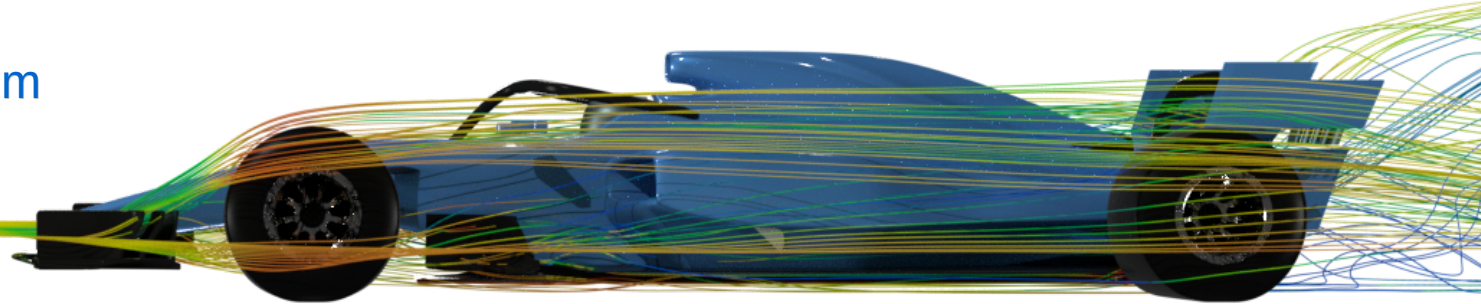


MANTIUM *CHALLENGE*

FROM LE MANS TO F1

André Zimmer
a.zimmer@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

HISTORY OF MVRC

2012 birth of
KVRC
with F1 style
cars

2015 switch
to Le Mans
style cars

2016
Challenge
is now
MVRC

2019 back
to F1 style
cars

DISCUSSION ON F1TECHNICAL


🔔 📧 LVDH ▾

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Engineering projects

New Topic

🔍
⚙️

Mark topics read • 428 topics
➡️
1 2 3 4 5 ... 15 ➡️

Announcements		Replies	Views	Last post
 Key 2019 Threads by turbof1 » 30 Nov 2015, 13:07 » in General chat	2	25582	by turbof1 » 23 Jan 2019, 11:49	
 Forum guide: read before posting by Steven » 23 Dec 2007, 14:54 » in General chat	1	75866	by Steven » 26 May 2010, 00:10	

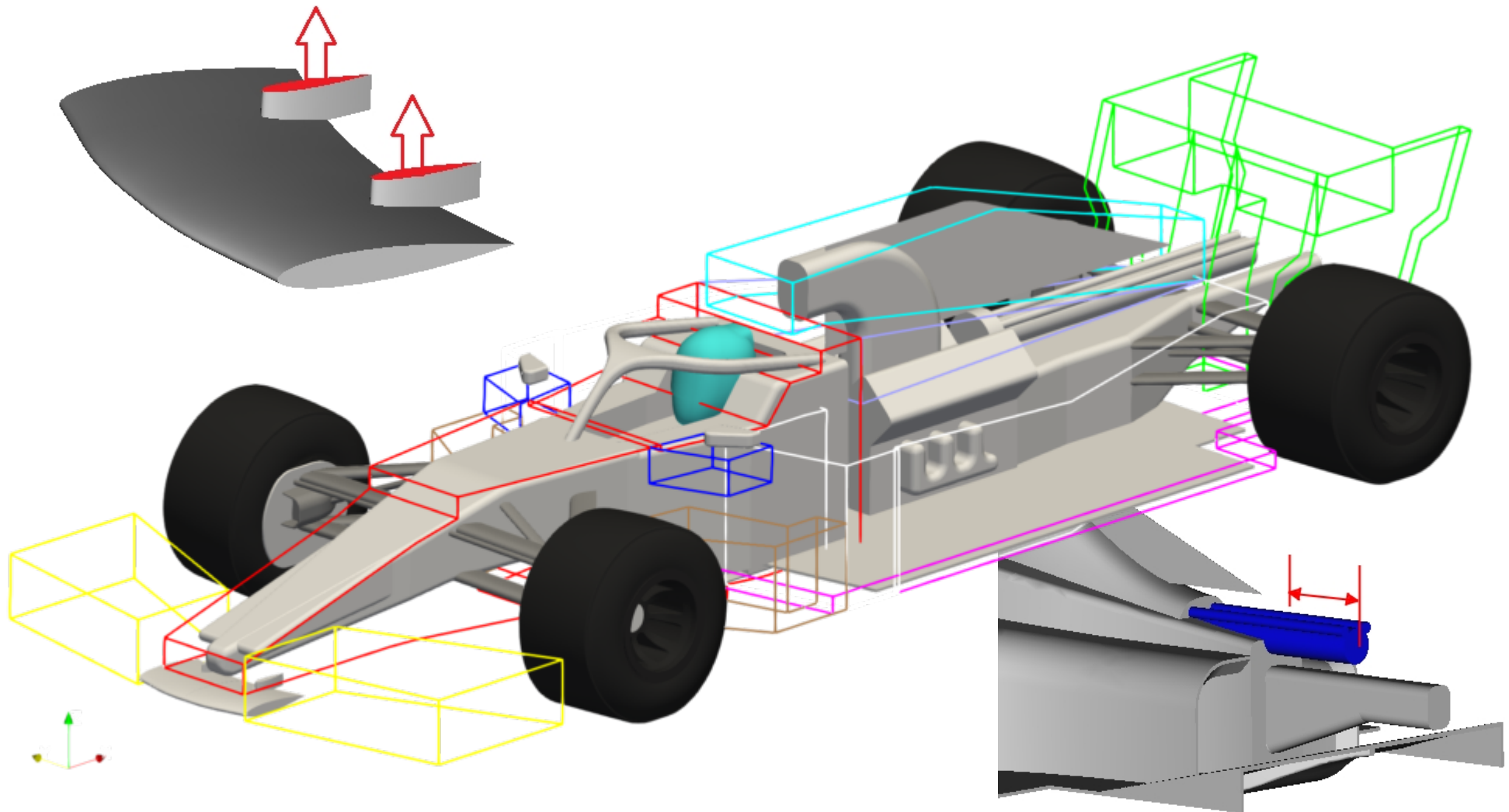
Topics		Replies	Views	Last post
 [MVRC] Mantium Virtual Racecar Challenge 2018 33 by LVDH » 09 Jul 2018, 09:39 1 ... 46 47 48 49 50	738	42844	by CAEdevice » 25 Feb 2019, 21:17	
 [MVRC] Mantium Virtual Racecar Challenge 2017 9 by cdsavage » 20 Jun 2017, 21:21 1 ... 80 81 82 83 84	1259	71759	by etsmc » 09 Jul 2018, 06:52	
 [MVRC] Mantium Virtual Racecar Challenge 2016 20 by cdsavage » 16 Aug 2016, 12:03 1 ... 87 88 89 90 91	1363	73905	by cdsavage » 20 Jun 2017, 21:21	
 [KVRC] Khamsin Virtual Racecar Challenge 2016 24 by cdsavage » 25 Aug 2015, 17:54 1 ... 95 96 97 98 99	1480	81566	by cdsavage » 17 Aug 2016, 21:43	

