

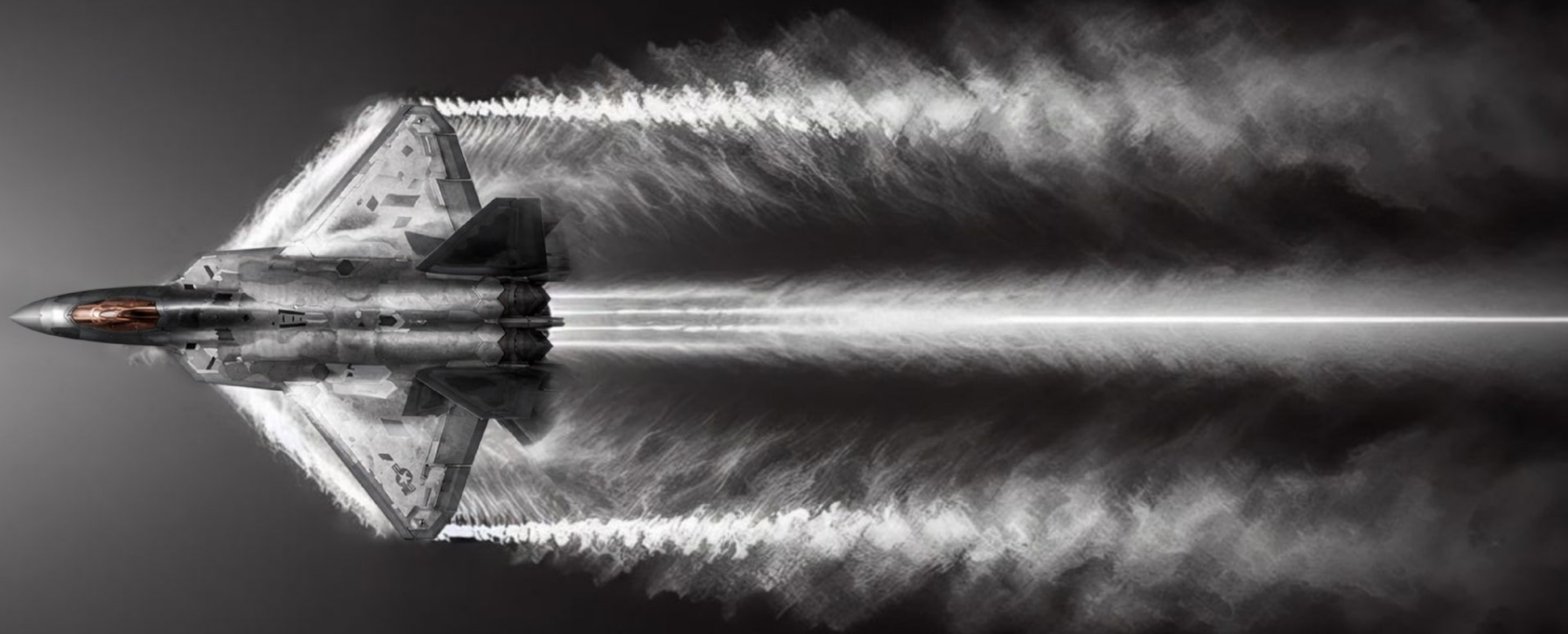


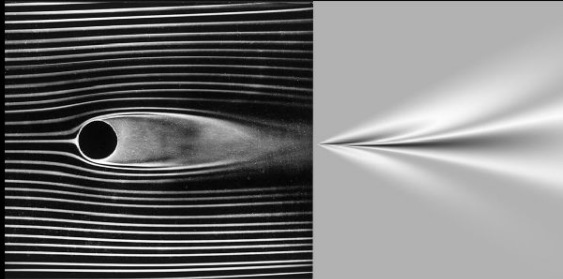
SAVVINI TORROELTO

AERODYNAMIC PROGRAM



AIR CANNOT BE SEEN.
BUT IT DECIDES EVERYTHING ABOVE 200 KM/H.

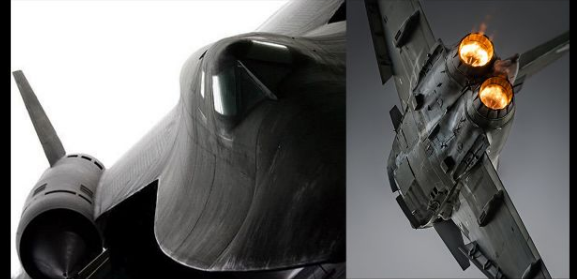




AERODYNAMICS



SHAPES



MOOD

MOODBOARD

"AERODYNAMICS IS 80% OF A CAR'S PERFORMANCE.
THE REST IS MECHANICS AND THE ENGINE."

(C) ADRIAN NEWAY: LEGENDARY F1 ENGINEER



CHAPTER 2

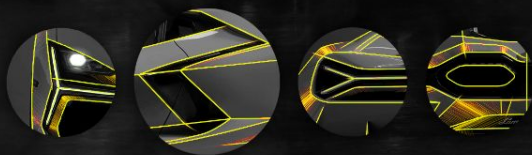
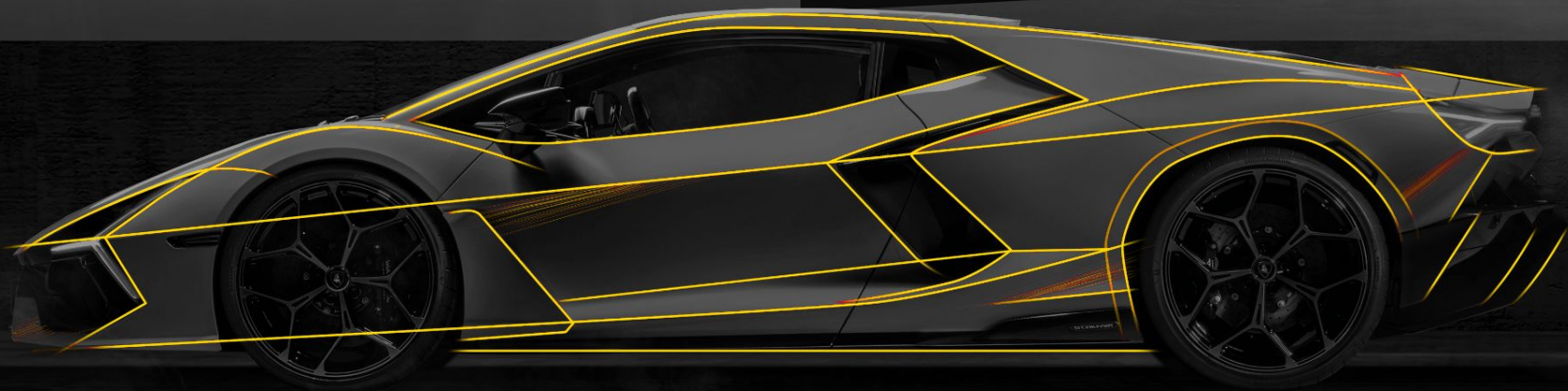
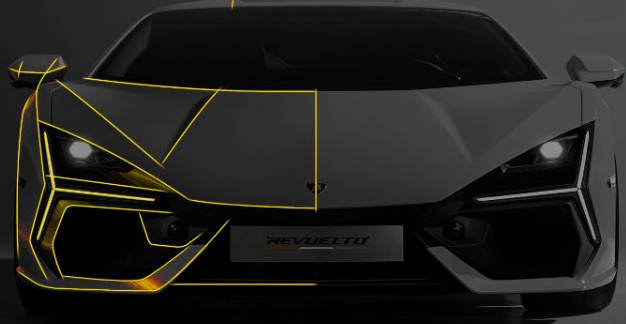
THE QUESTION

LAMBORGHINI CREATED ONE OF THE MOST ADVANCED
PRODUCTION SUPERCARS.

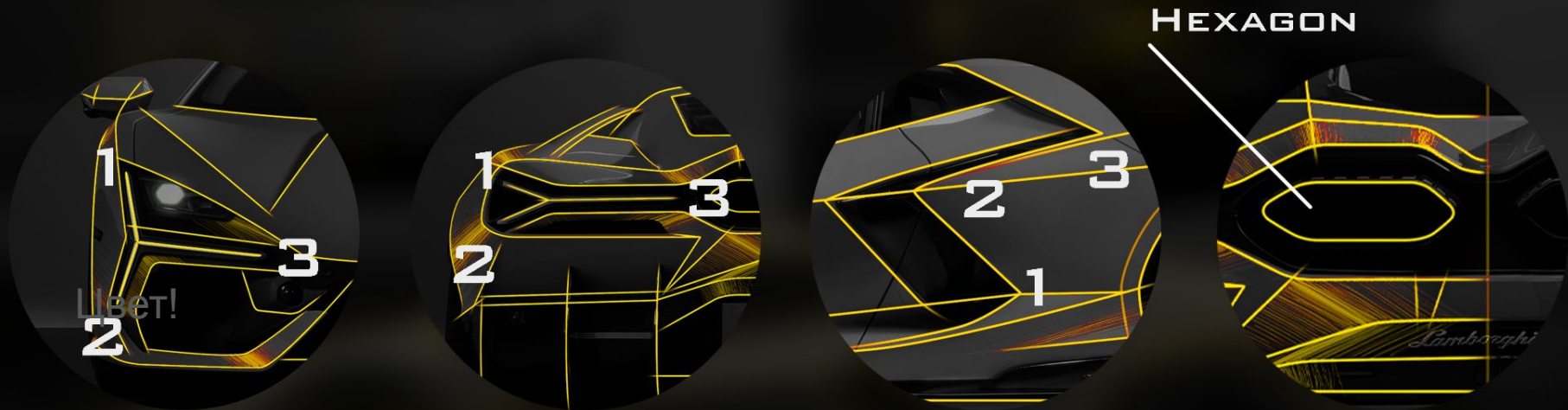
OUR QUESTION WASN'T HOW TO MAKE IT MORE AGGRESSIVE.

OUR QUESTION WAS WHETHER IT COULD BECOME
SIGNIFICANTLY FASTER THROUGH AERODYNAMICS
WHILE PRESERVING ITS IDENTITY.

UNDERSTANDING THE ORIGINAL DESIGN



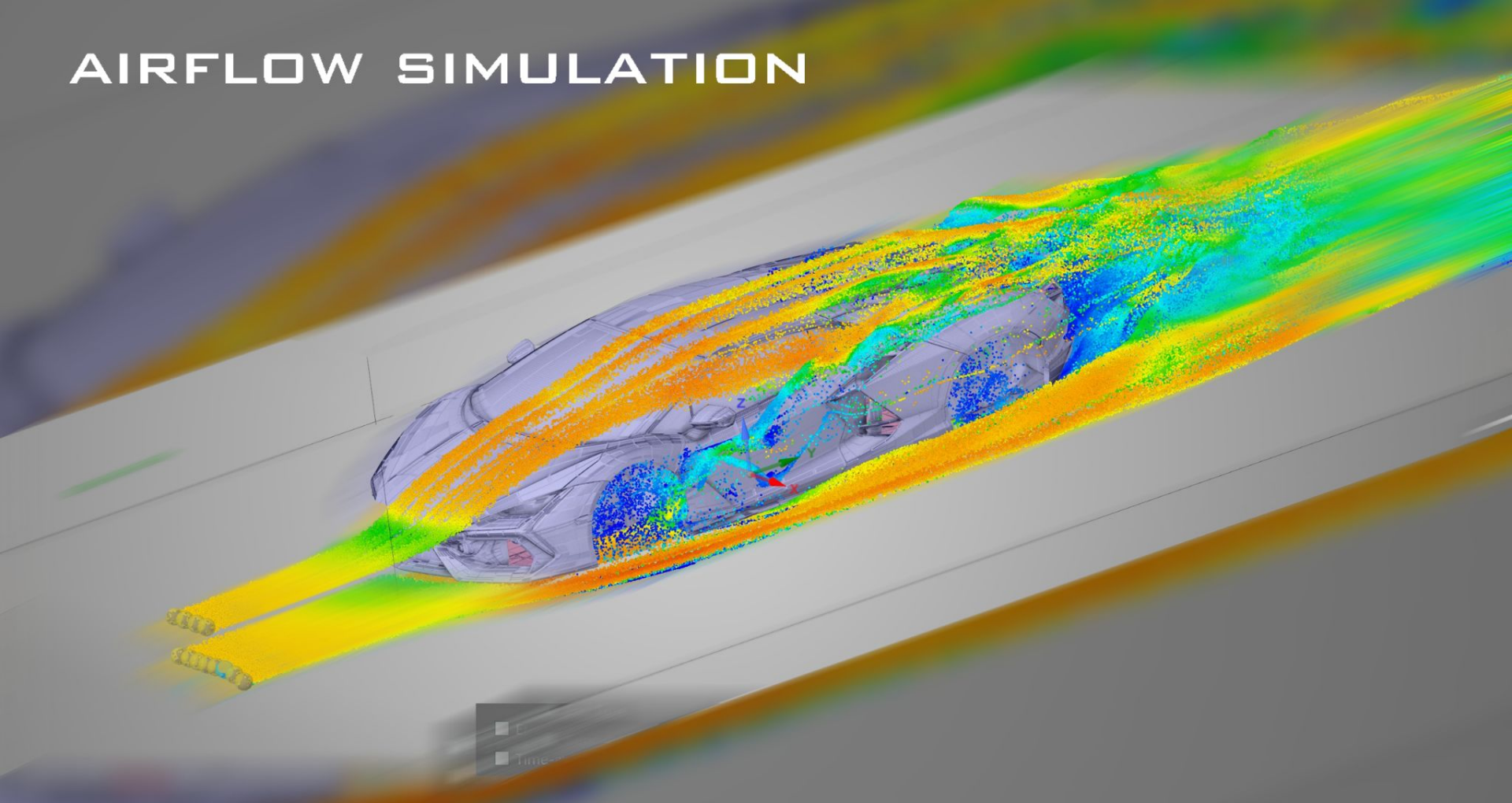
Lamborghini Revuelto design research
Base - sharp geometry, number of angles
multiples of 3, smoothly divided straight warps

