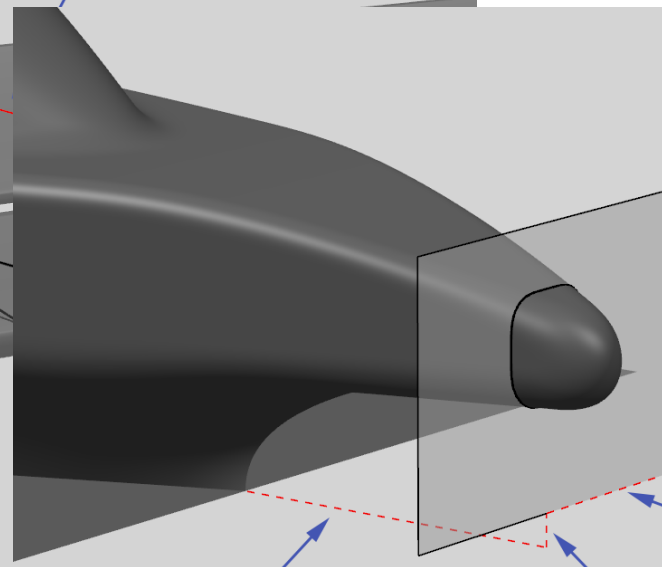
$A \geq 25,000\text{mm}^2$



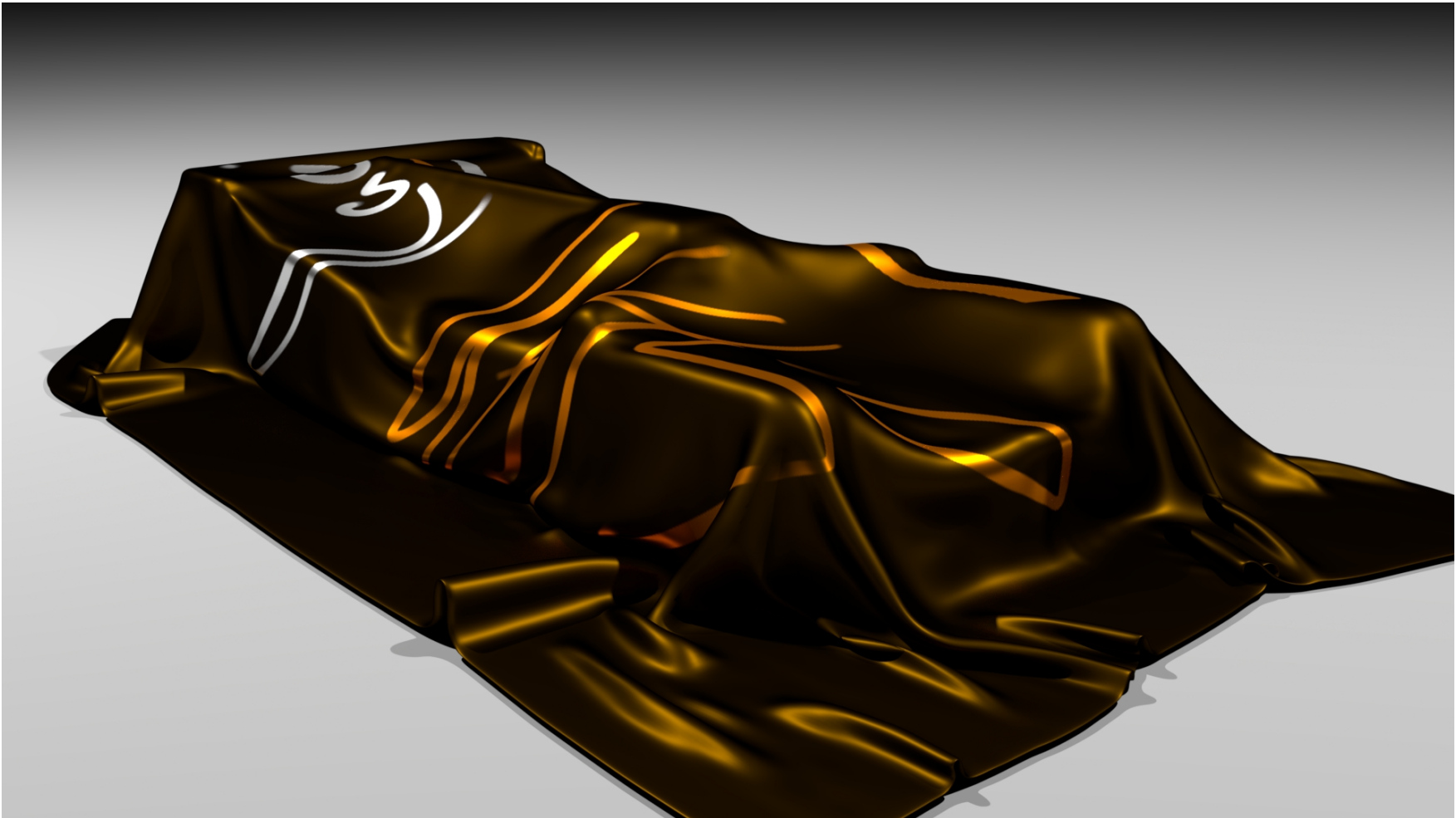
750mm from FWCL

50mm

300mm



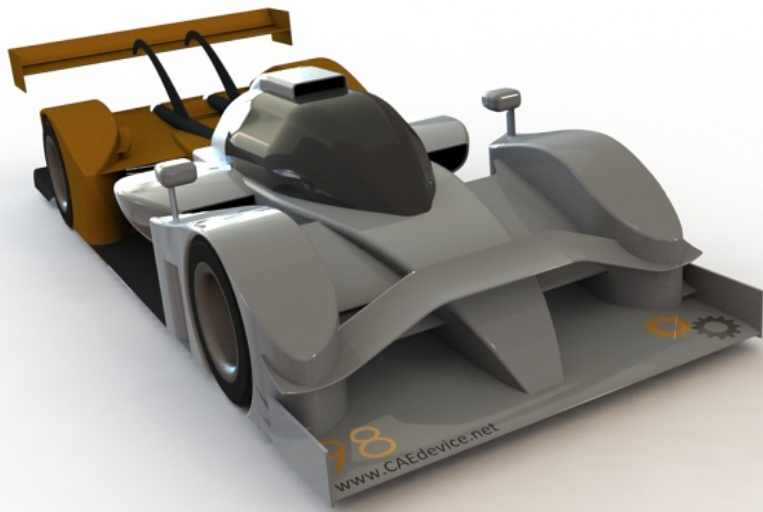
# SOME CARS



# SOME CARS

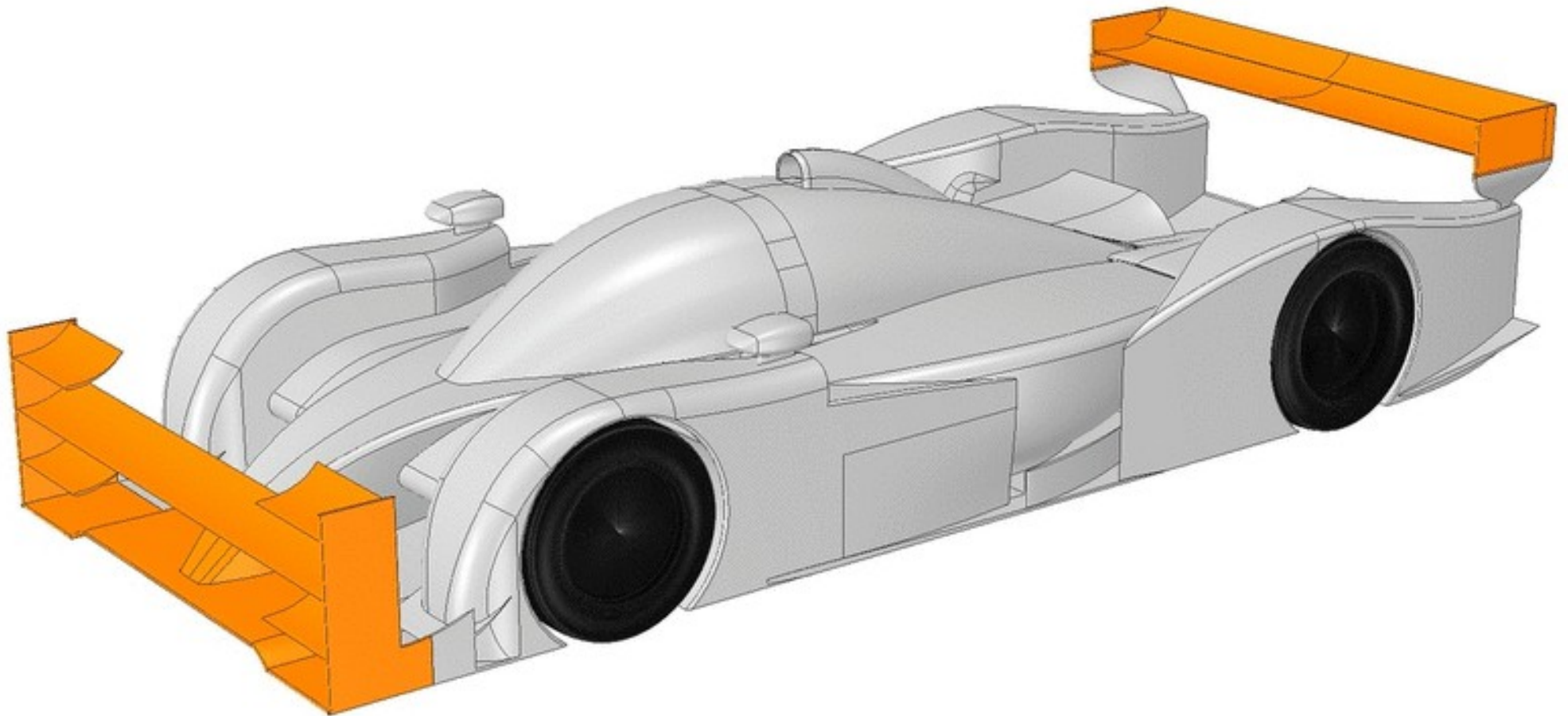


# SOME CARS

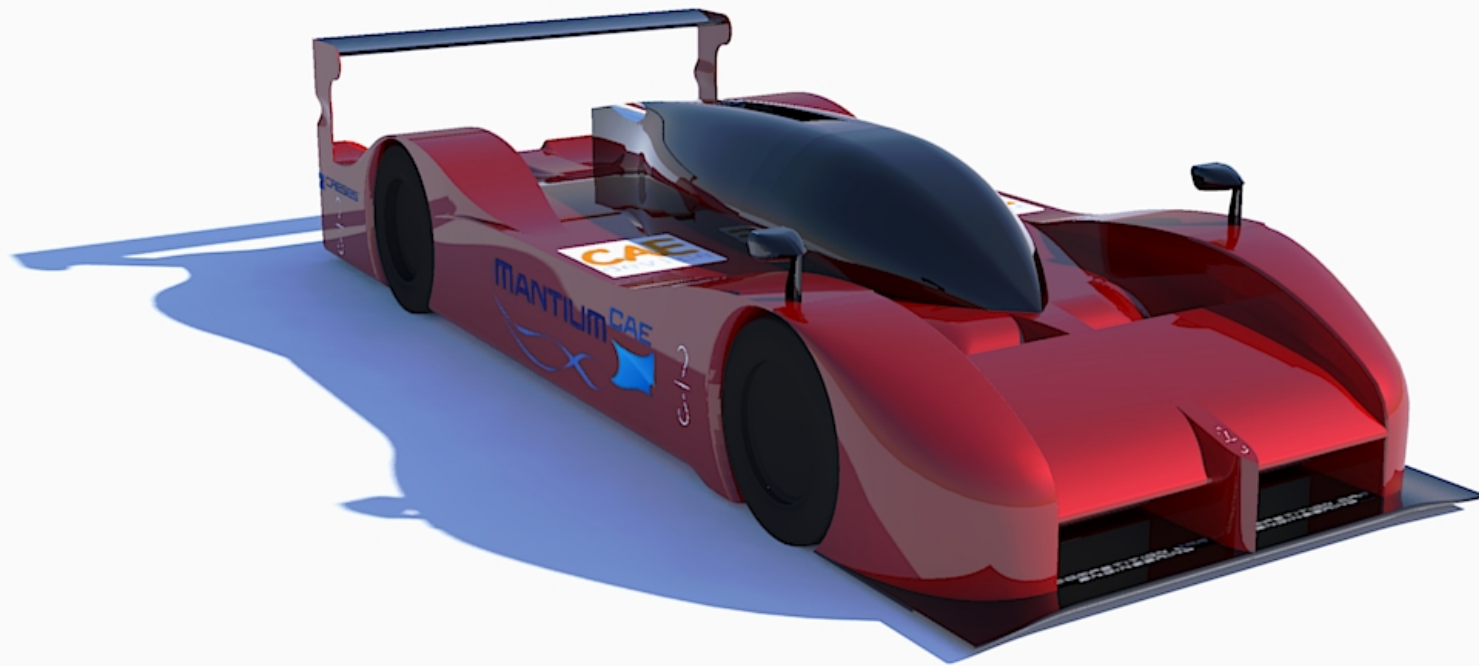




# SOME CARS



# SOME CARS



# SOME CARS



# SOFTWARE

SOFTWARE USED FOR THE CHALLENGE:

# MANTIUM *FLOW*

*VIRTUAL STOPWATCH*  
**COMPETITION CAR  
ENGINEERING**



# CAESES<sup>®</sup>

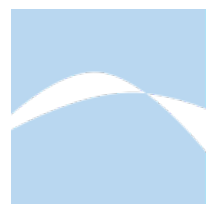
# SOFTWARE

SOFTWARE USED FOR THE CHALLENGE:

# MANTIUM *FLOW*

VIRTUAL STOPWATCH

COMPETITION CAR  
ENGINEERING



# CAESES<sup>®</sup>

# MANTIUM<sup>FLOW</sup>

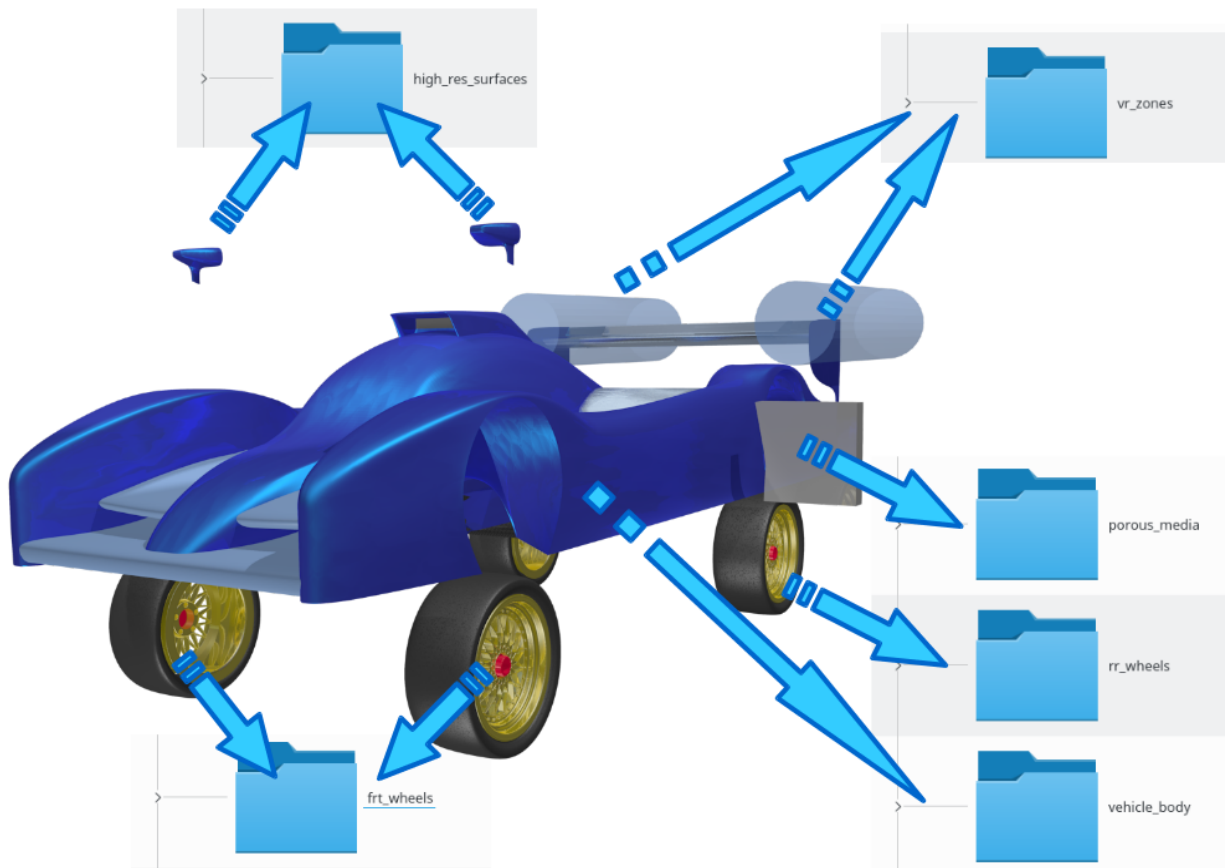
A CFD Software developed by MantiumCAE:

- Robustness
- Repeatability
- Minimal amount of user error
- Comparability of Results

 MANTIUM<sup>FLOW</sup>

 CAD in → Report out

# MANTIUM<sup>FLOW</sup>



- input\_files
      - geometry
        - default\_wall
        - frt\_wheels
        - high\_res\_surfaces
        - low\_res\_surfaces
        - monitoring\_surfaces
        - MRF\_regions
        - porous\_media
        - rotating\_geometries
        - rr\_wheels
        - special\_bc
        - special\_zones
        - vehicle\_body
        - vr\_zones
          - VR\_03\_lhs.stl
          - VR\_03\_rhs.stl
          - VR\_04\_lhs.stl
          - VR\_04\_lower.stl
          - VR\_04\_rhs.stl
          - VR\_04\_top.stl
        - WT
        - solver\_settings.ini

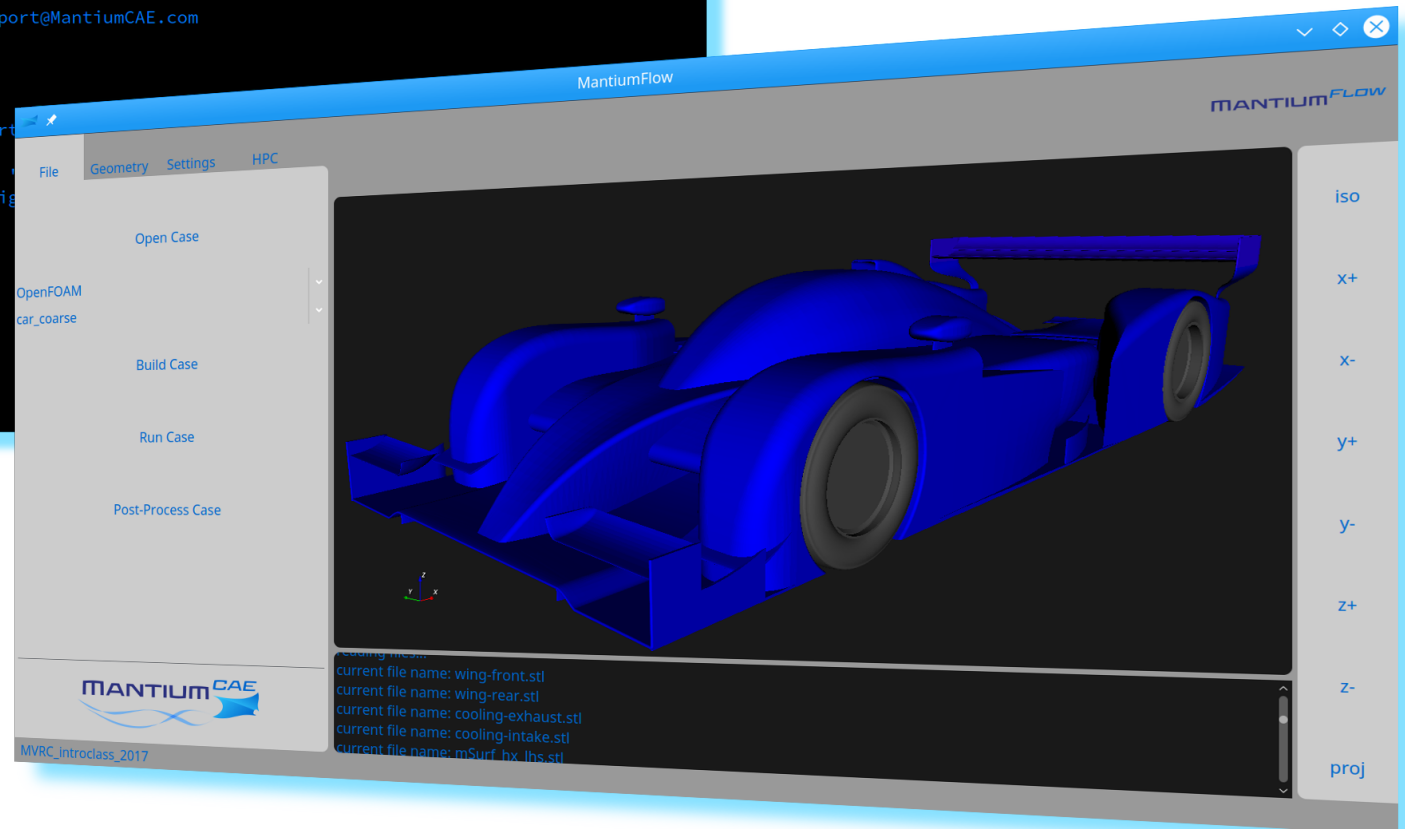
# MANTIUM<sup>FLOW</sup>

```

MANTIUMFLOW
Version Beta

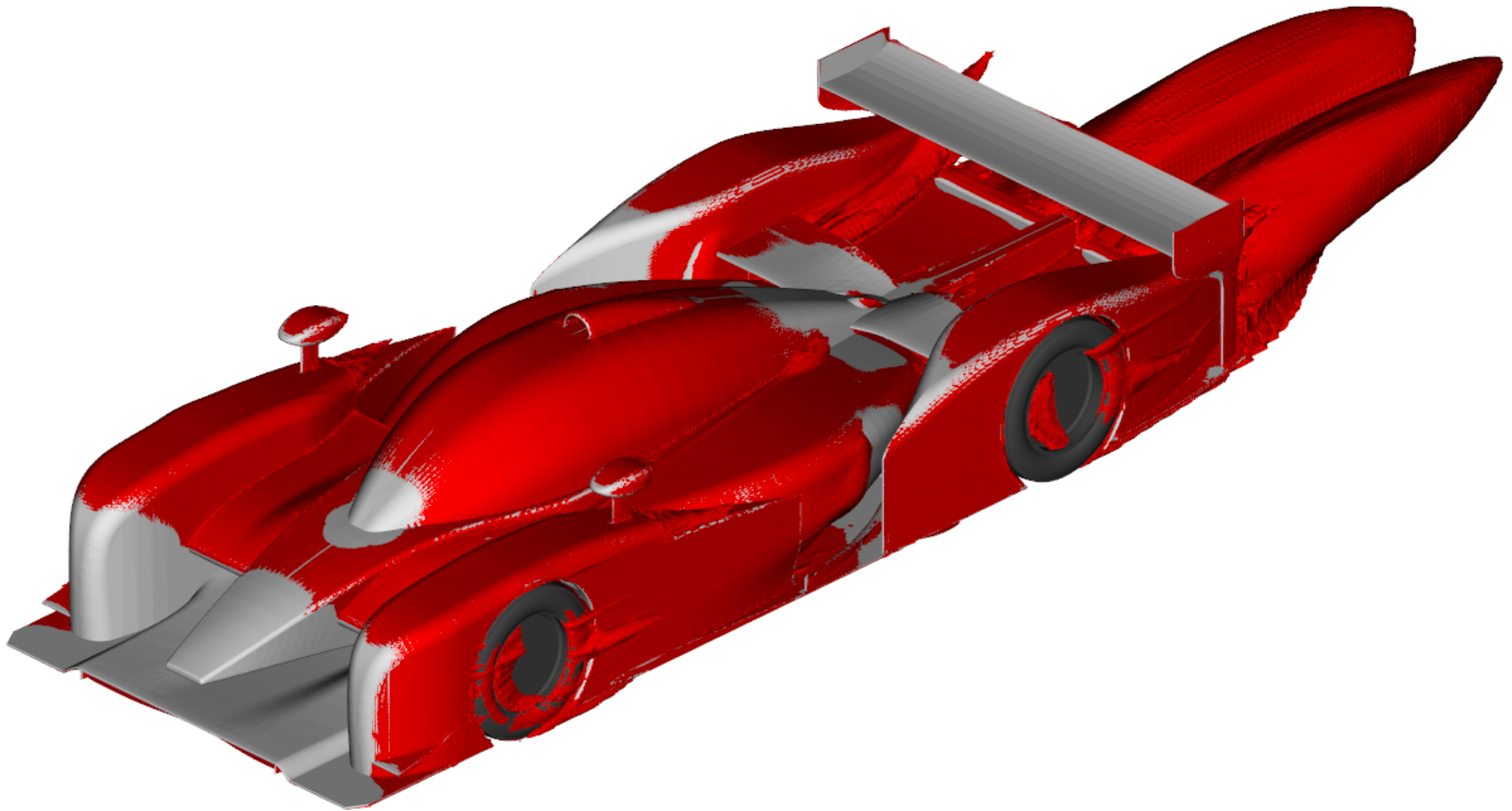
By MantiumCAE, for support please email to support@MantiumCAE.com
www.MantiumCAE.com

Case folder: /home/andre/large_disk/MVRC/support
checking folder structure...
Detected folders in geometry: ['vehicle_body', 'high']
Valid MantiumFlow folders: ['vehicle_body', 'high']
reading files...
current file name: vehicle_body.STL
current file name: rear_wing.STL
current file name: hx_left.STL
current file name: hx_right.STL
current file name: Rear_wheel_SX.stl
current file name: Rear_wheel_DX.stl
current file name: Front+wheel_DX.stl
current file name: Front_wheel_SX.stl
current file name: engine_in.STL
    
```