<https://www.f1technical.net/forum/viewforum.php?f=14>

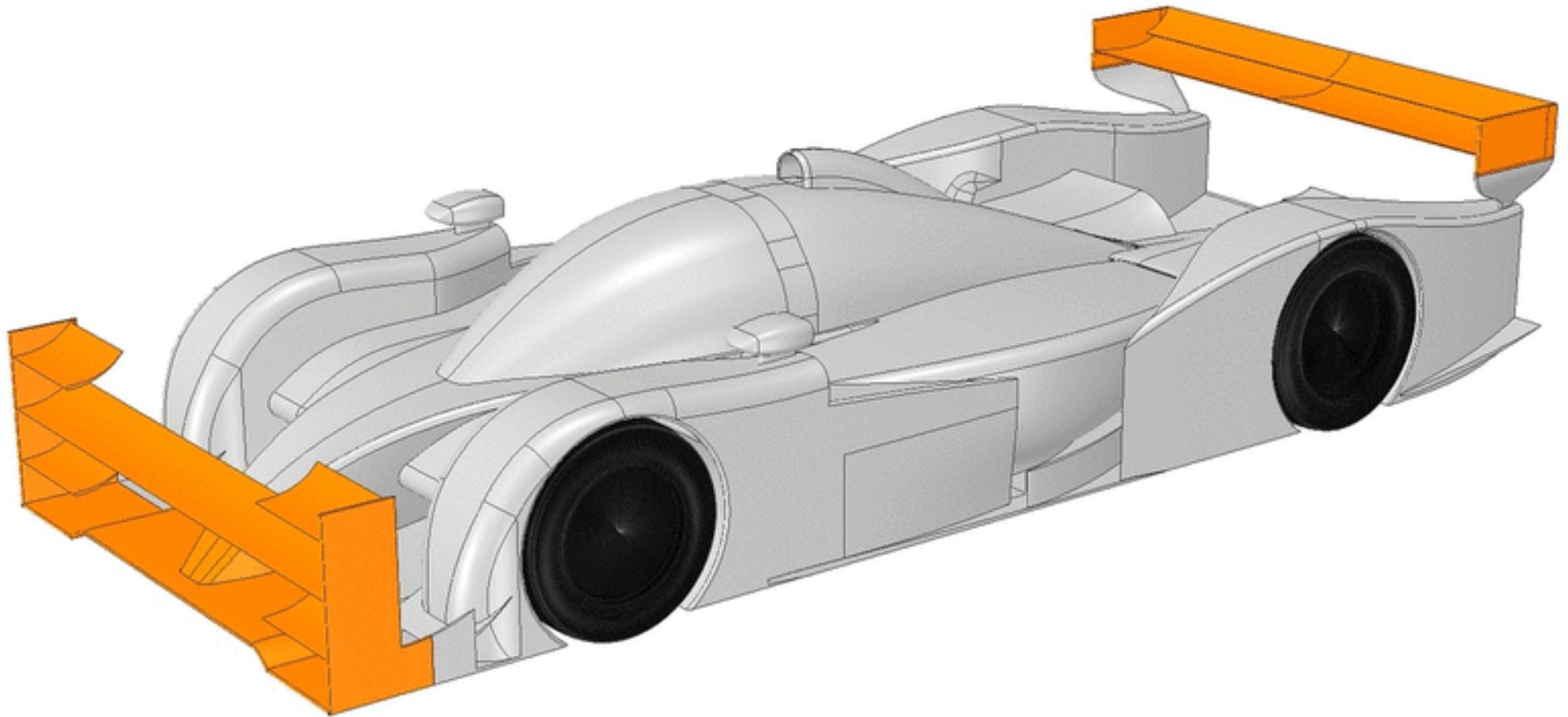
MVRC 2020 RACE CALENDAR

DATE	RACE
10 TH MAY	MONACO
21 ST JUNE	AUSTRIA
23 RD AUGUST	ITALY
27 TH SEPTEMBER	JAPAN
1 ST NOVEMBER	BRAZIL

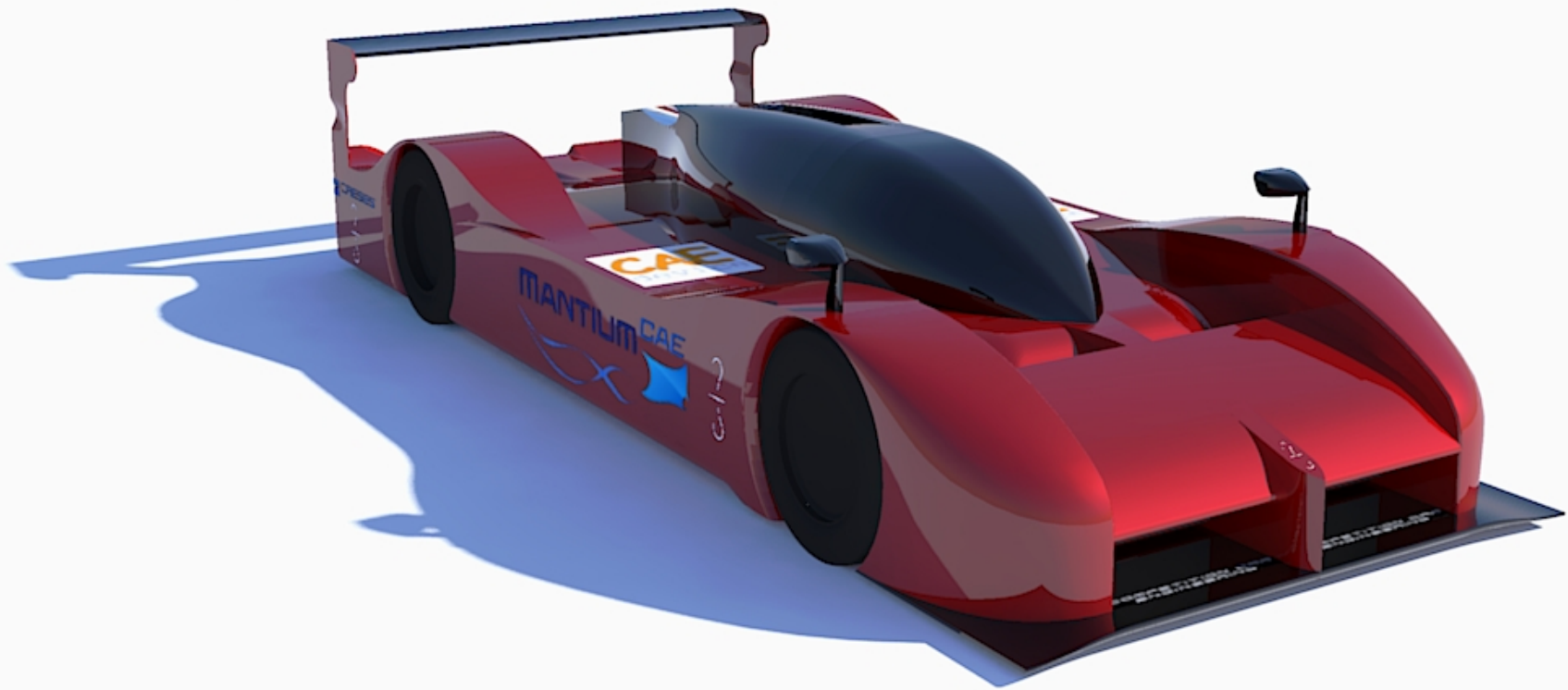
RULES