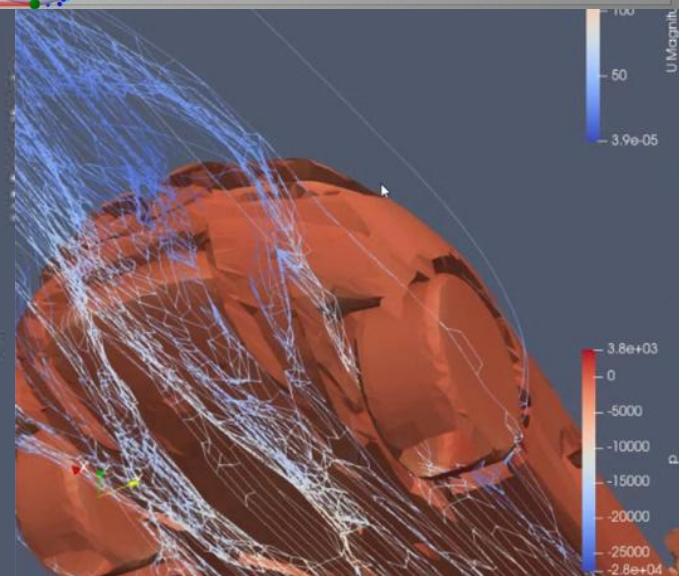
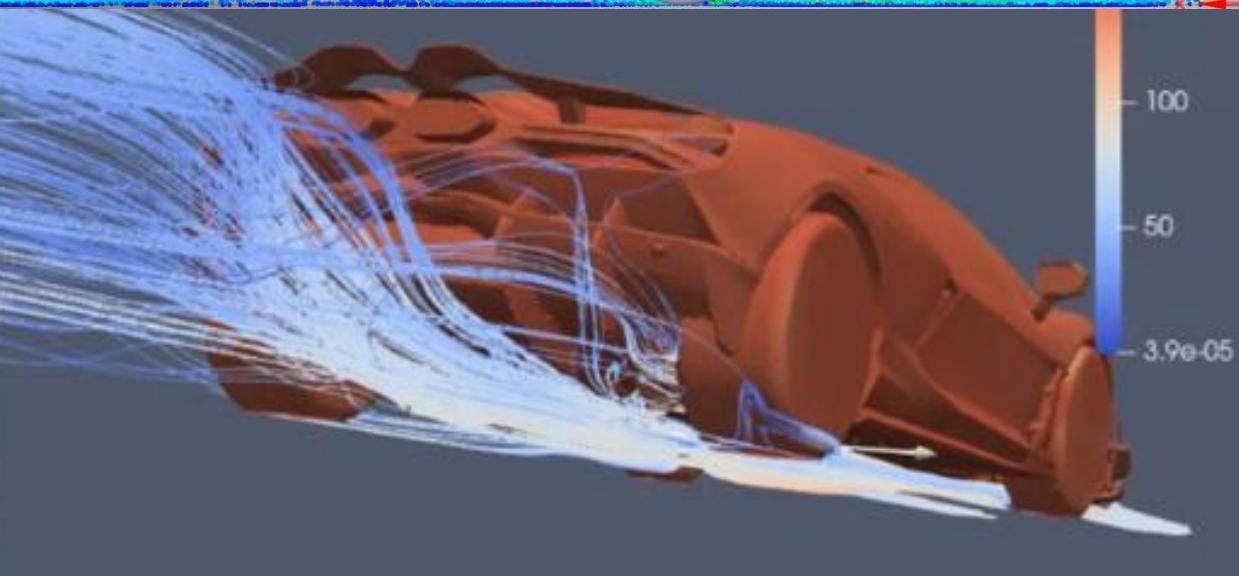
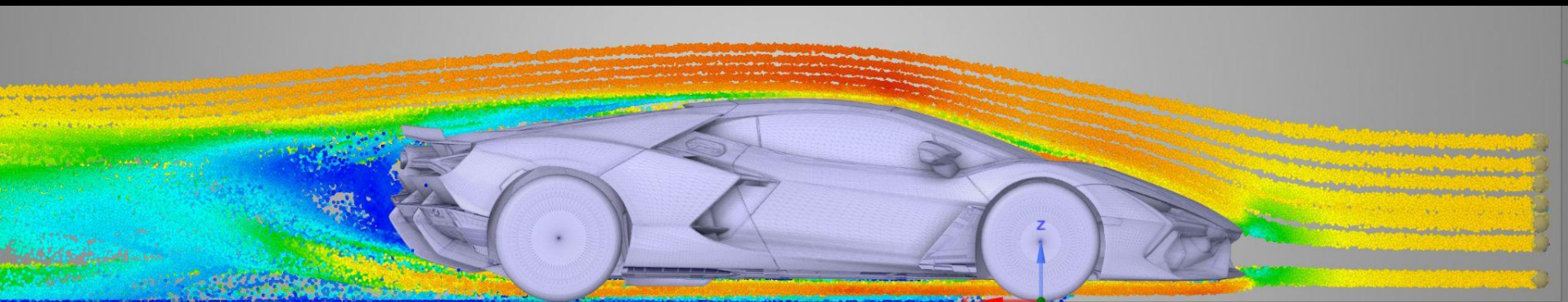


A DESIGN ANALYSIS REVEALED THAT THE DEFINING
FEATURE OF LAMBORGHINI'S AGGRESSIVE
DESIGN IS GEOMETRIC SHAPES WITH A NUMBER
OF ANGLES THAT IS A MULTIPLE OF THREE

ORIGINAL AERODYNAMICS

AIRFLOW SIMULATION





На рисунке 4 представлена зависимость коэффициента лобового сопротивления, прижимной силы и момента в зависимости от скорости автомобиля

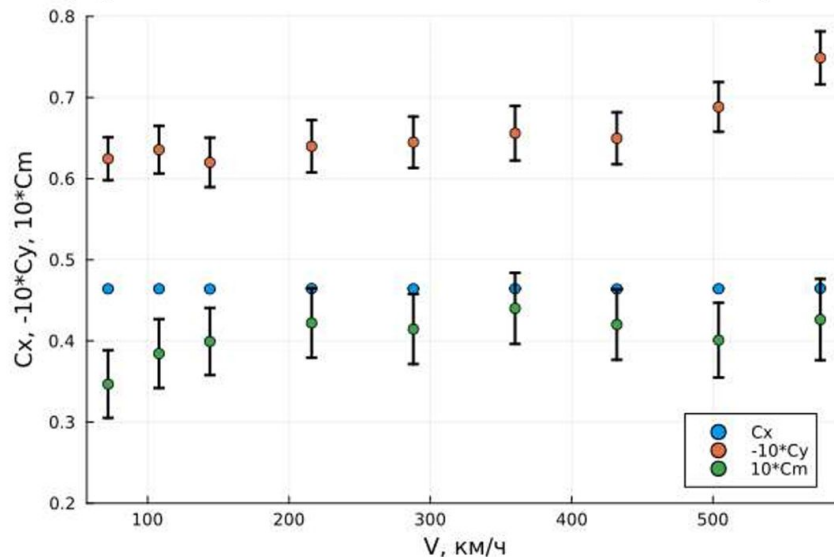
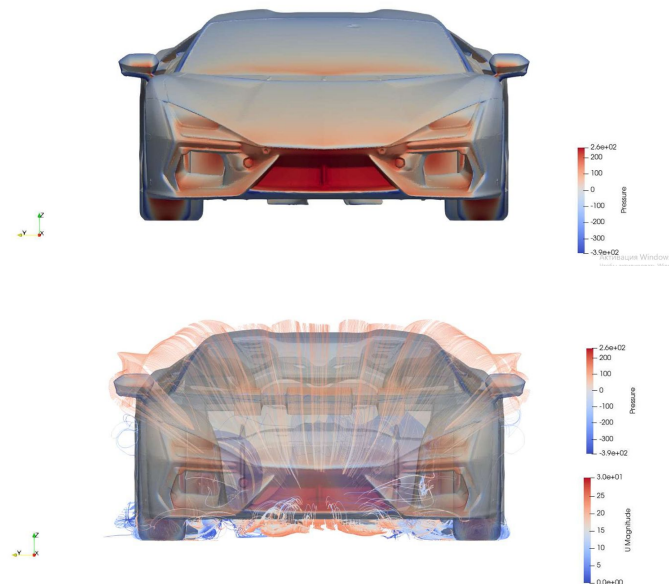


Рисунок 4 – Зависимость аэродинамических коэффициентов от скорости

На рисунках 5 – 9 представлено поле давления на поверхности кузова автомобиля. Приведено распределение относительного давления **Gauge Pressure** в паскалях.



Расчетная область разбивалась на сетку с помощью утилиты **blockMesh**¹², мельчение сетки в окрестности кузова автомобиля проводилось с помощью утилиты **snappyHexMesh**¹³. Сетка состоит из 13 млн. ячеек, размеры ячейки сетки у поверхности автомобиля составляют 0.5 – 20 мм в зависимости от кривизны и наличия особенностей у поверхности. Полученная сетка приведена на рисунке 3.