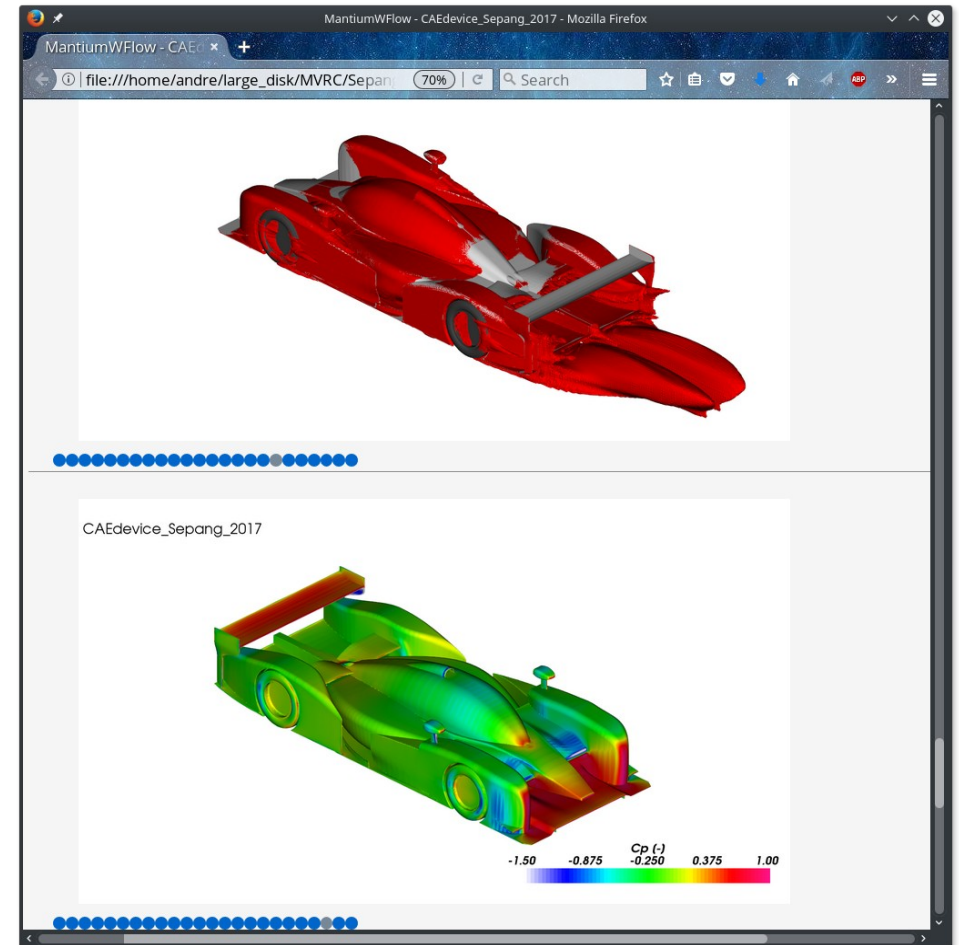




# MANTIUM<sup>FLOW</sup>



# MANTIUM<sup>FLOW</sup>



# SOFTWARE

SOFTWARE USED FOR THE CHALLENGE:

MANTIUM *FLOW*

VIRTUAL STOPWATCH  
COMPETITION CAR  
ENGINEERING



# VIRTUAL STOPWATCH

**VIRTUAL STOPWATCH**

CHASSIS LAYOUT: LMP1	REAR TYPE/WHEEL SIZE: 365-18"
CONSTRUCTION: Carbon Monocoque	TYRE TYPE: Medium Compound Slicks
BODY STYLE: LMP1 Car	WHEEL TYPE: Alloy
UNDERFLOOR AERO: -	WHEEL RIM WEIGHT REDUCTION: -