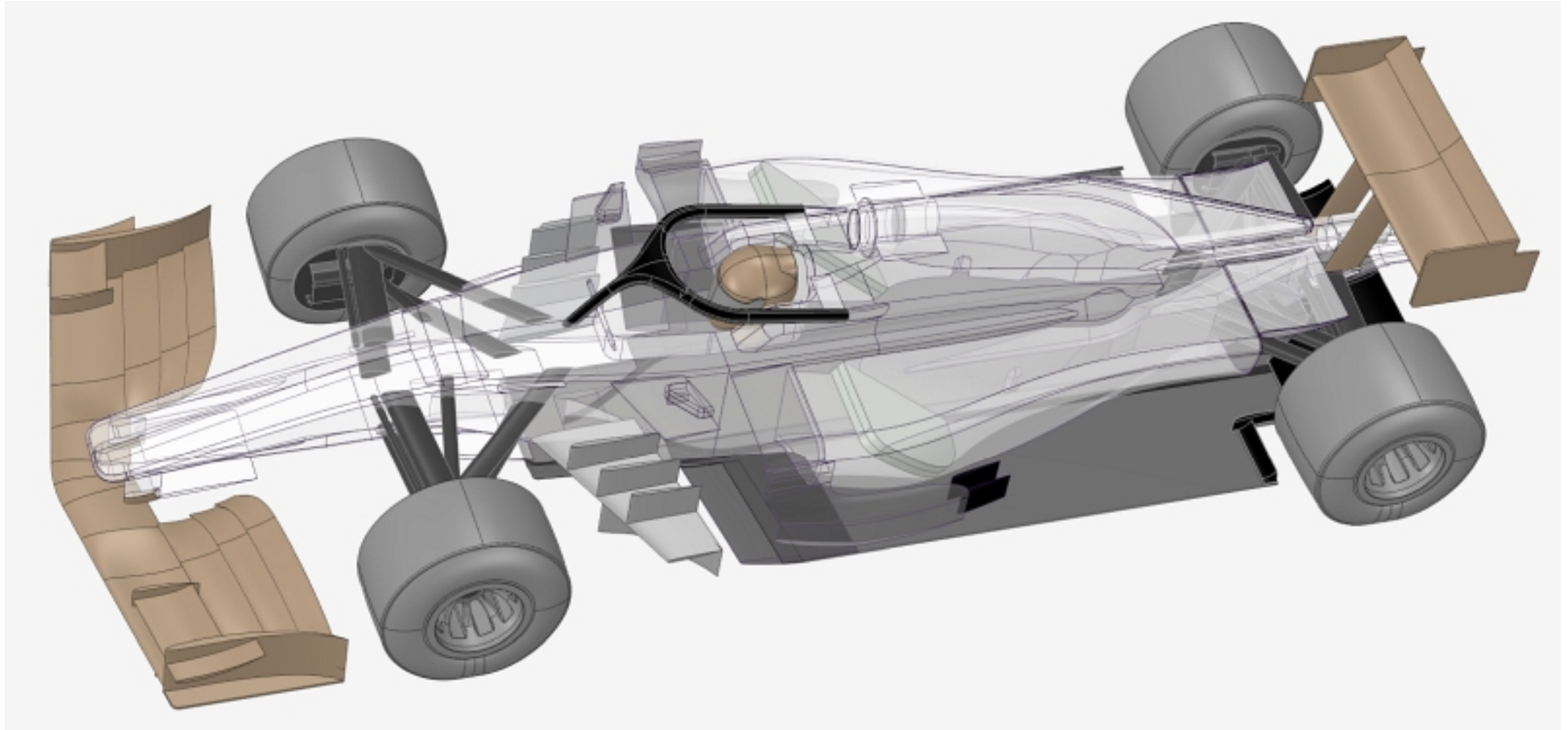
SOME CARS



SOME CARS



SOME CARS



Open source design, download here:
<https://www.caedevise.net/cfd/mvrc-2019-car-development/>

SOME CARS



Technical discussion here:
<https://www.f1technical.net/forum/viewtopic.php?f=14&t=27635&start=15>