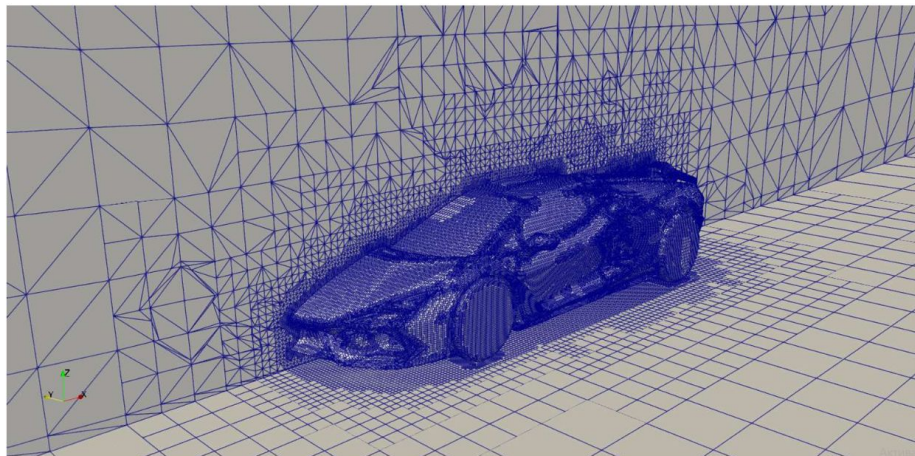


Рисунок 3 – Расчетная сетка

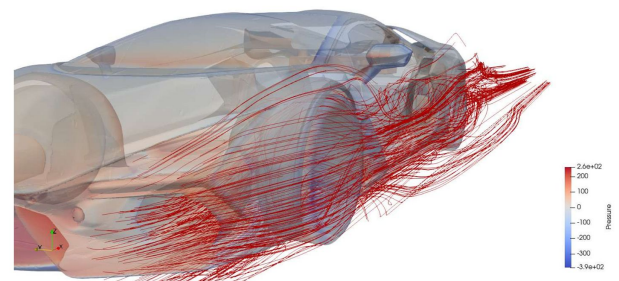
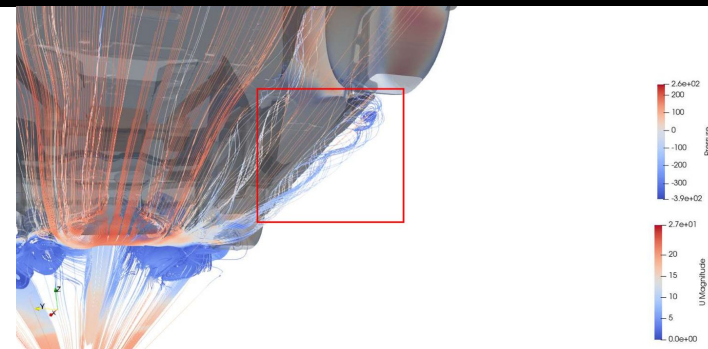
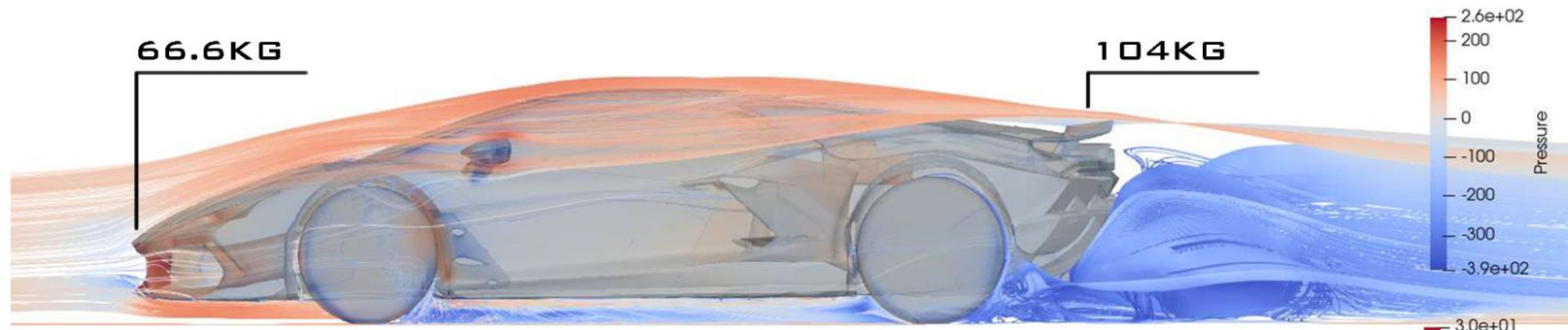


Рисунок 11 – Линии тока воздуха вдоль борта

RESULT

OF ORIGINAL AERODYNAMICS:



TOTAL:

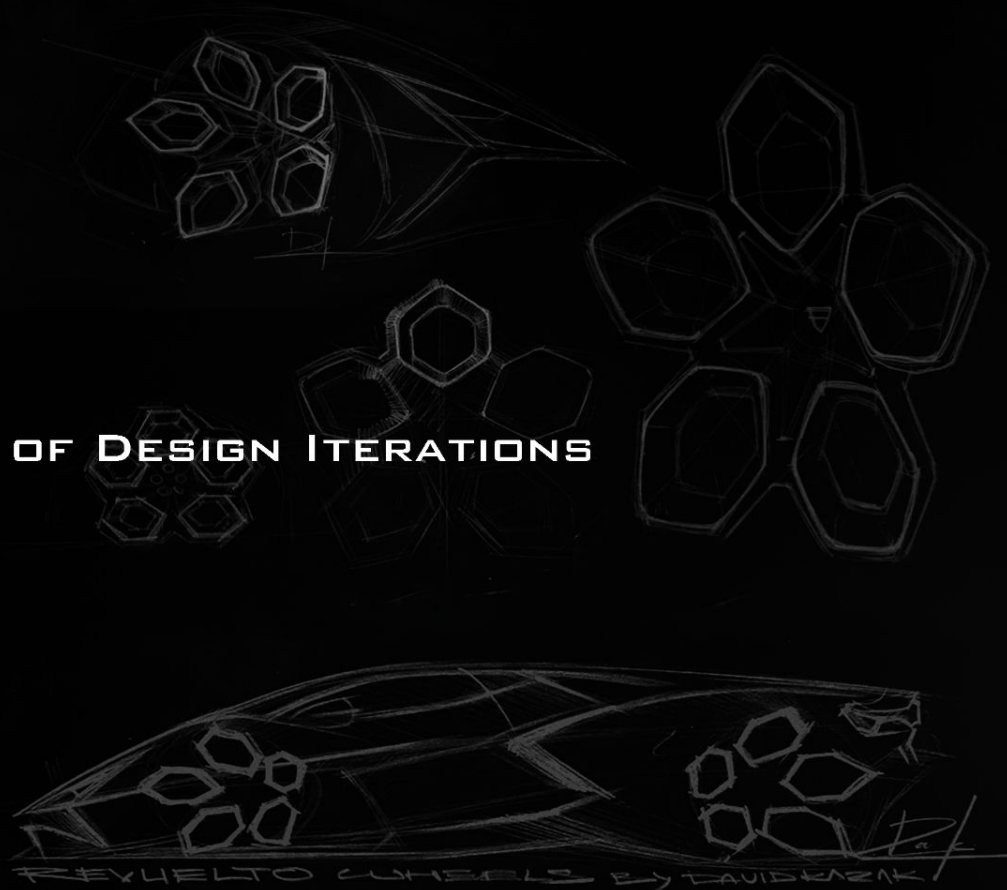
416KG OF DOWNFORCE AND **53% : 47% CoP**