ENGINE: 3.0l petrol 540bhp + 144bhp ERS	DIFFERENTIAL RATIO: 3.2 : 1
GEARBOX: Xtrac 8 ratio Seamless	DIFFERENTIAL RAMP ANGLES: 45/85
	TRANSMISSION TYPE: RWD

WHEELBASE: 3.0 m

CFD RESULTS

TEST SPEED: 100mph	CdA: 1.3	CdA: 4.5	COP behind front Axle: 1.65
Engine Intake: 0.0	Engine Exhaust: 4.5	Cooling Flow: 3.0	

DRIVER MASS: 80

PROXIMITY TO CORNERING LIMIT: 100%

FUEL/BALLAST CARRIE: 10kg

PERFORMANCE TRIAL: Nurburgring

TARMAC GRIP FACTOR: 1

**START**

0

[http://www.competition-car-engineering.com/MVRC\\_Timing.htm](http://www.competition-car-engineering.com/MVRC_Timing.htm)

# VIRTUAL STOPWATCH

**VIRTUAL STOPWATCH**

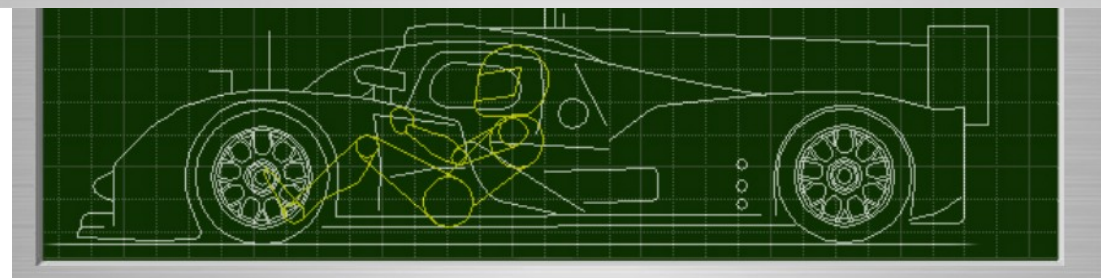
CHASSIS LAYOUT: LMP1  
 CONSTRUCTION: Carbon Monocoque  
 BODY STYLE: LMP1 Car

REAR TYRE/WHEEL SIZE: 365-18"  
 TYRE TYPE: Medium Compound Slicks  
 WHEEL TYPE: Alloy

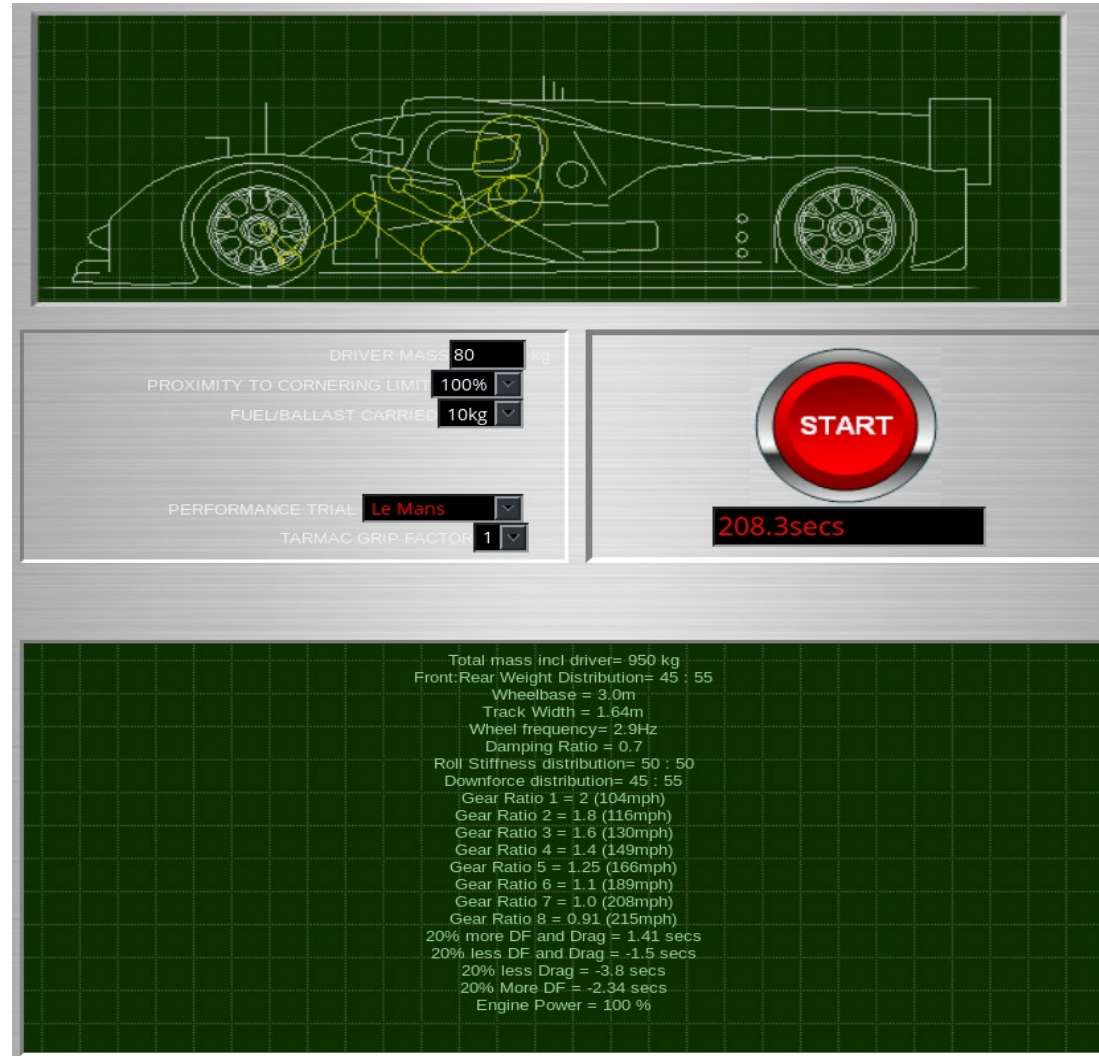
WHEELBASE: 3.0 m

CFD RESULTS

TEST SPEED	Cd.A	Cl.A	COP behind front Axle
100mph	1.3	4.5	1.65
Engine Intake	Engine Exhaust	Cooling Flow	
0.0 Pa.m <sup>2</sup>	4.5 Pa.m <sup>2</sup>	3.0 m <sup>3</sup> /sec	