SOFTWARE

SOFTWARE USED FOR THE CHALLENGE:

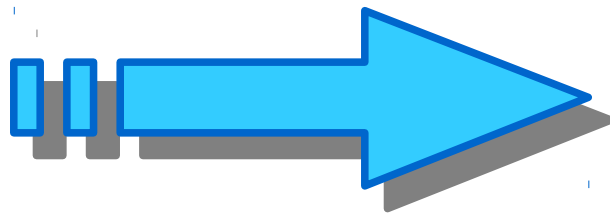
MANTIUM^{CAE} FLOW

VIRTUAL STOPWATCH
COMPETITION CAR
ENGINEERING

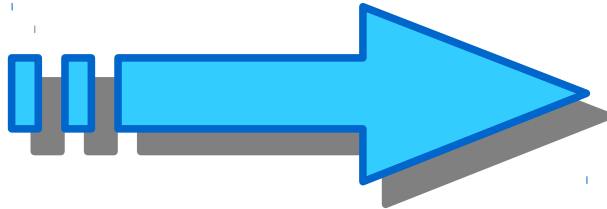
MANTIUM^{FLOW}

A CFD Software developed by MantiumCAE:

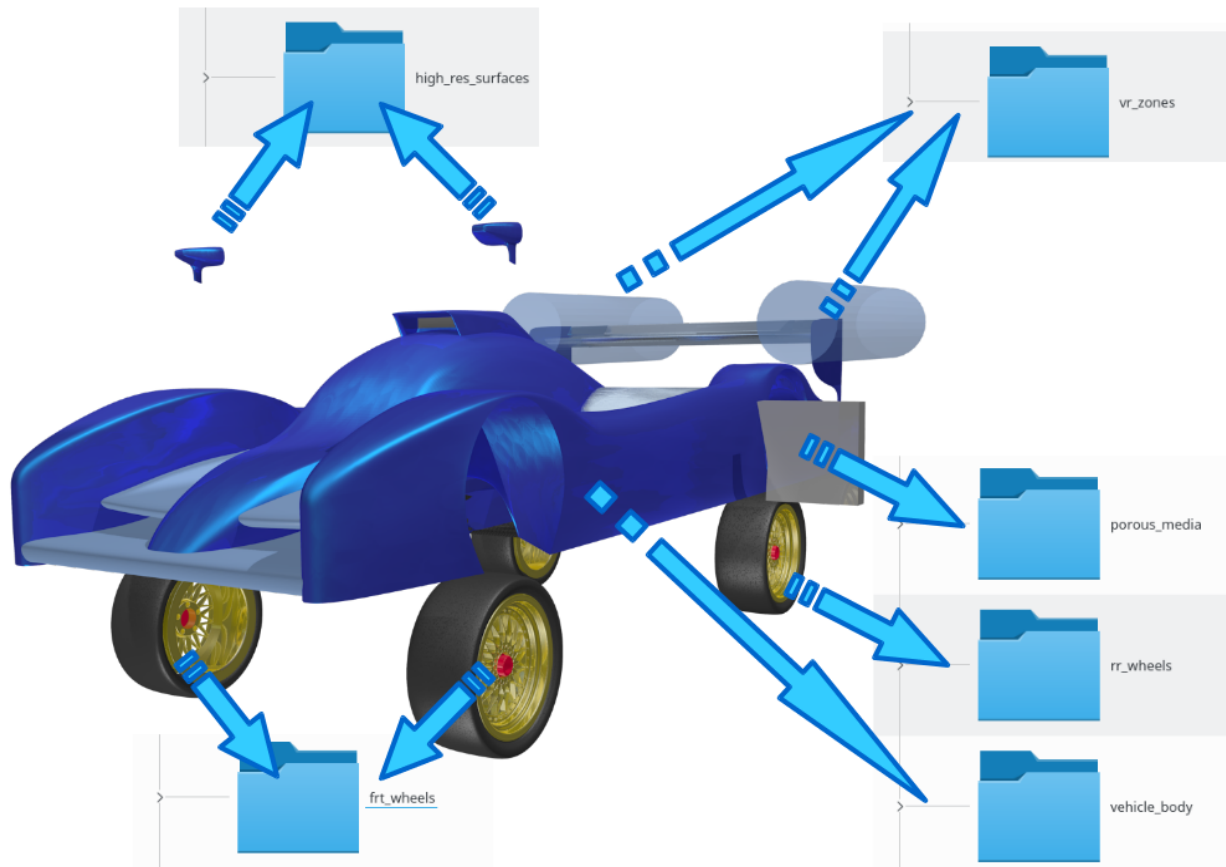
- Robustness
- Repeatability
- Minimal amount of user error
- Comparability of Results