CHAPTER 3

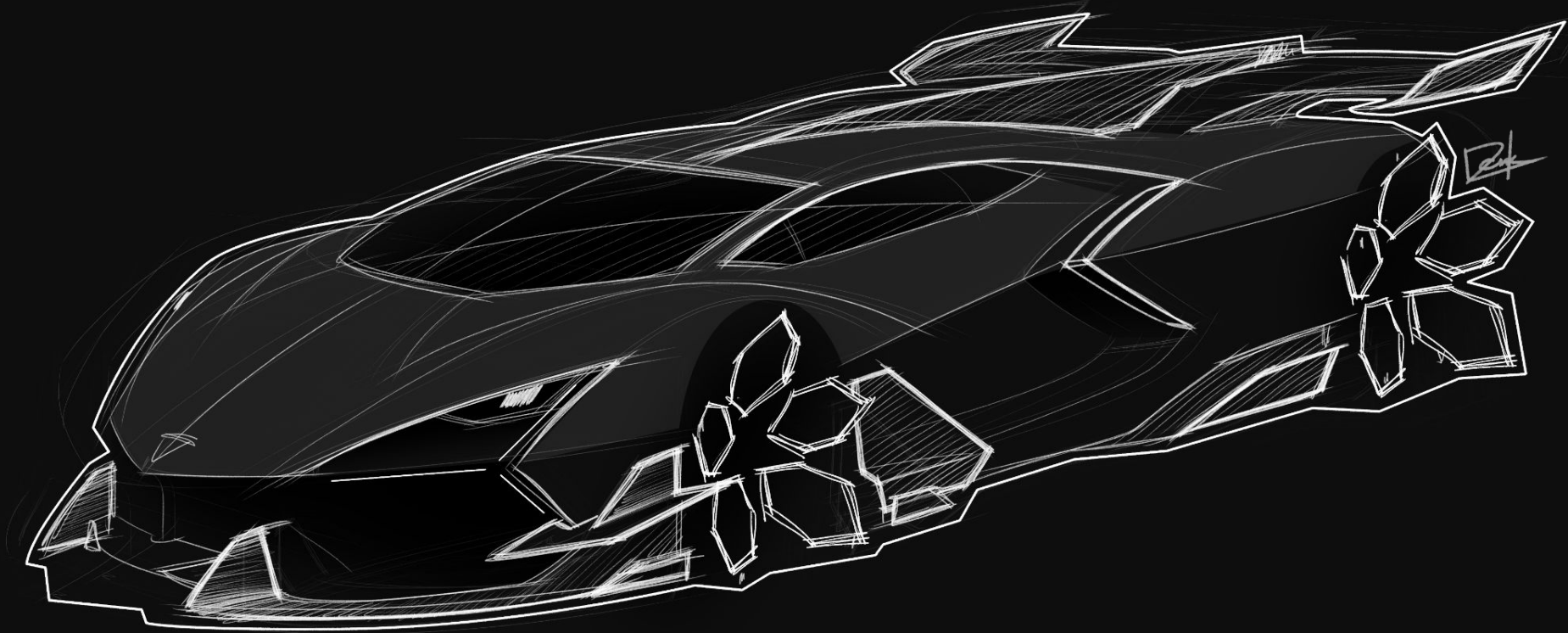
THE CHALLENGE

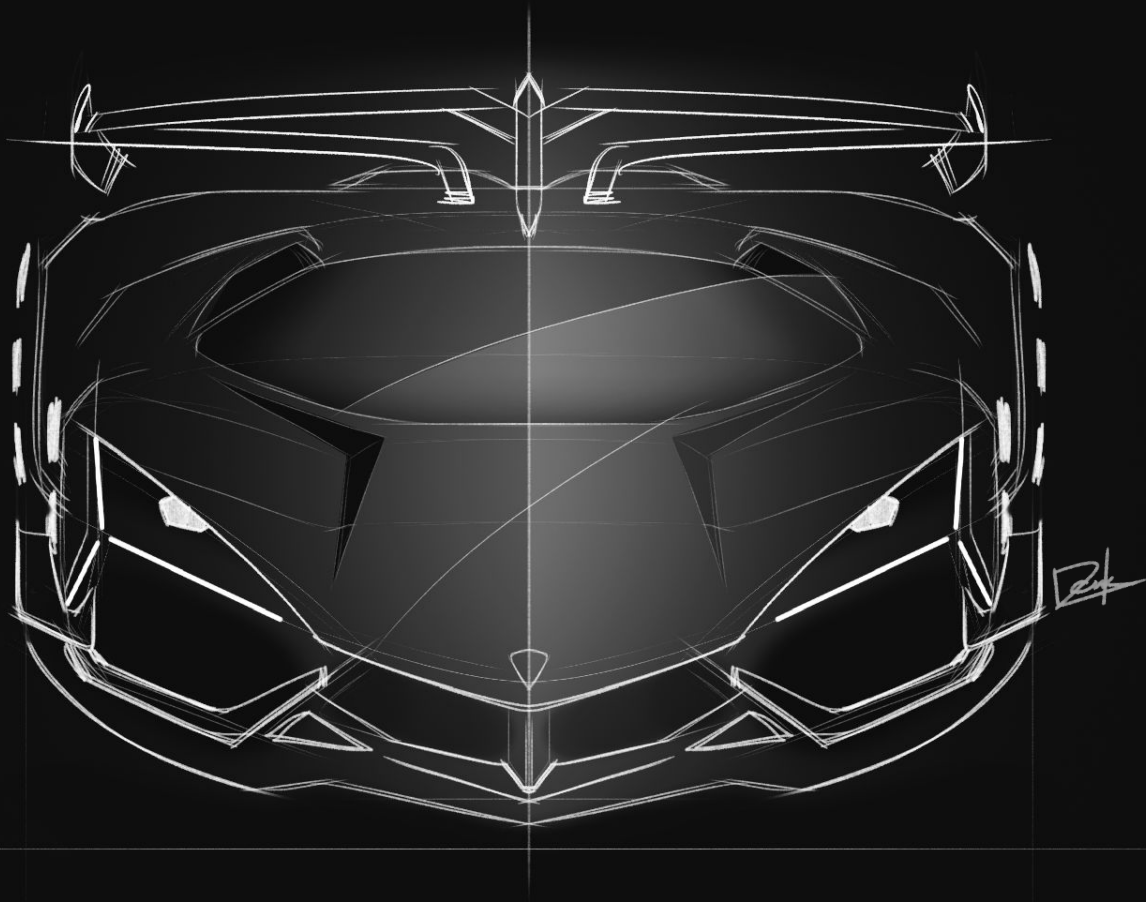


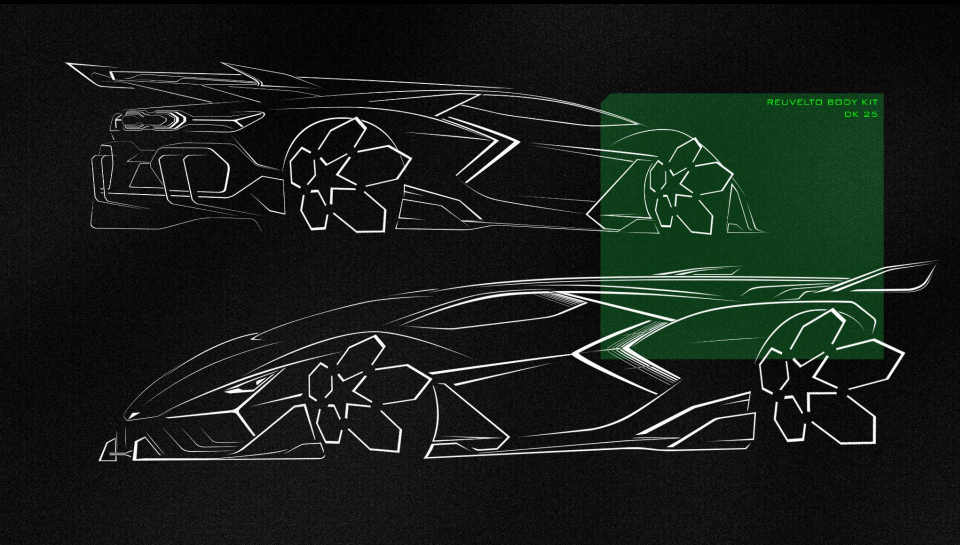
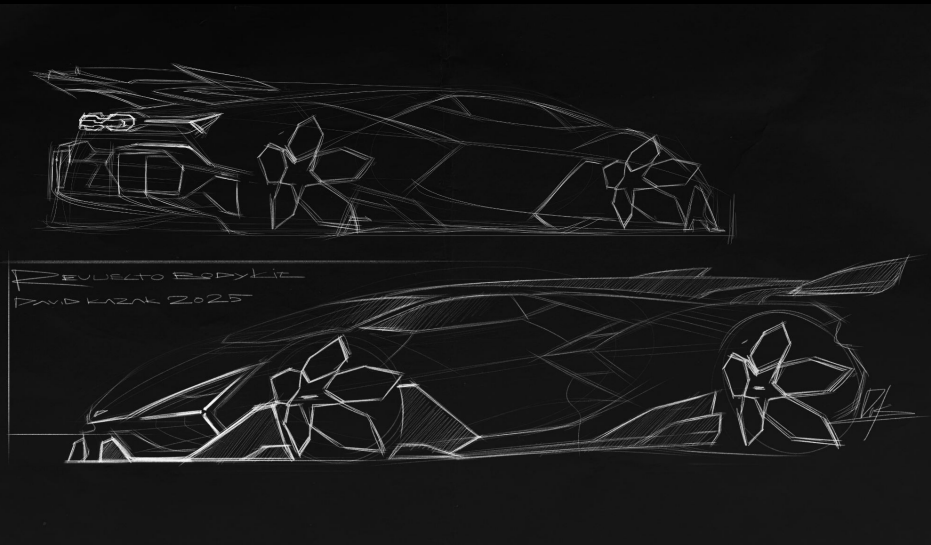
HUNDREDS OF DESIGN ITERATIONS