# VIRTUAL STOPWATCH



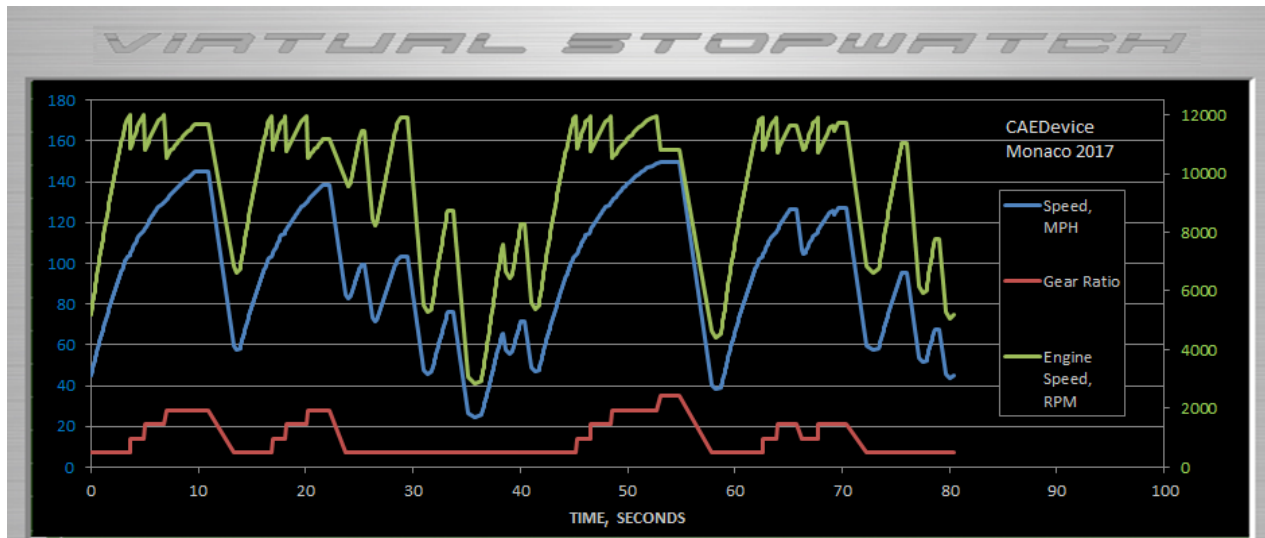
The interface displays a wireframe model of a race car on a green grid background. Below the model are two control panels. The left panel contains settings for DRIVER MASS (80 kg), PROXIMITY TO CORNERING LIMIT (100%), FUEL/BALLAST CARRIED (10kg), PERFORMANCE TRIAL (Le Mans), and TARMAC GRIP FACTOR (1). The right panel features a large red 'START' button and a display showing '208.3secs'. At the bottom, a detailed list of vehicle parameters is provided on a green grid background.

DRIVER MASS: 80 kg  
 PROXIMITY TO CORNERING LIMIT: 100%  
 FUEL/BALLAST CARRIED: 10kg  
 PERFORMANCE TRIAL: Le Mans  
 TARMAC GRIP FACTOR: 1

**START**  
 208.3secs

Total mass incl driver= 950 kg  
 Front:Rear Weight Distribution= 45 : 55  
 Wheelbase = 3.0m  
 Track Width = 1.64m  
 Wheel frequency= 2.9Hz  
 Damping Ratio = 0.7  
 Roll Stiffness distribution= 50 : 50  
 Downforce distribution= 45 : 55  
 Gear Ratio 1 = 2 (104mph)  
 Gear Ratio 2 = 1.8 (116mph)  
 Gear Ratio 3 = 1.6 (130mph)  
 Gear Ratio 4 = 1.4 (149mph)  
 Gear Ratio 5 = 1.25 (166mph)  
 Gear Ratio 6 = 1.1 (189mph)  
 Gear Ratio 7 = 1.0 (208mph)  
 Gear Ratio 8 = 0.91 (215mph)  
 20% more DF and Drag = 1.41 secs  
 20% less DF and Drag = -1.5 secs  
 20% less Drag = -3.8 secs  
 20% More DF = -2.34 secs  
 Engine Power = 100 %

# VIRTUAL STOPWATCH



[www.competition-car-engineering.com](http://www.competition-car-engineering.com)



[www.competition-car-engineering.com](http://www.competition-car-engineering.com)

# RESULTS LAST RACE





# SOFTWARE

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COMPETITION CAR  
ENGINEERING



**CAESES**<sup>®</sup>

# CAESES APPS

## DRONE PROPELLER

This is a simple parametric model of a drone propeller with a set of fancy parameters. Try it out and generate your own drone blade geometry that

## SHIP HULL

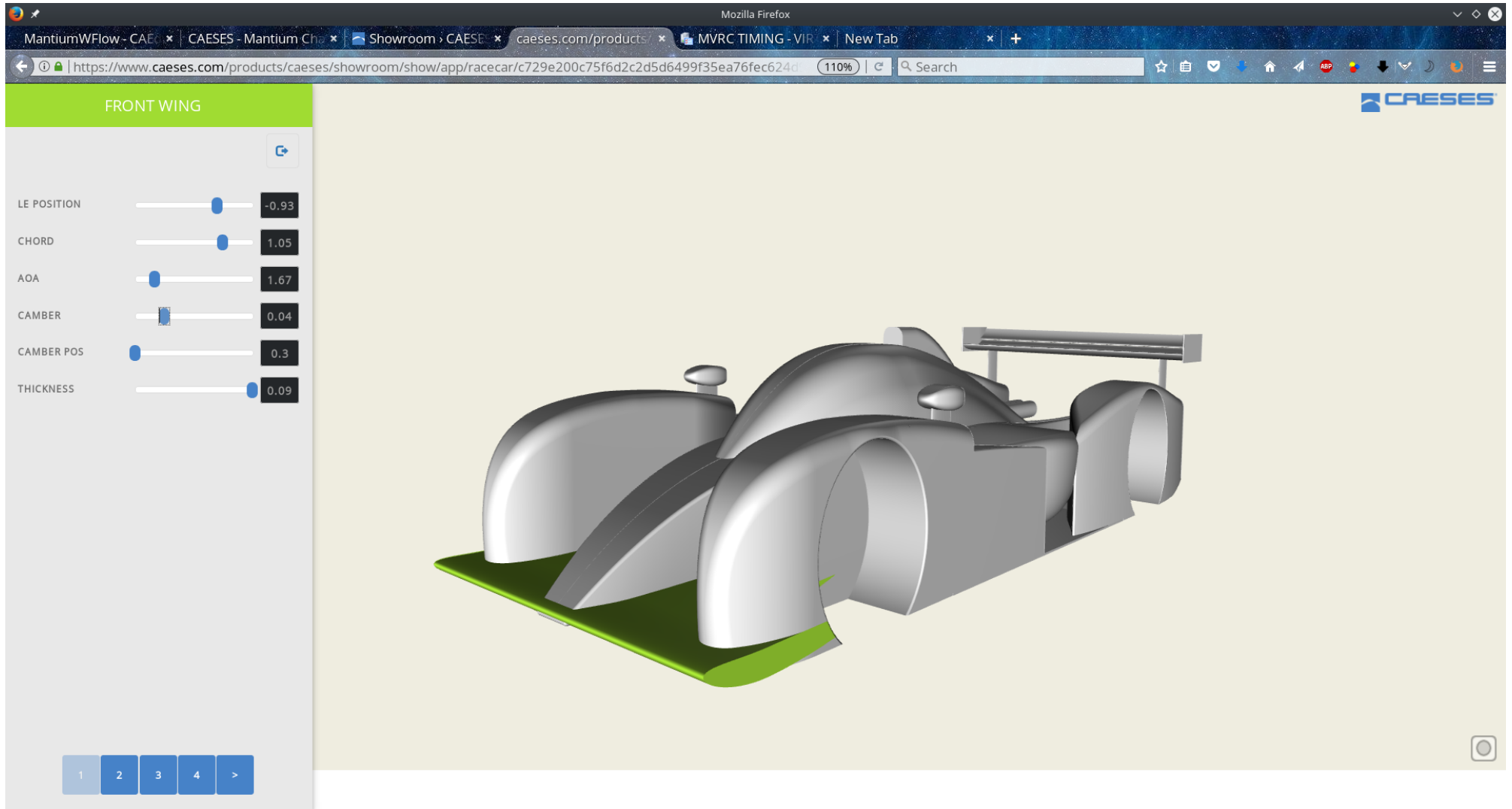
This is a ship hull model we have worked on within the R&D project [HOLISHIP](#). Thanks also to our partners from [CFRPA](#) to include technical parameters