MANTIUM^{FLOW}



CAD in → Report out

MANTIUM^{FLOW}

```
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
```

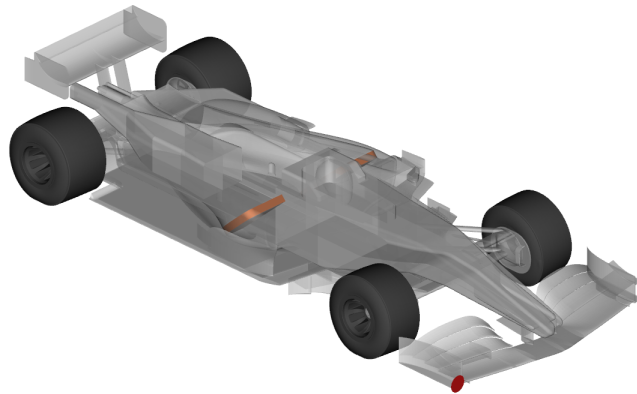



MANTIUM^{CAE}FLOW

MANTIUM^{CAE}

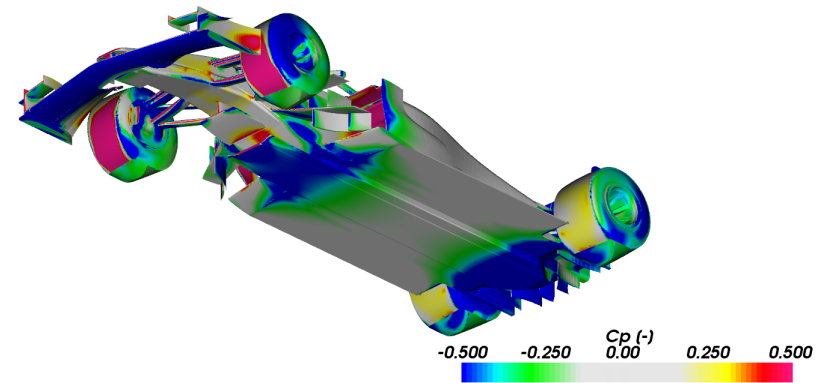
CAEdevice_YasMarina_MVRC_2019

MantiumFlow
MVRC



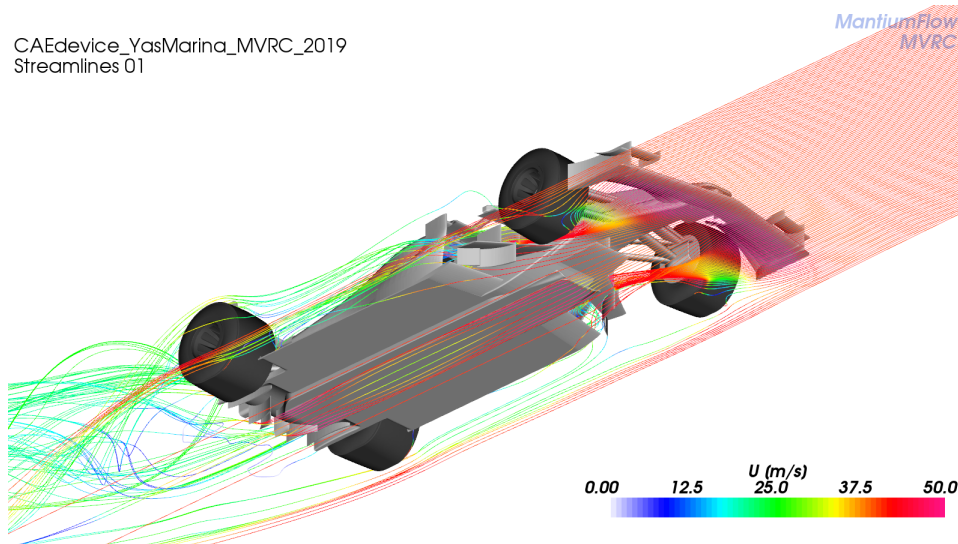
CAEdevice_YasMarina_MVRC_2019

MantiumFlow
MVRC



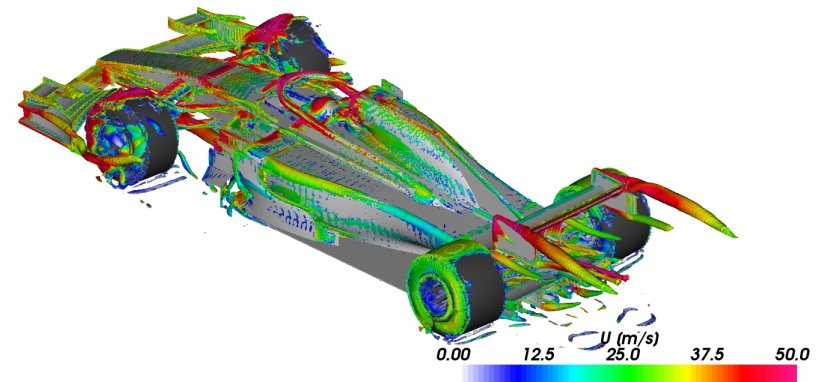
CAEdevice_YasMarina_MVRC_2019
Streamlines 01