REYUELTO CUEBELS BY DAVID KAZAK



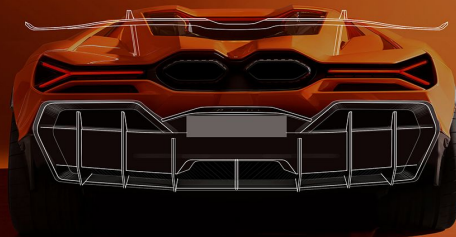




1



2



3



DESIGN 1

BASIC SHAPES: **HIGH DOWNFORCE**, BAD BALANCE



DESIGN 2

NEW SHAPES: LOWER DOWNFORCE, **BETTER BALANCE**



DESIGN 3

FINAL SHAPES: MAX DOWNFORCE, PERFECT BALANCE





FINAL DESIGN

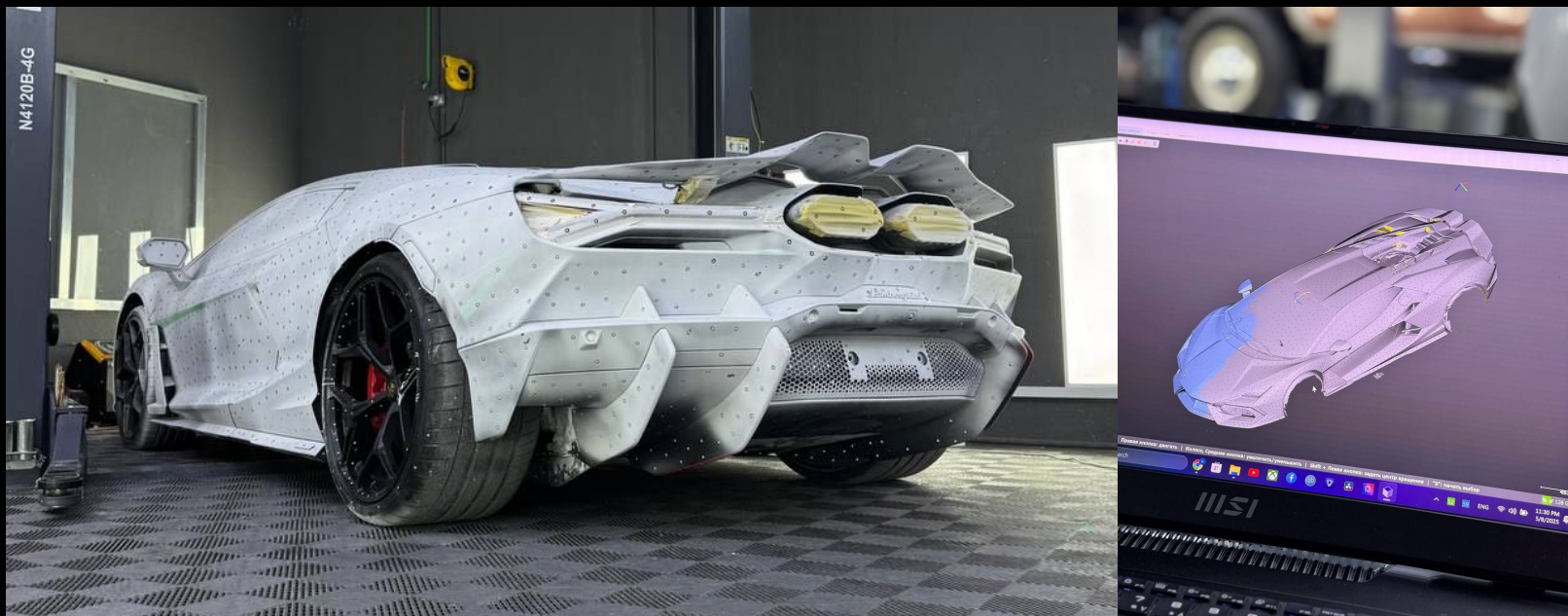
CHAPTER 4

ENGINEERING

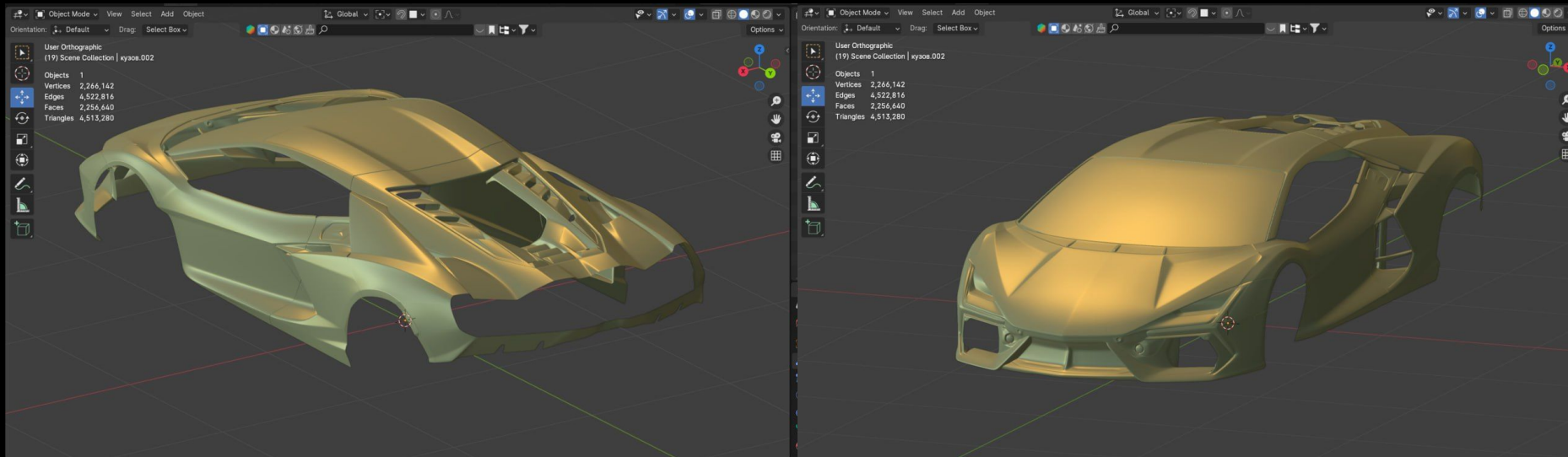


6 MONTHS
OF AERODYNAMIC DEVELOPMENT

3D SCANING

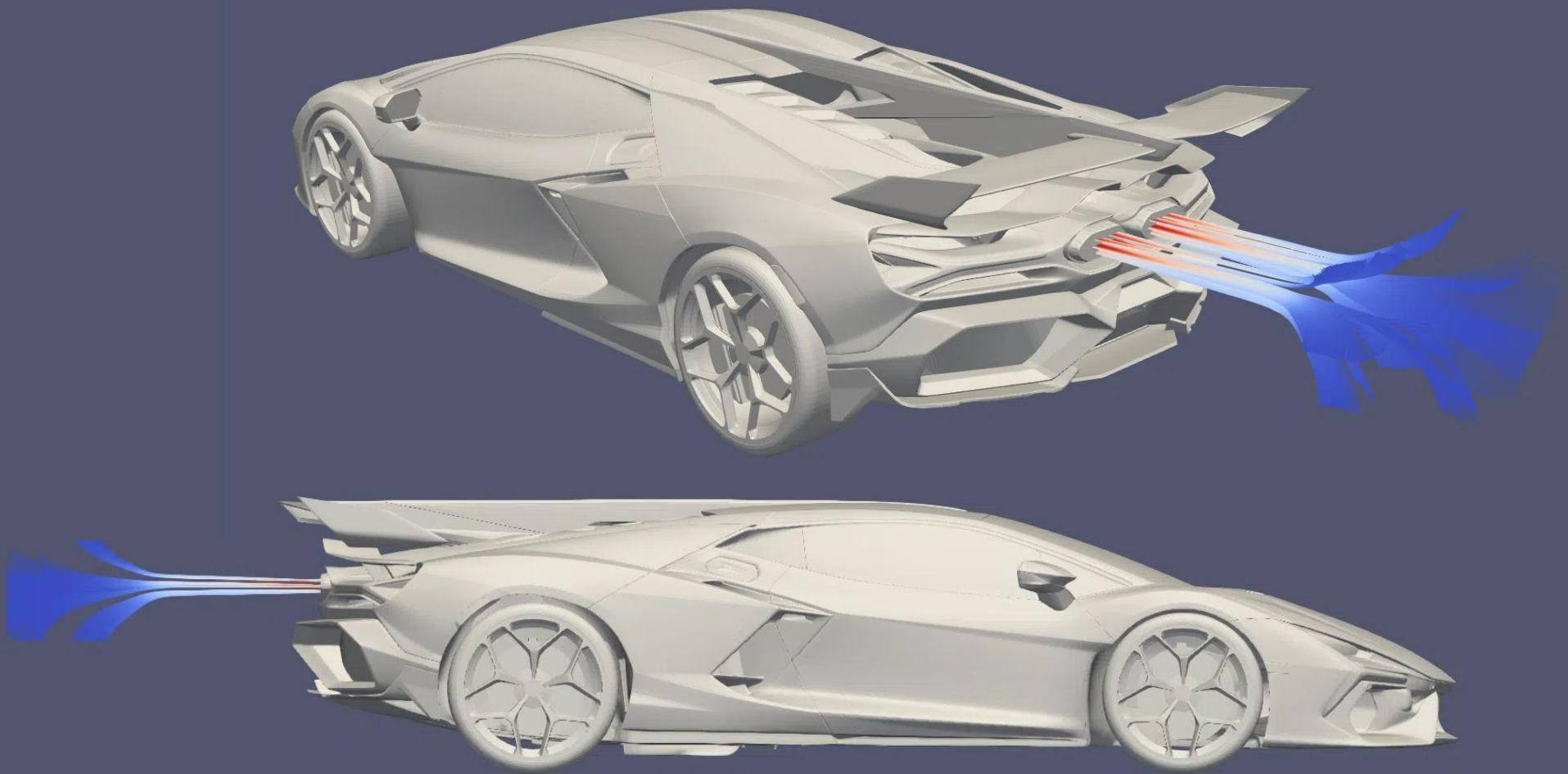


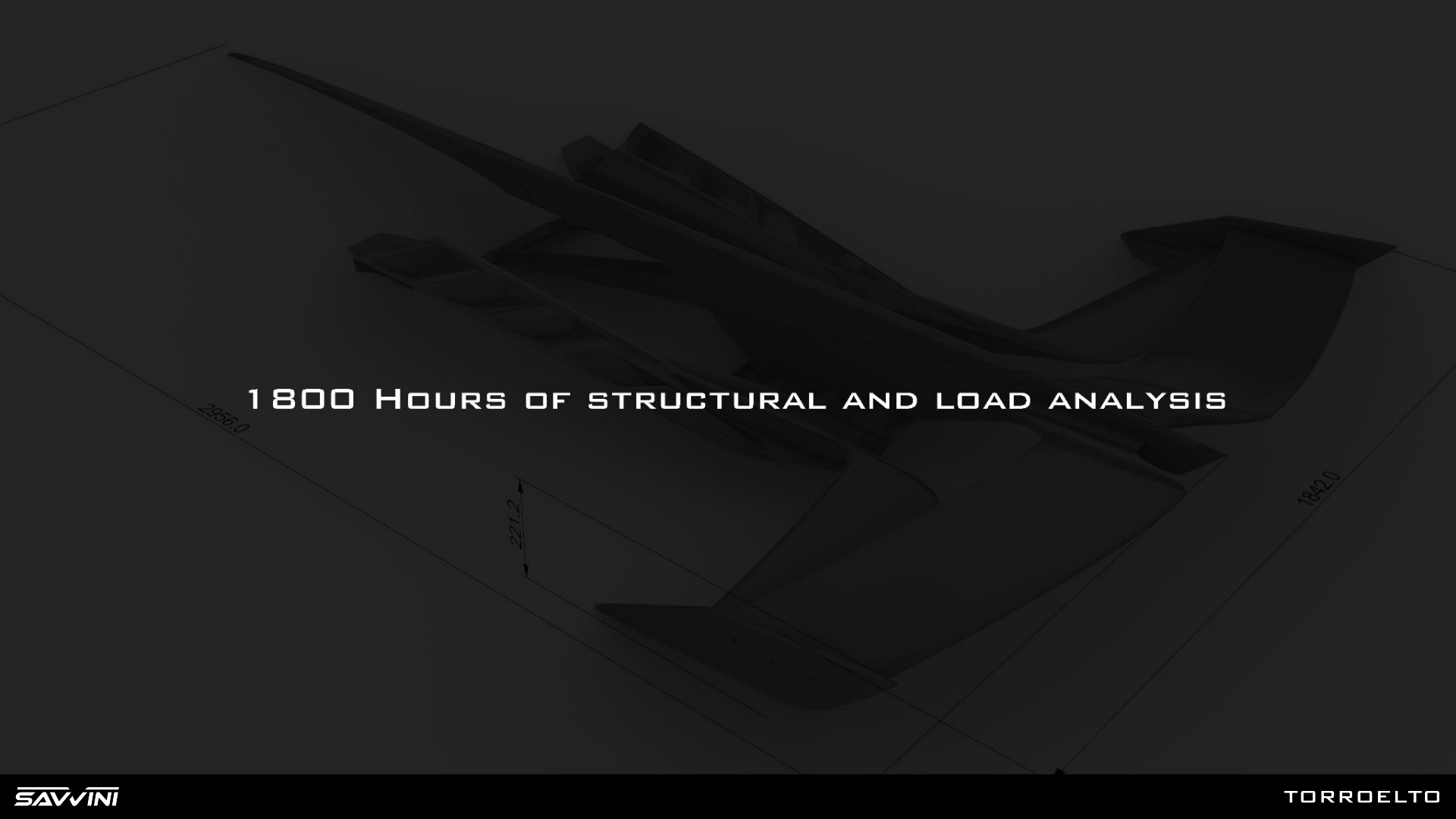
REVERSE ENGINEERING





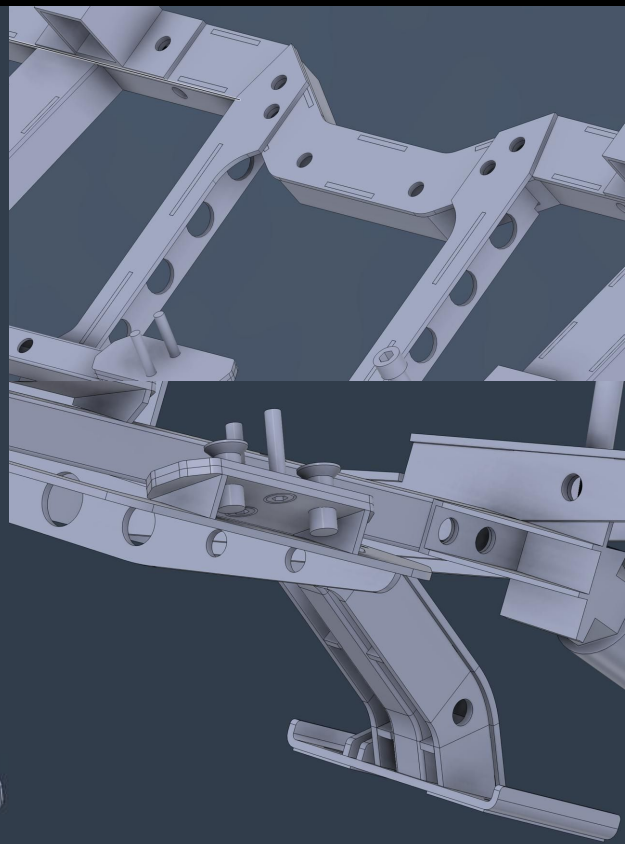
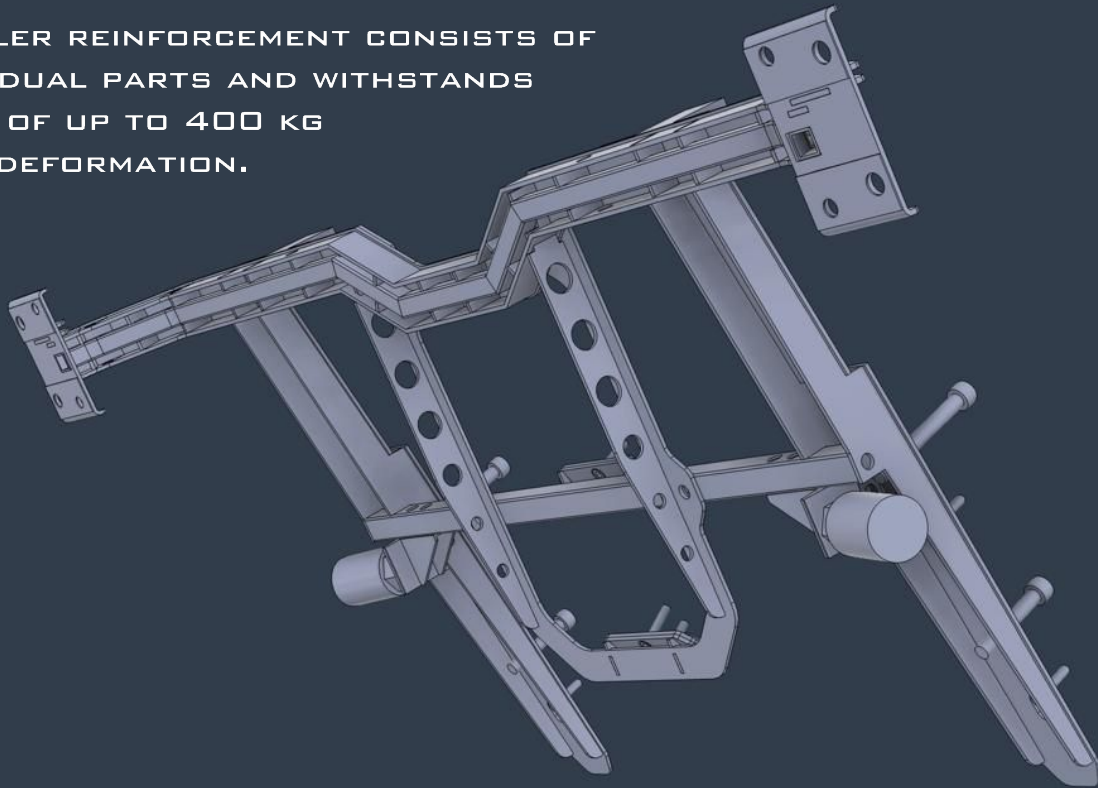
2130 HOURS OF CFD

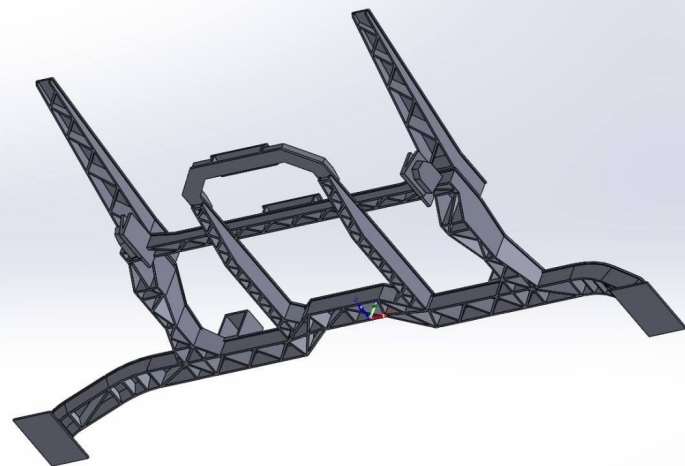
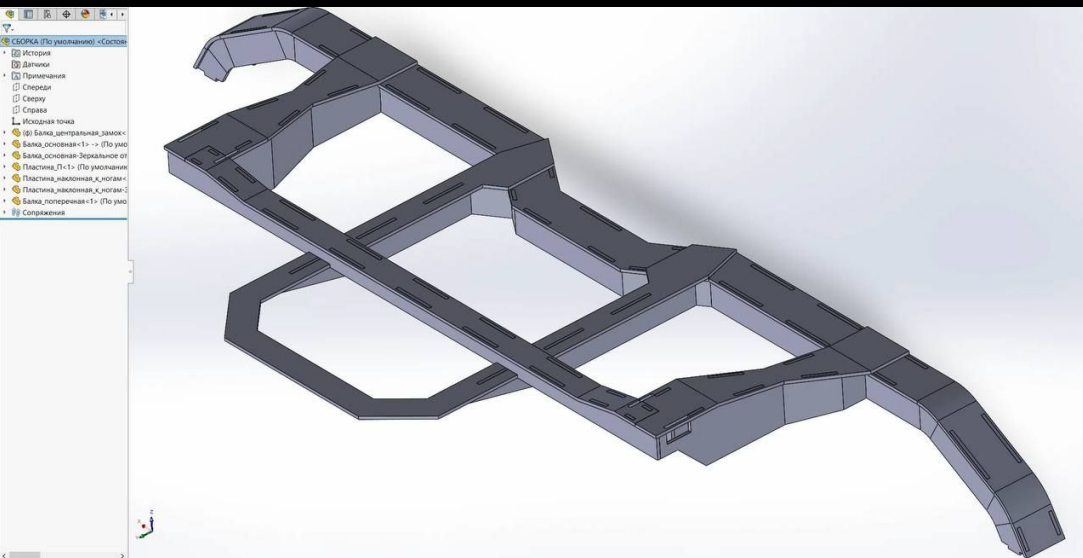


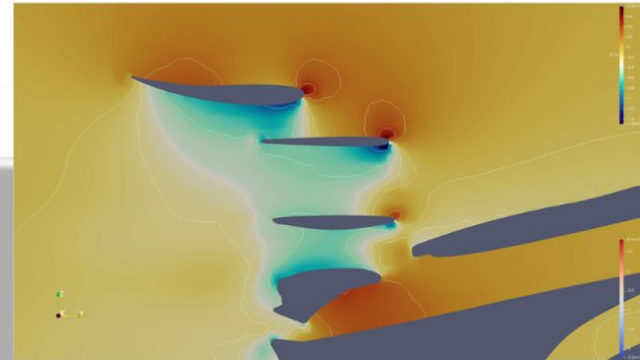
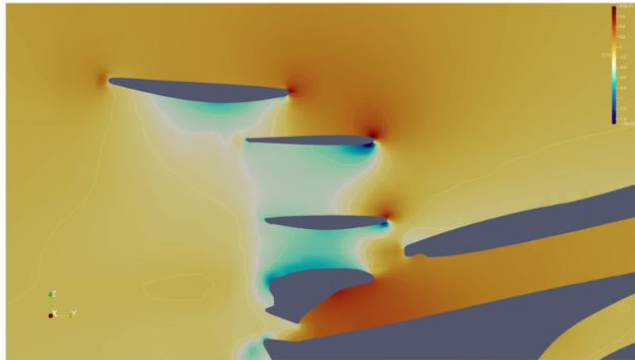
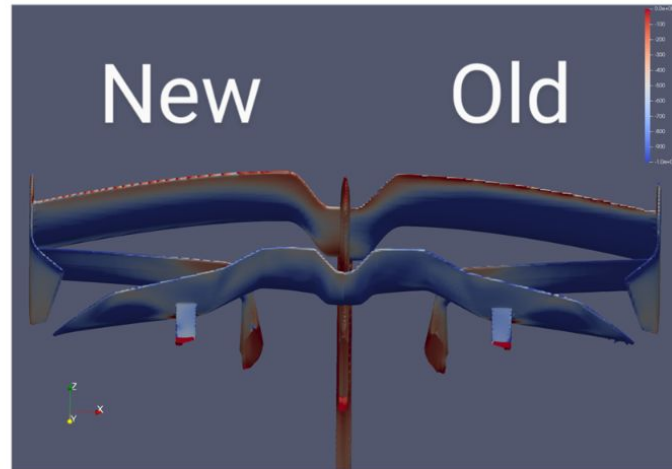
A 3D CAD model of a complex mechanical assembly, possibly a robotic arm or a specialized transport mechanism, rendered in a dark, monochromatic style. The model is shown from an isometric perspective, highlighting its various components, including a long, angled arm and a base structure. Three dimensions are explicitly labeled: 2956.0 along the bottom left edge, 221.2 for a vertical segment, and 1842.0 along the bottom right edge. The text "1800 HOURS OF STRUCTURAL AND LOAD ANALYSIS" is superimposed in the center of the image.

1800 HOURS OF STRUCTURAL AND LOAD ANALYSIS

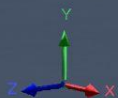
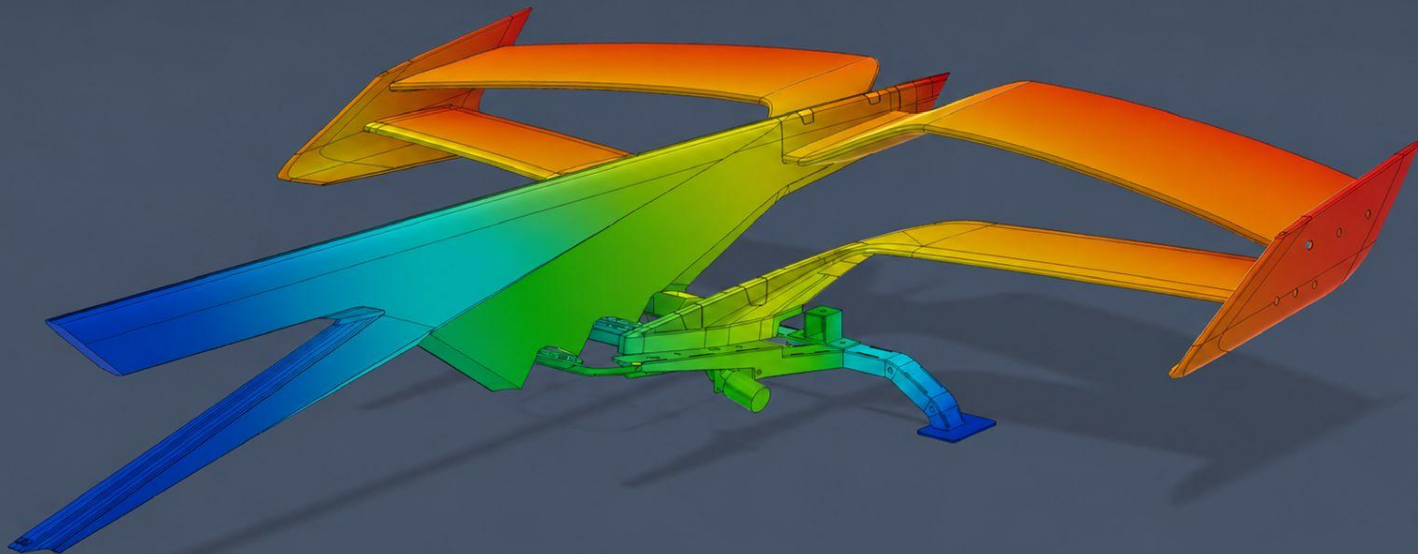
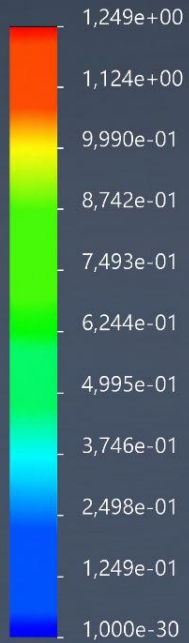
THE SPOILER REINFORCEMENT CONSISTS OF
93 INDIVIDUAL PARTS AND WITHSTANDS
A WEIGHT OF UP TO 400 KG
WITHOUT DEFORMATION.

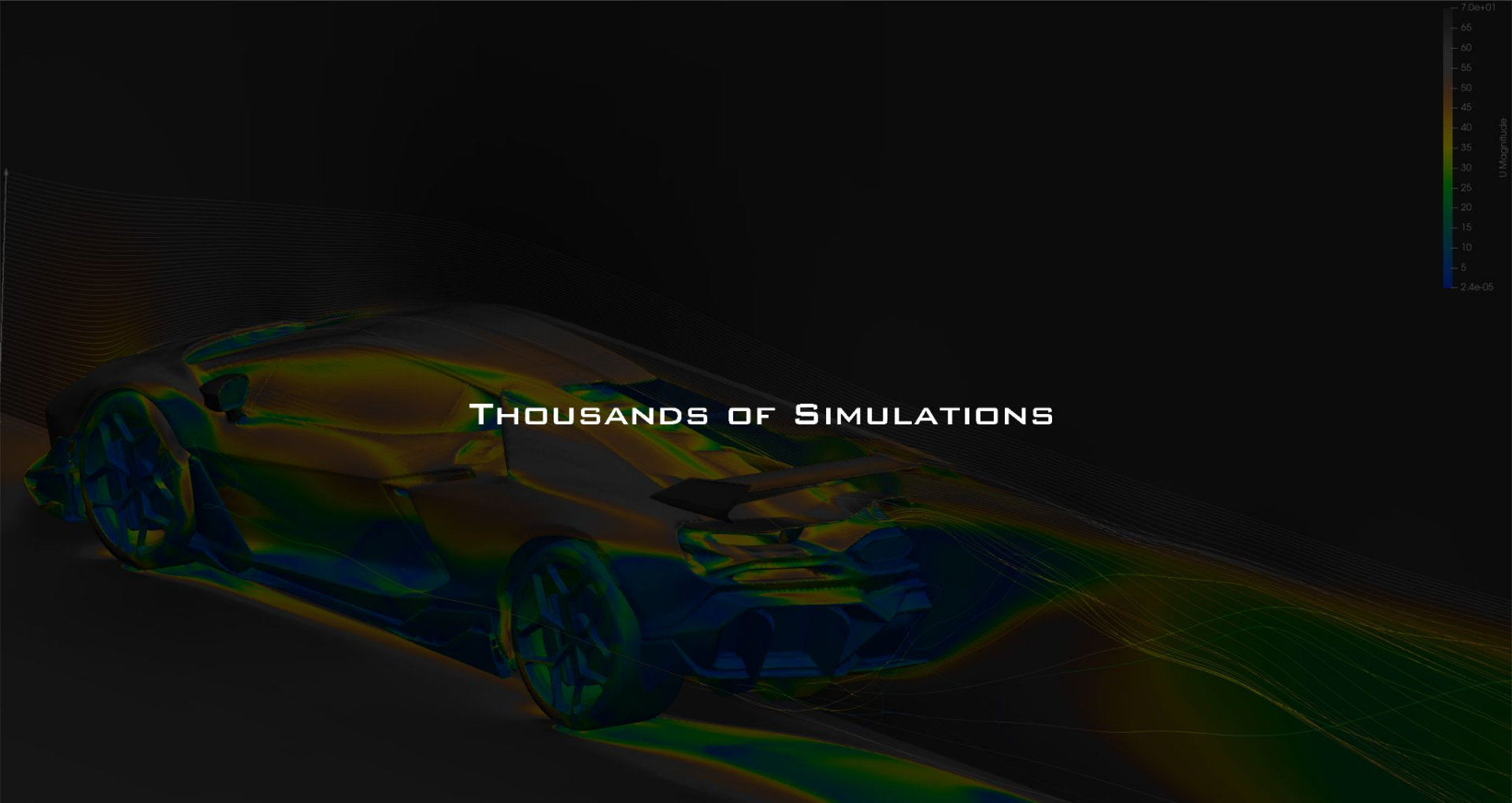


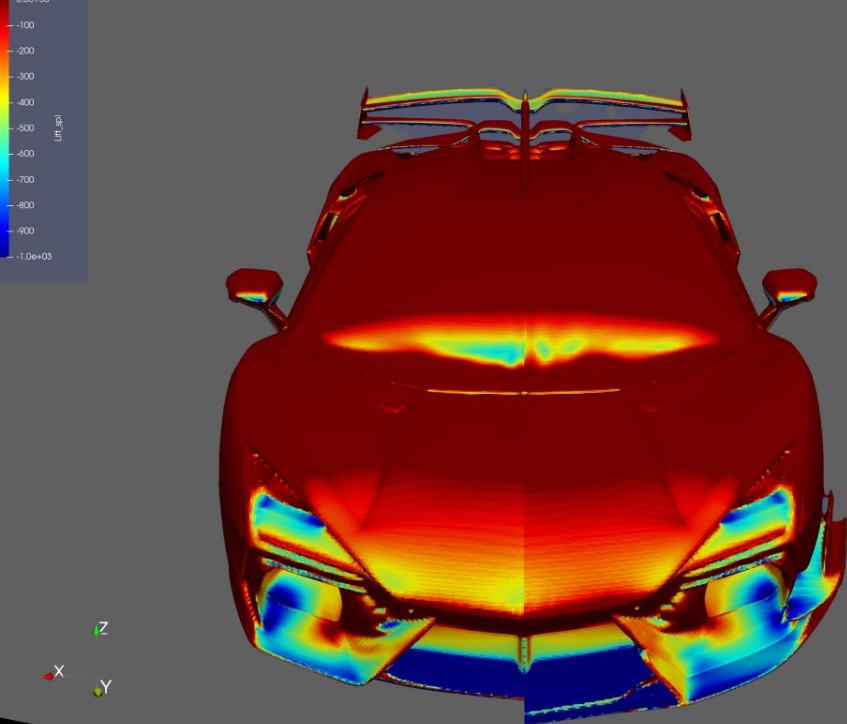




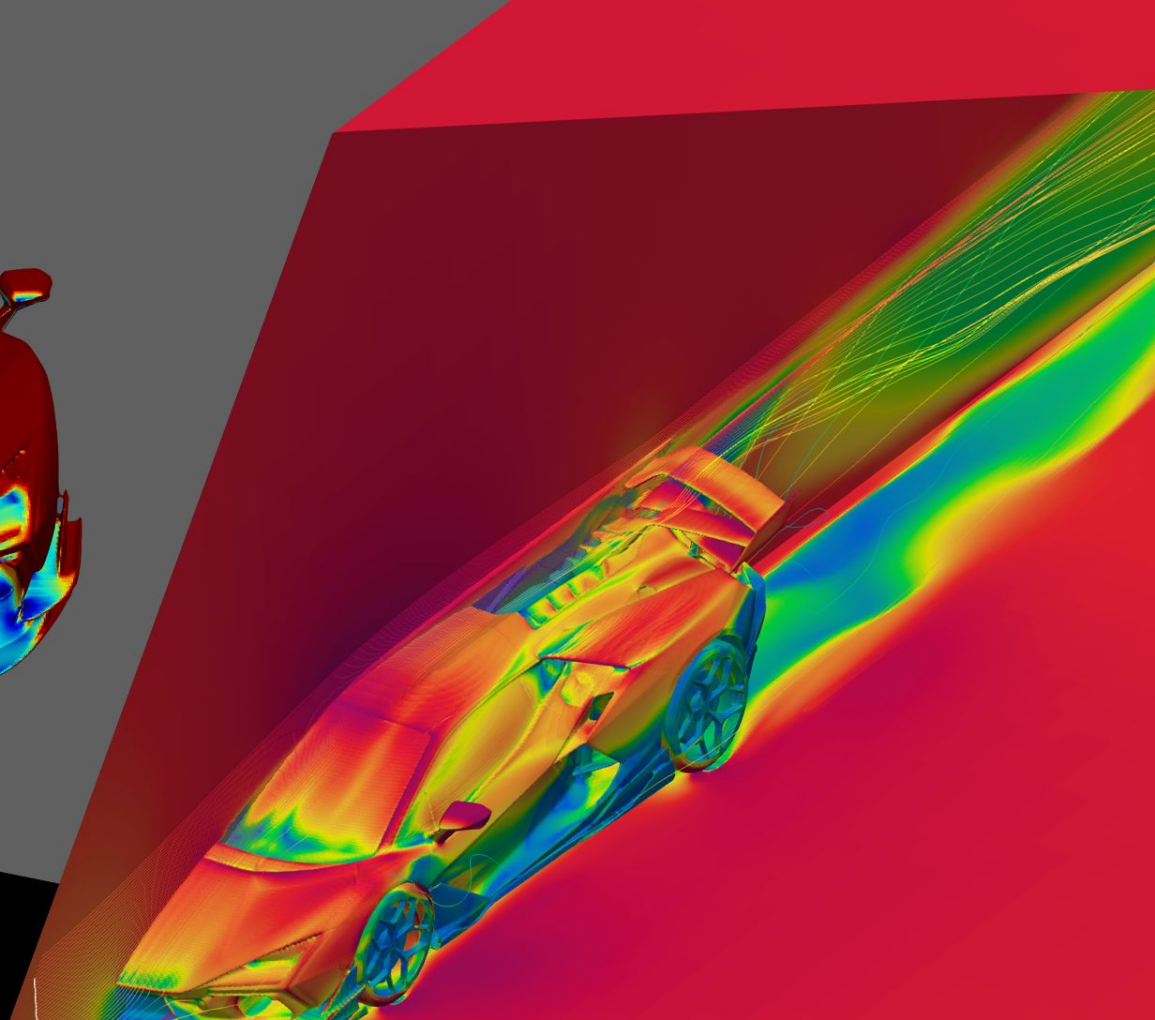
URES (mm)



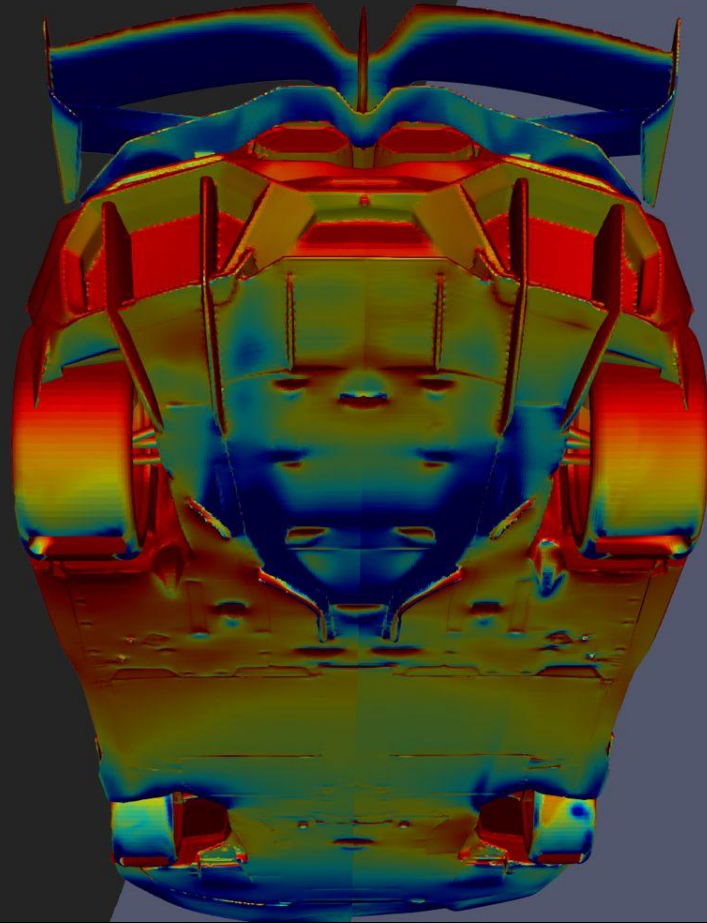
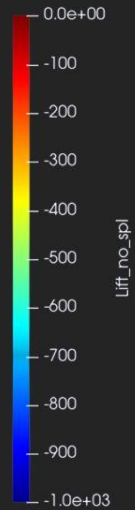




SIMULATION OF AIRFLOW
AND PRESSURE



UNDERBODY DOWNFORCE



781

KG OF DOWNFORCE



IMPROVEMENT

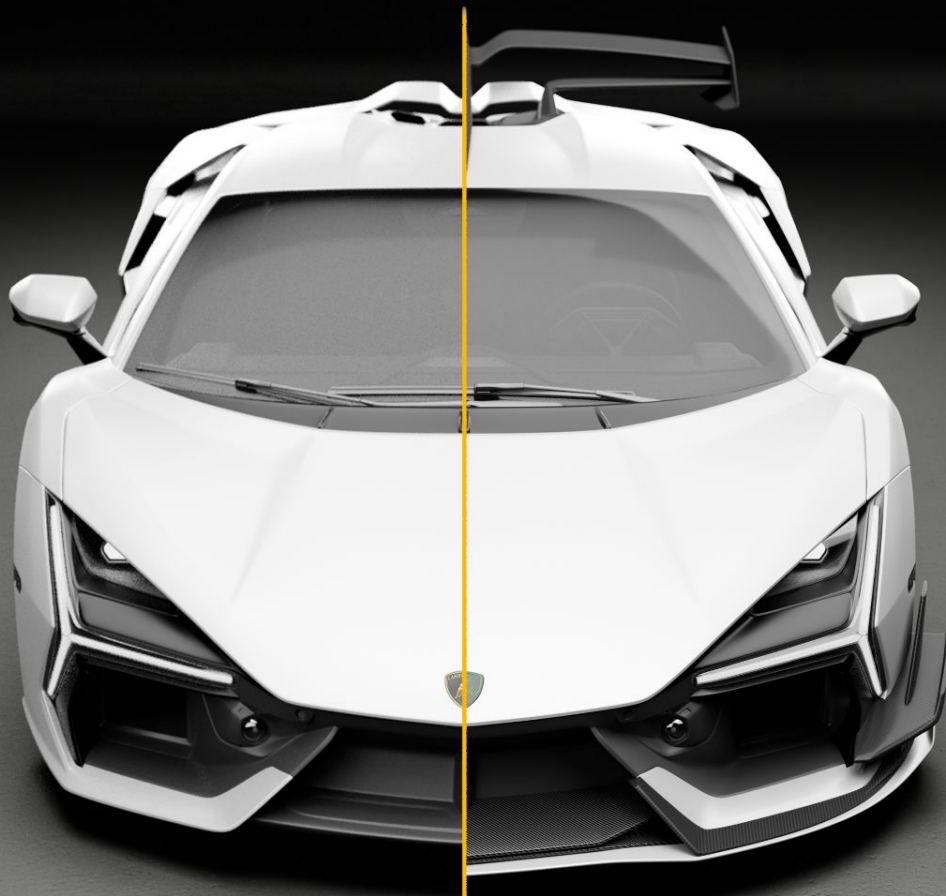
ORIGINAL

DOWNFORCE

416 KG

CoP

53:47



SAVVINI

DOWNFORCE

781 KG

CoP

50.5:49.5

TOTAL: +90% OF DOWNFORCE

SPLITTER DOWNFORCE

STOCK: 104 KG

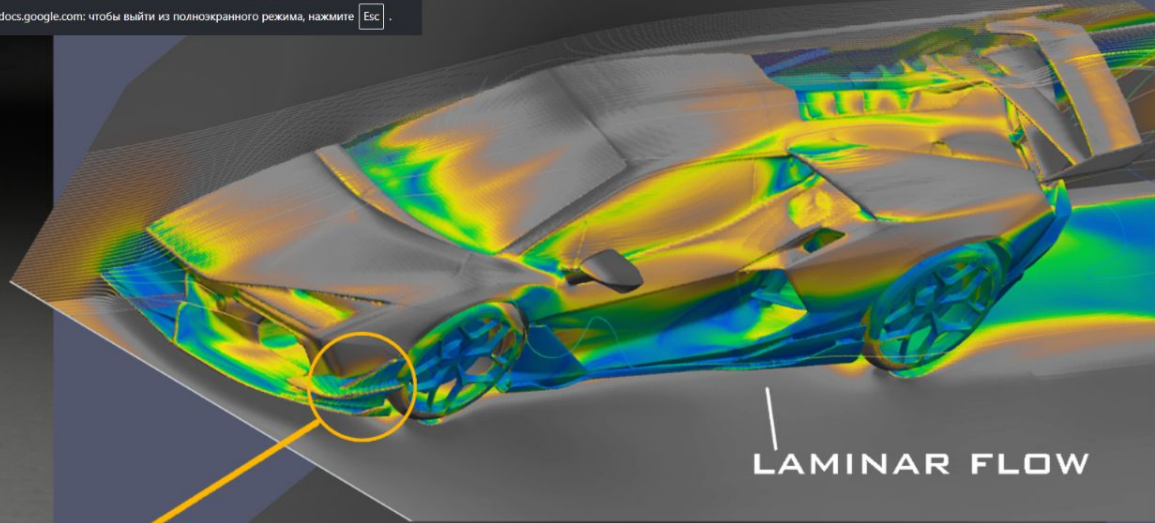
SAVVINI: 296,8 KG

SPOILER DOWNFORCE

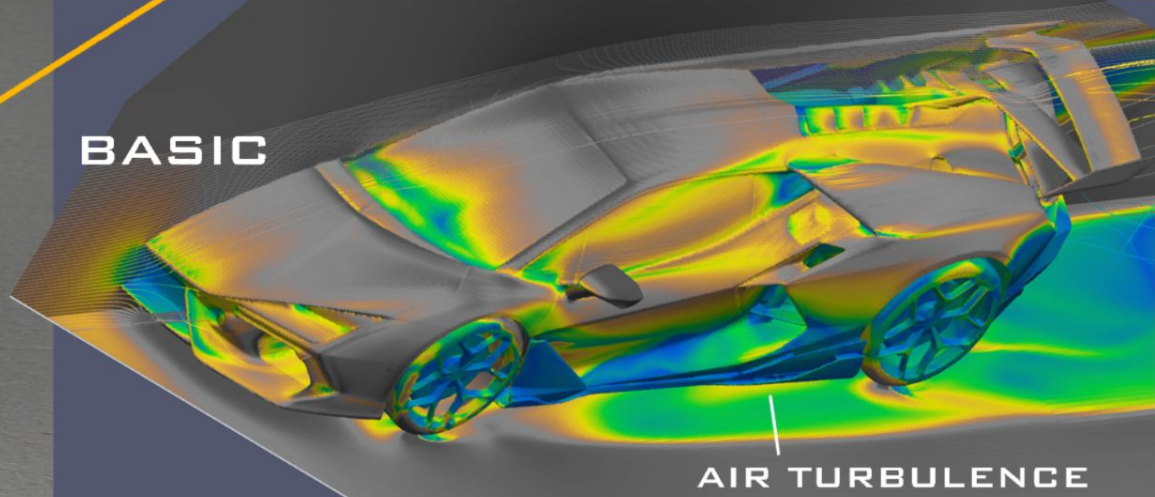
STOCK: 66,6 KG

SAVVINI: 234,3 KG





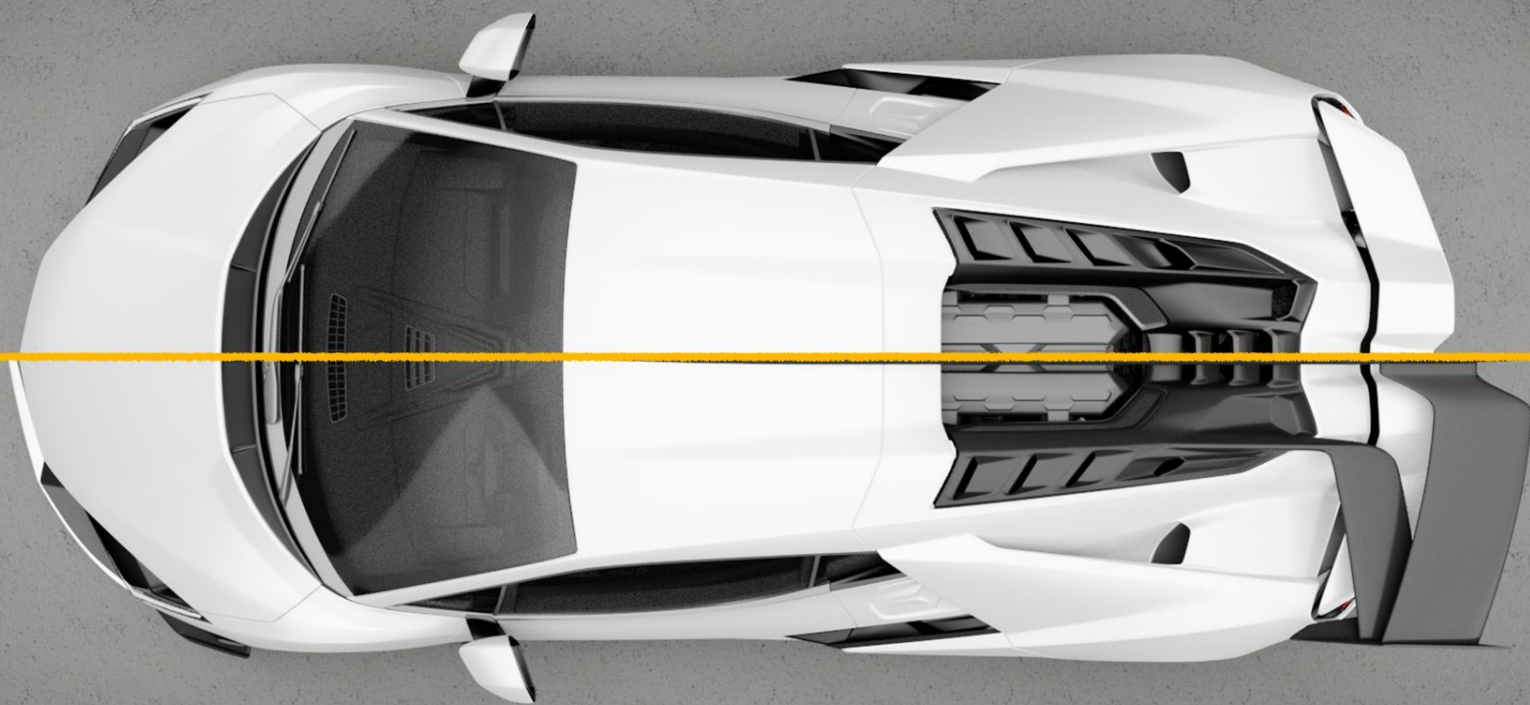
LAMINAR FLOW



BASIC

AIR TURBULENCE

TORROELTO



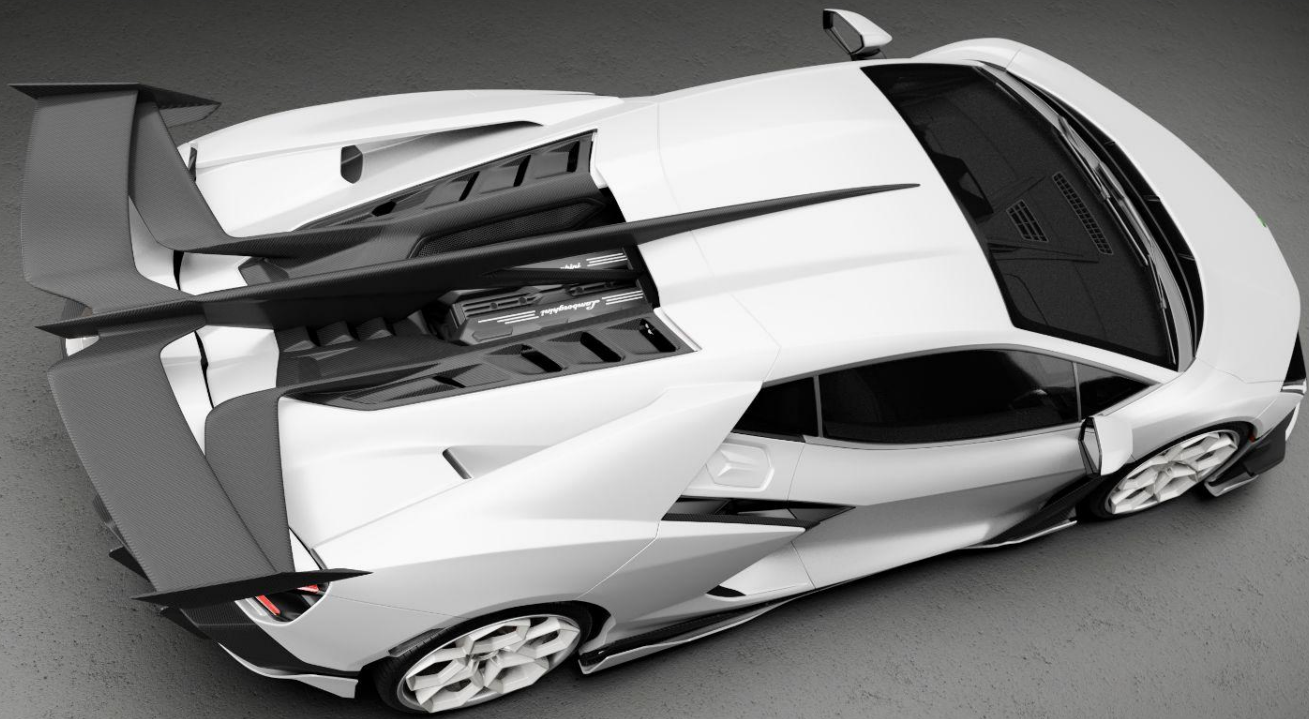
CHAPTER 5

DESIGN



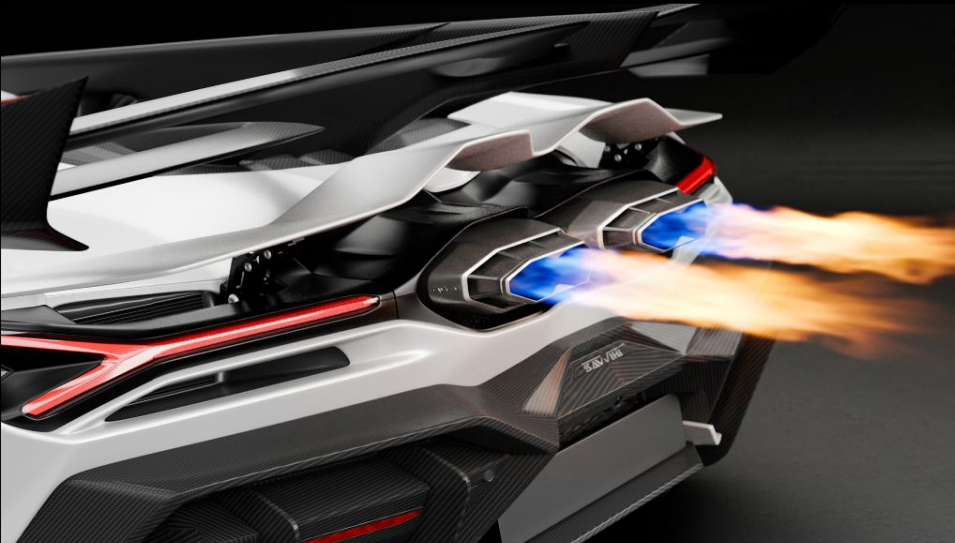






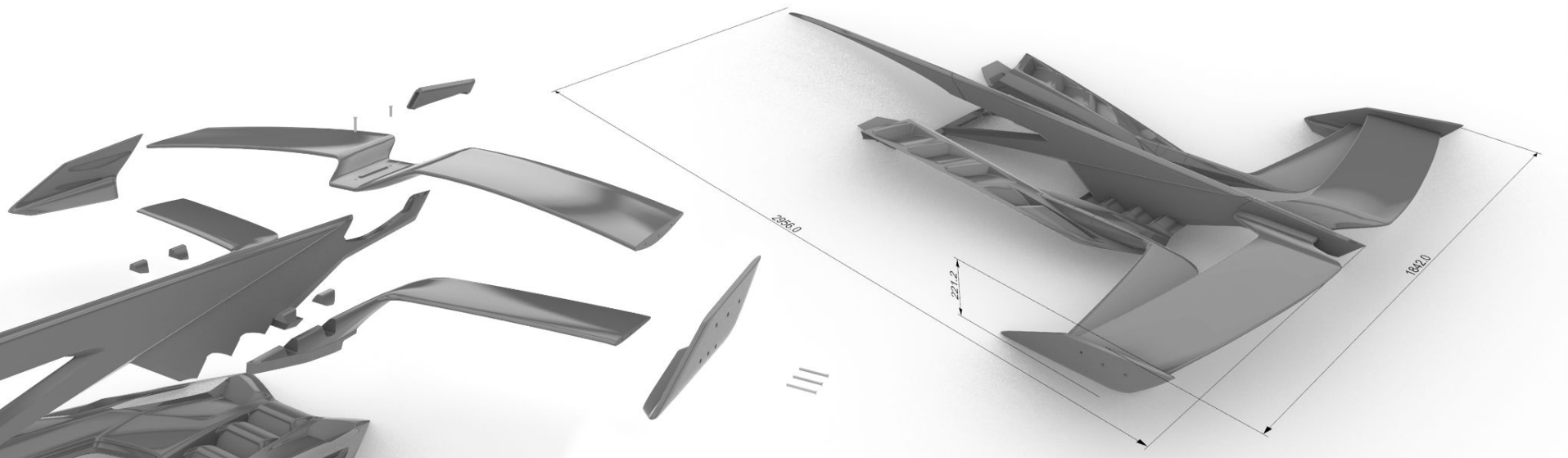


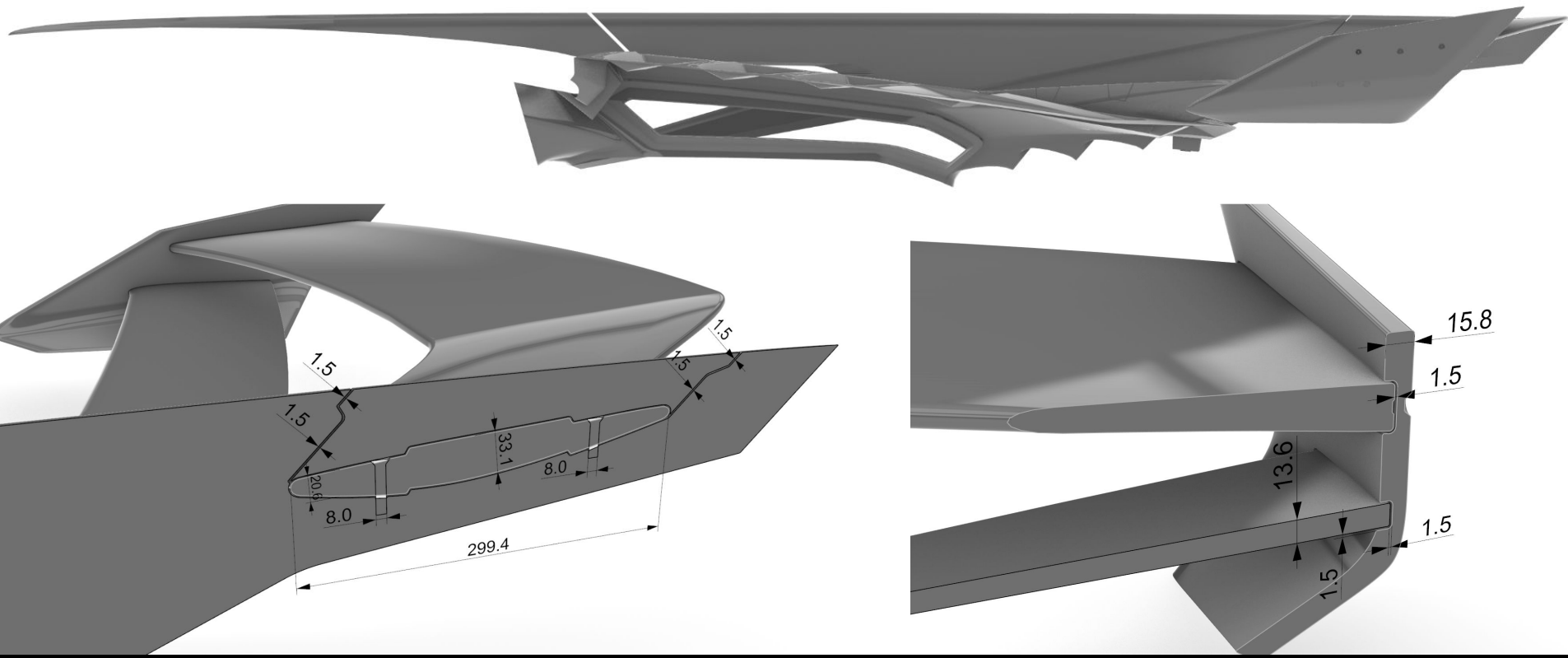




CHAPTER 6

CONSTRUCTION





CHAPTER 7

OWNERSHIP

ONE OF TEN

EVERY KIT HAS IT'S
INDIVIDUAL NUMBER

001/010

CERTIFICATE

OWNER DELIVERY