## AERO PACKAGE

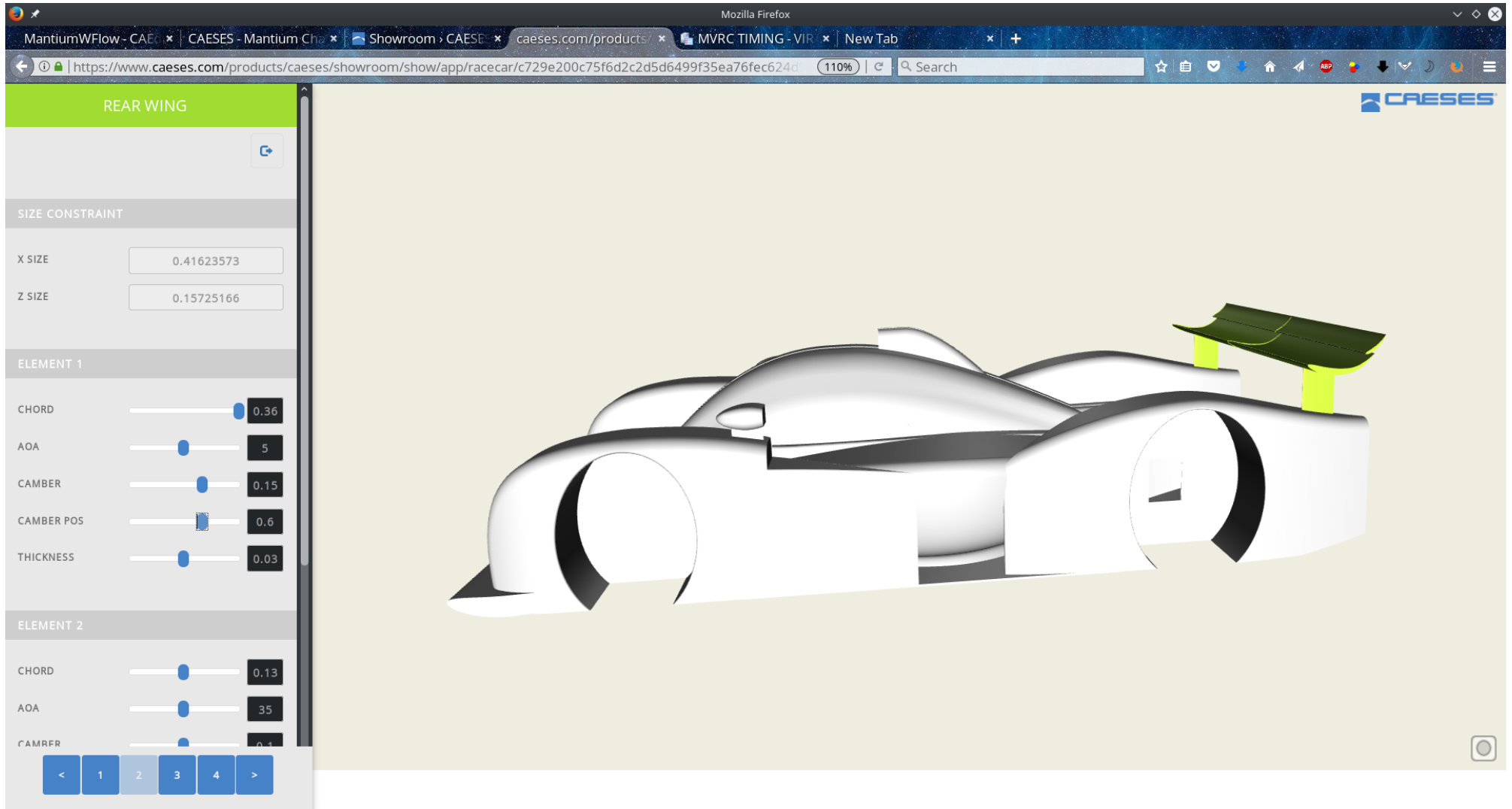
This is the online geometry generator for the aero package of the [MVRC challenge](#) intro class car. Rear wing, front wing and floor/diffuser can be configured and downloaded as STL files.