MantiumFlow
MVRC



CAEdevice_YasMarina_MVRC_2019
Lambda2=35000 Iso

MantiumFlow
MVRC



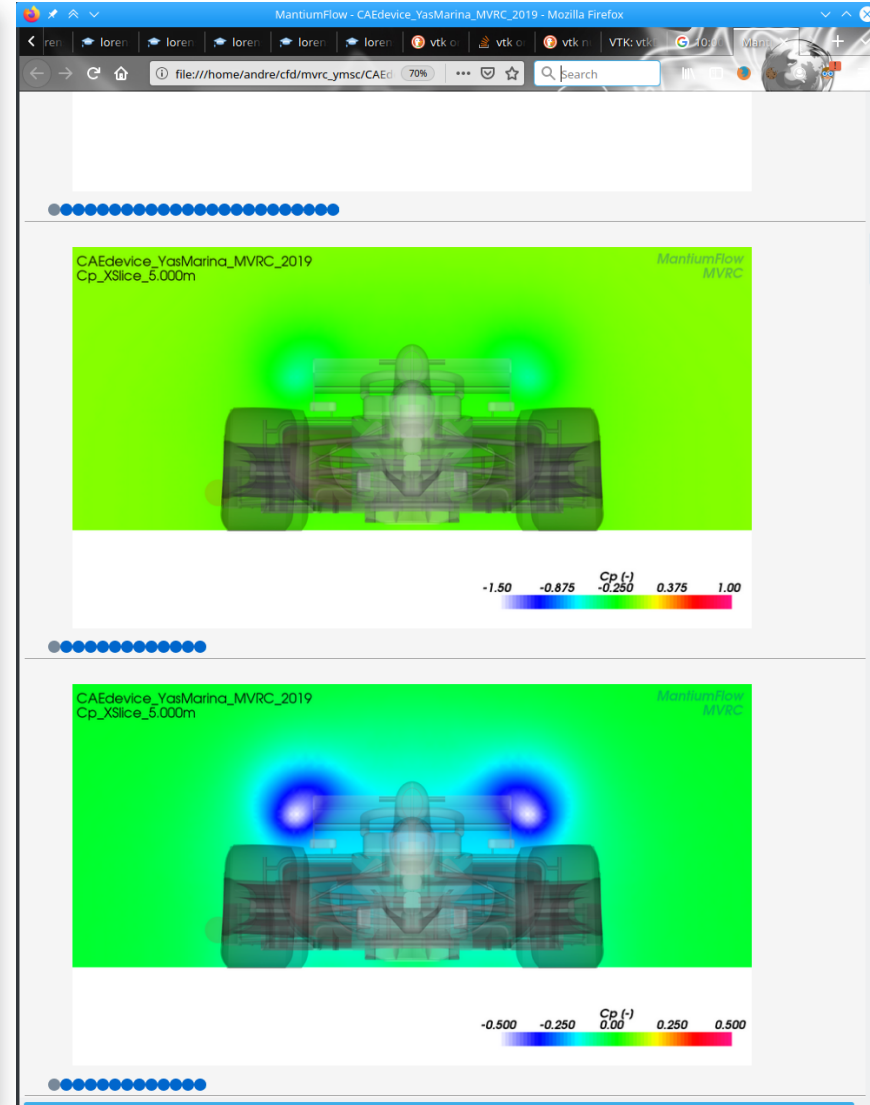
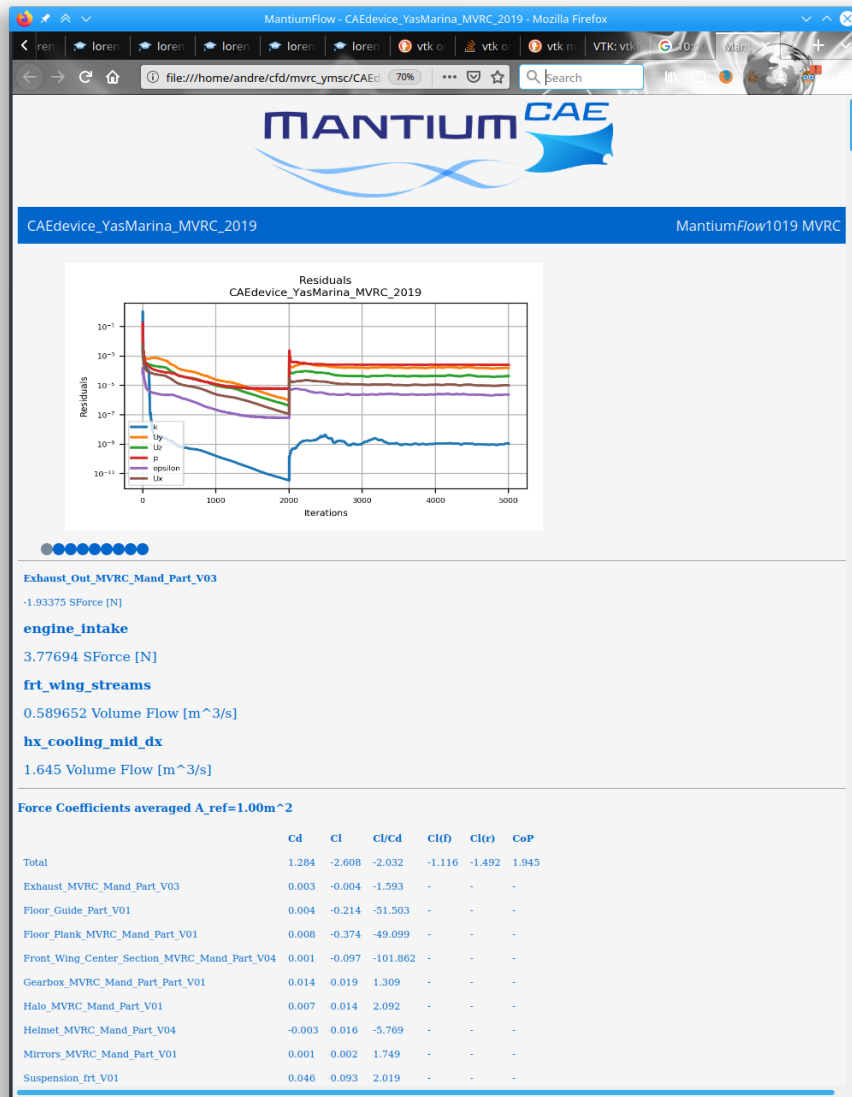
22.04.20

MANTIUM^{CAE}

15

MVRC

MANTIMUM^{CAE} FLOW



SOFTWARE

SOFTWARE USED FOR THE CHALLENGE:

MANTIUM^{CAE} FLOW

VIRTUAL STOPWATCH
COMPETITION CAR
ENGINEERING

VIRTUAL STOPWATCH

VIRTUAL STOPWATCH

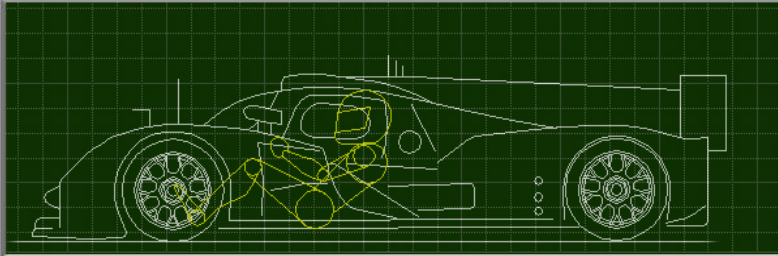
CHASSIS LAYOUT: LMP1	REAR TYRE/WHEEL SIZE: 365-18"
CONSTRUCTION: Carbon Monocoque	TYRE TYPE: Medium Compound Slicks
BODY STYLE: LMP1 Car	WHEEL TYPE: Alloy
UNDERFLOOR AERO: -	WHEEL RIM WEIGHT REDUCTION: -

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

WHEELBASE: 3.0 m

CFD RESULTS

TEST SPEED: 100mph	Cd A: 1.3	Cd A: 4.5	COP behind front Axle: 1.65
Engine Intake: 0.0	Engine Exhaust: 4.5	Cooling Flow: 3.0	
	m ³ /s	m ³ /s	m ³ /sec



DRIVER MASS: 80
PROXIMITY TO CORNERING LIMIT: 100%
FUEL/BALLAST CARRIED: 10kg

PERFORMANCE TRIAL: Nurburgring

TARMAC GRIP FACTOR: 1

START

0

http://www.competition-car-engineering.com/MVRC_Timing.htm

VIRTUAL STOPWATCH

VIRTUAL STOPWATCH

CHASSIS LAYOUT	LMP1	REAR TYRE/WHEEL SIZE	365-18"
CONSTRUCTION	Carbon Monocoque	TYRE TYPE	Medium Compound Slicks
BODY STYLE	LMP1 Car	WHEEL TYPE	Alloy

WHEELBASE

3.0 m

CFD RESULTS

TEST SPEED

100mph mph

Cd.A

1.3 m²

C.I.A

4.5 m²

COP behind front Axle

1.65 m

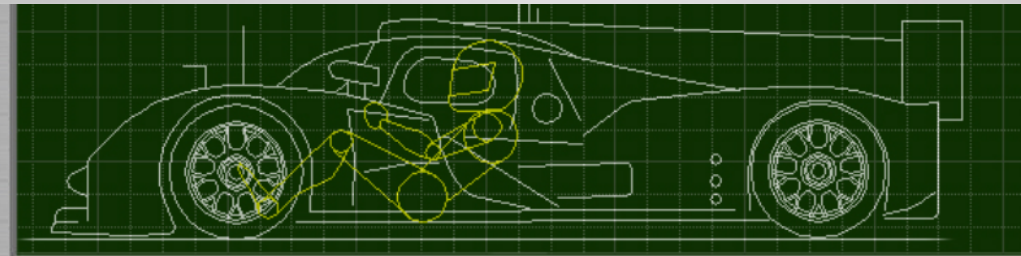
Engine Intake

0.0 Pa.m²

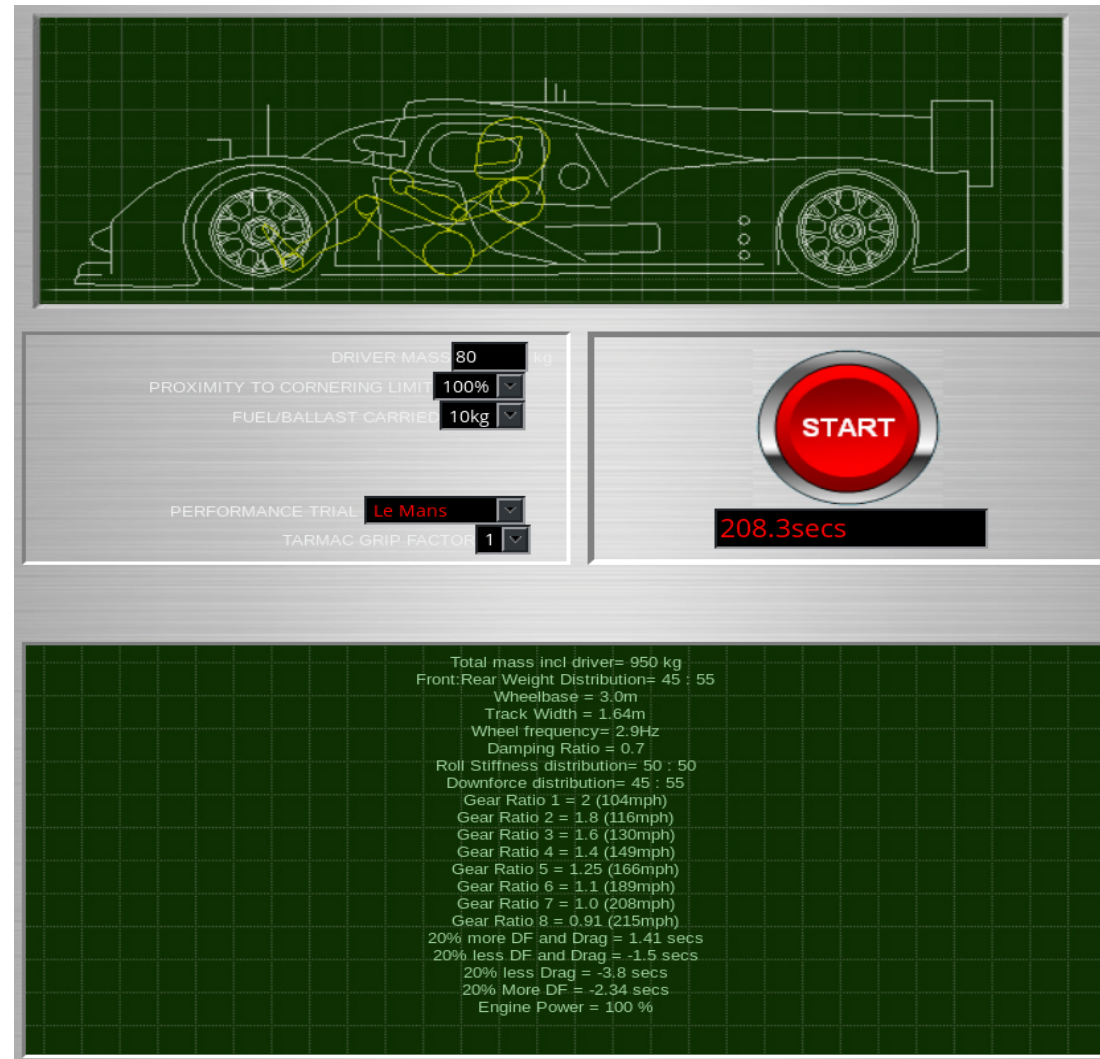
Engine Exhaust

4.5 Pa.m²

Cooling Flow

3.0 m³/sec

VIRTUAL STOPWATCH



DRIVER MASS: 80 kg

PROXIMITY TO CORNERING LIMIT: 100%

FUEL/BALLAST CARRIED: 10kg

PERFORMANCE TRIAL: Le Mans

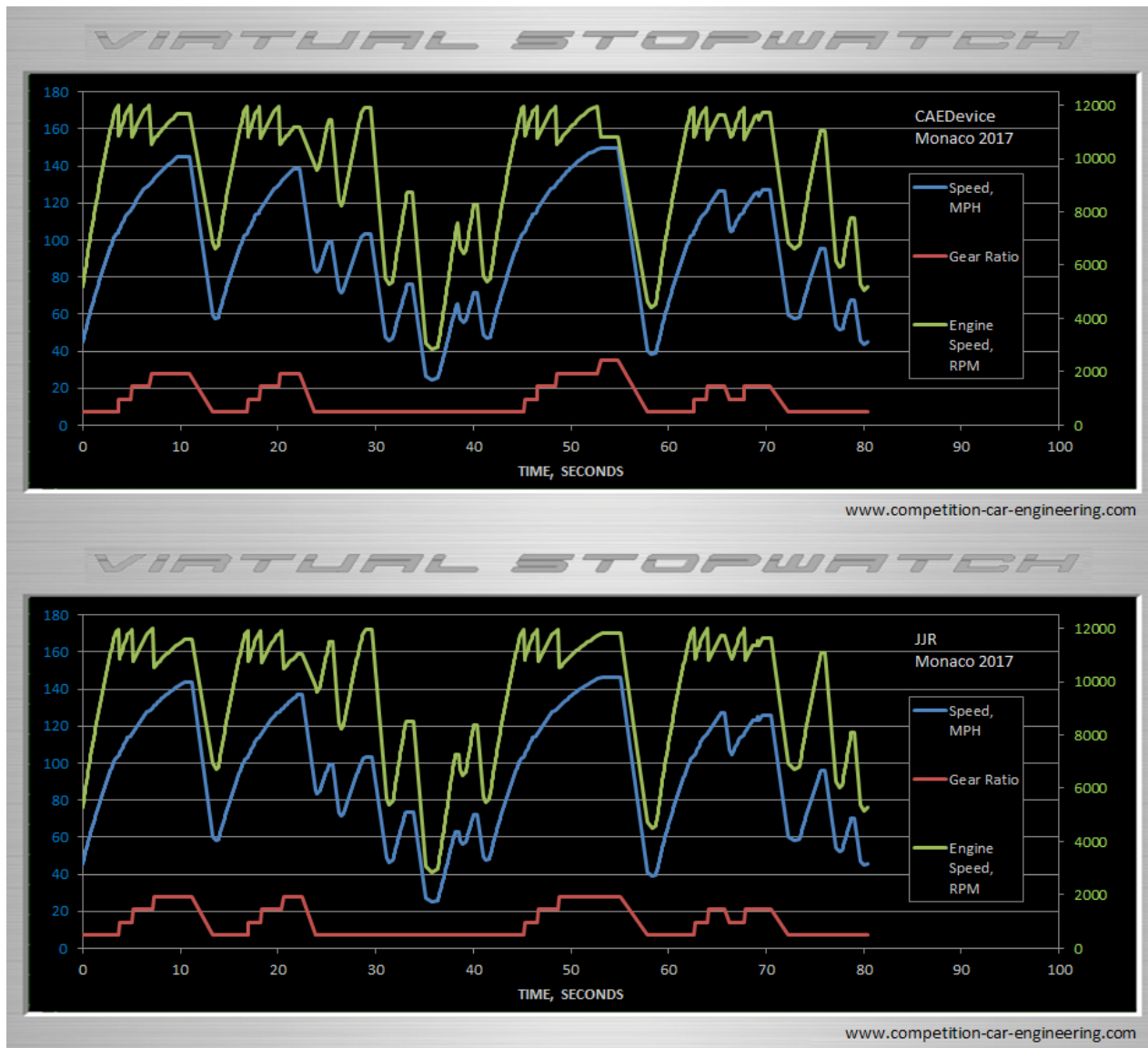
TARMAC GRIP FACTOR: 1

START

208.3secs

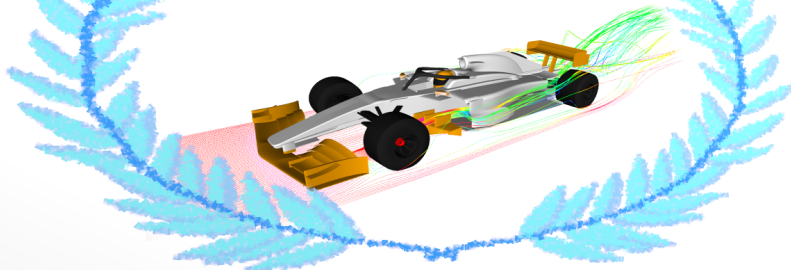
Total mass incl driver= 950 kg
 Front:Rear Weight Distribution= 45 : 55
 Wheelbase = 3.0m
 Track Width = 1.64m
 Wheel frequency= 2.9Hz
 Damping Ratio = 0.7
 Roll Stiffness distribution= 50 : 50
 Downforce distribution= 45 : 55
 Gear Ratio 1 = 2 (104mph)
 Gear Ratio 2 = 1.8 (116mph)
 Gear Ratio 3 = 1.6 (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



CHAMPIONS 2019

WORLD CHAMPION
MVRC 2019



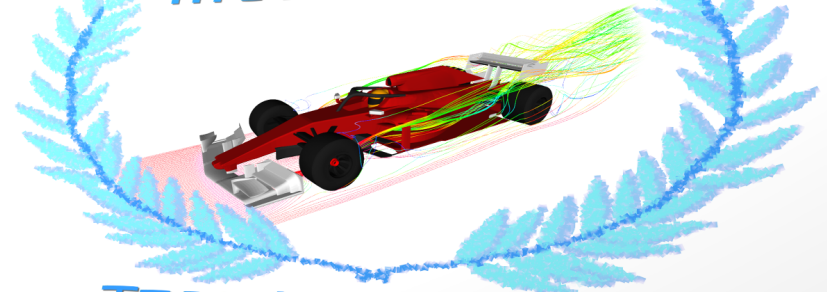
CAEDEVICE

MANTIUM^{CAE}

COMPETITION CAR
ENGINEERING



ROOKIE OF THE YEAR
MVRC 2019



TEAM KOLOSKAAL

MANTIUM^{CAE}

COMPETITION CAR
ENGINEERING



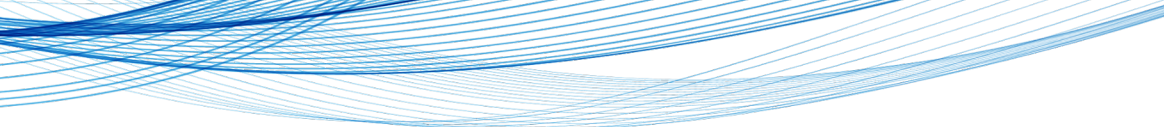
MVRC FUTURE

- 2020 Season will see a mid-season rule switch to new F1 rules!
- Join the championship as competitor!
- Join the championship as staff member!
- Join the championship as CFD journalist!
- An HPC sponsor would be very welcome!

LAST RACE 2019



https://www.youtube.com/watch?v=Aqj_E3St5bU&feature=emb_logo



MANTIUM^{CAE}

Thank you for your attention!

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