LIVE PREVIEW

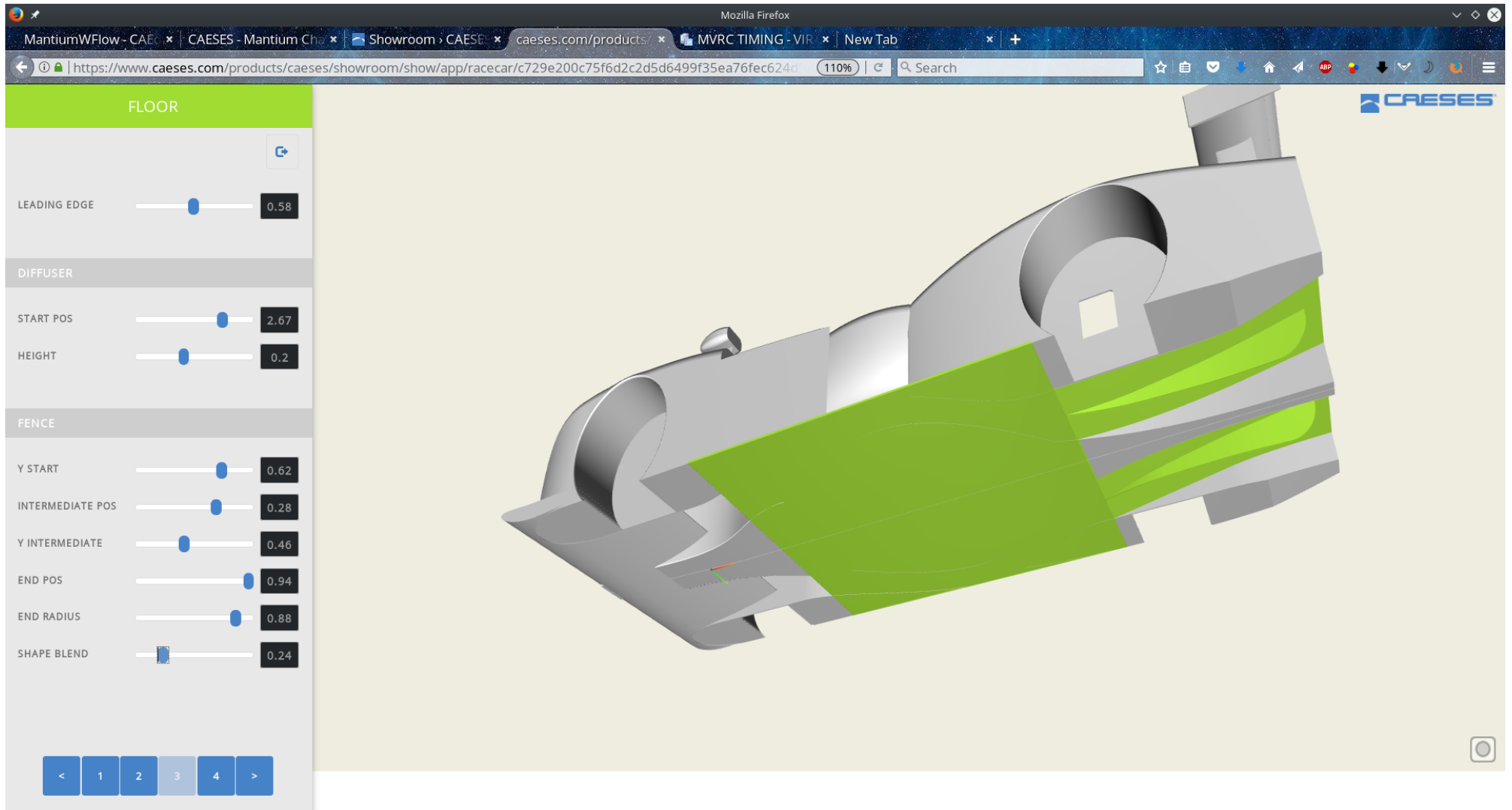
# CAESES APPS



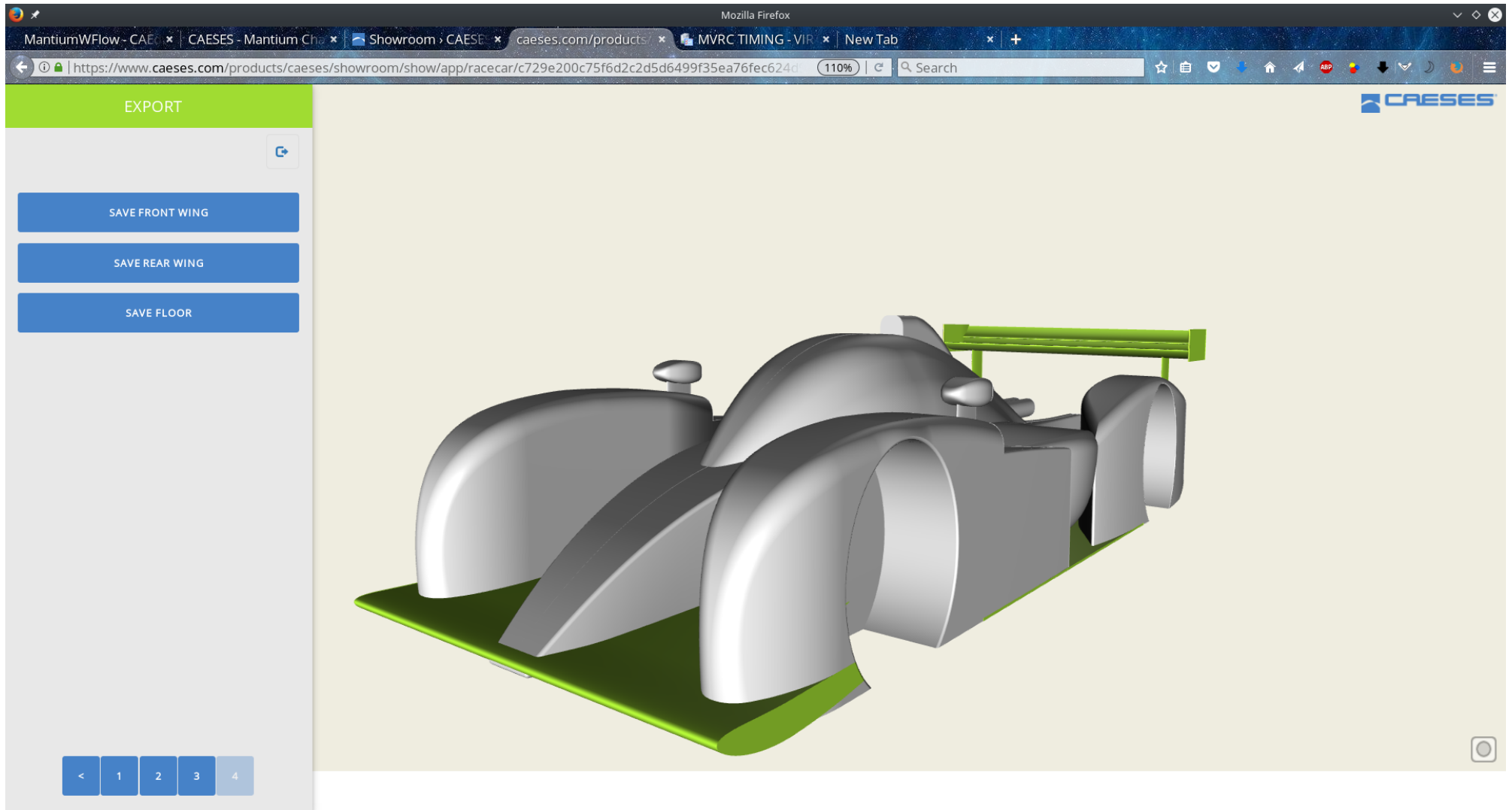
# CAESES APPS



# CAESES APPS



# CAESES APPS



# CAESES FUTURE

FLOW SIMULATION

RUN MANTIUM FLOW

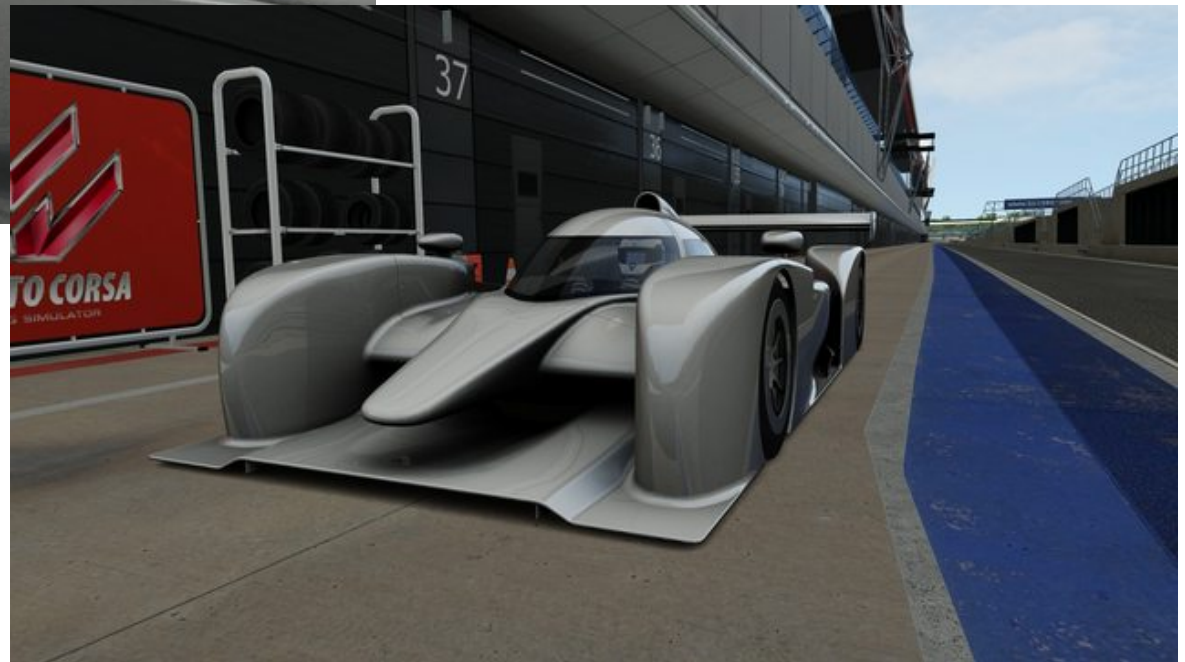
DRAG (CD)	1.07767166
LIFT (CL)	-4.19227416

DOWNLOAD REPORT

< 1 2 3 4

CAESES

# MVRC FUTURE







**MANTIUM** CAE

Thank you for your attention!

Special thanks also go out to Chris, Richard and the MVRC sponsors:

