Design Support Documents

Frame & Ergonomics

Objectives

The objective of this document is to present the various tools and approaches we used to design the frame of Artemiz. Our goal was to create the team's first frame for an electric vehicle. We also aimed to be as competitive as possible, so we set a performance target based on the previous results achieved with the team's combustion-powered car.

Objectives	
Event	score
Acceleration	40
Skipad	20
AutoX	10
Endurance	100
Effiency	0

Figure 0 : Objectives points

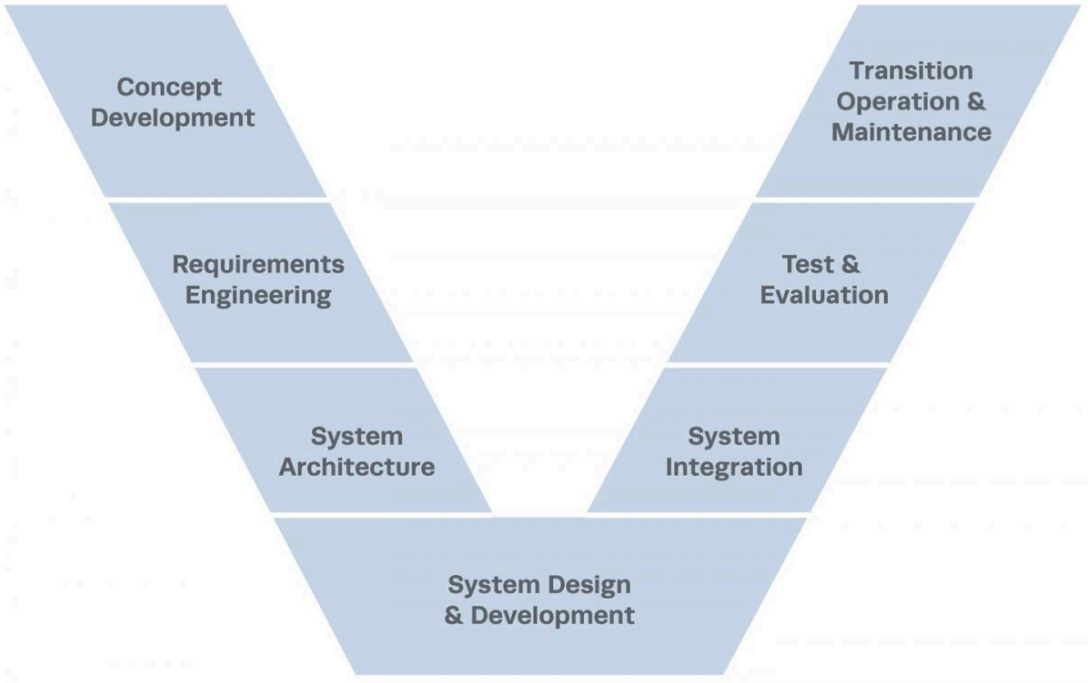


Figure 1 : Design of the product cycle: V-cycle

Conception steps

To begin with, we set objectives, summated constraints imposed by the rules and located improvements opportunities, in order to structure and define our work. Then, a preconception phase instituted the basics of the development that was brought in detailed conception. This consisted of an **iterative process** between CAD and simulations and **interface management** with other systems.

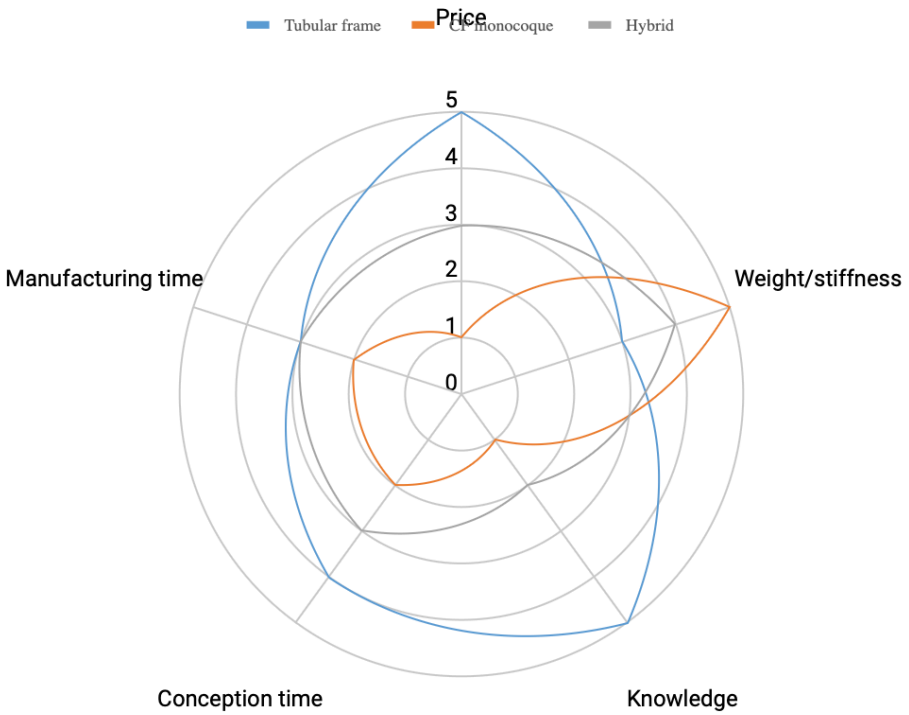


Figure 2 : Decision graph frame

Assumptions

We realised simulations under the following assumptions.

- Elastic behaviour
- Small displacement
- No dynamic phenomenon
- Welding beams infinitely stiff
- Beam model

Important values

	Target	Simulation	Test
Torsional Stiffness (Nm/deg)	1200 - 1500	1430	1150
Weight (kg)	57	52	53

- Steel: 25CrMo4
- Yield strength: > 700MPa

CAD

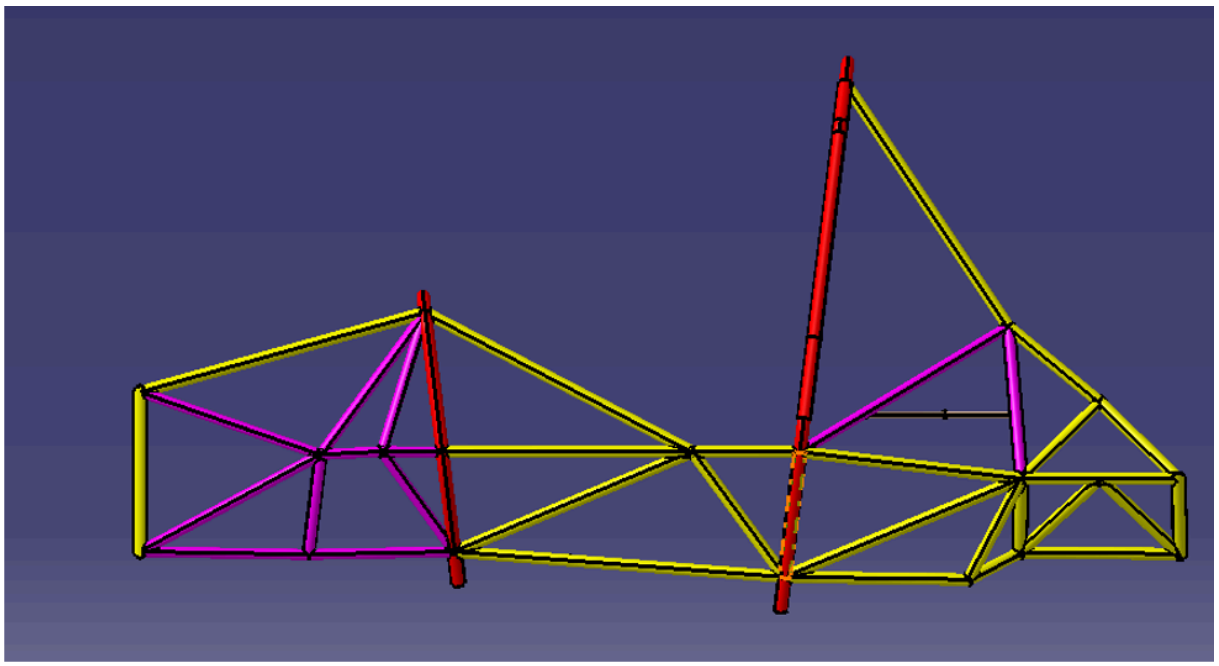


figure 3 : CAD of the frame

Simulation tests results

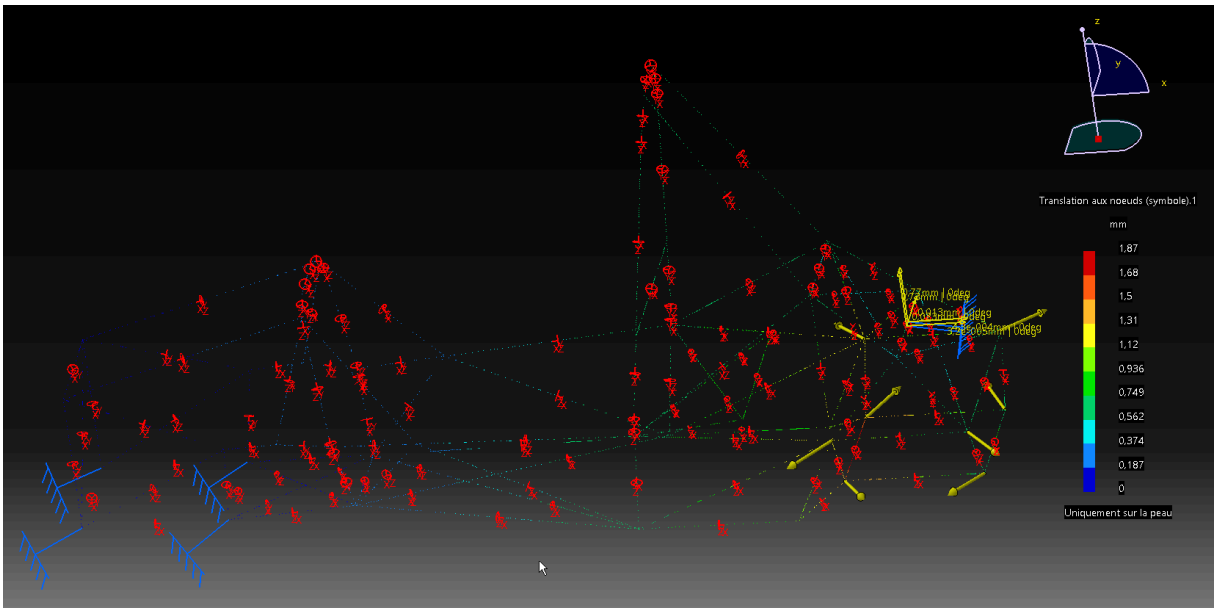


Figure 4 : Bump 3g rear

Tests Results

Doc ET4-3 Indice 11 10/2018

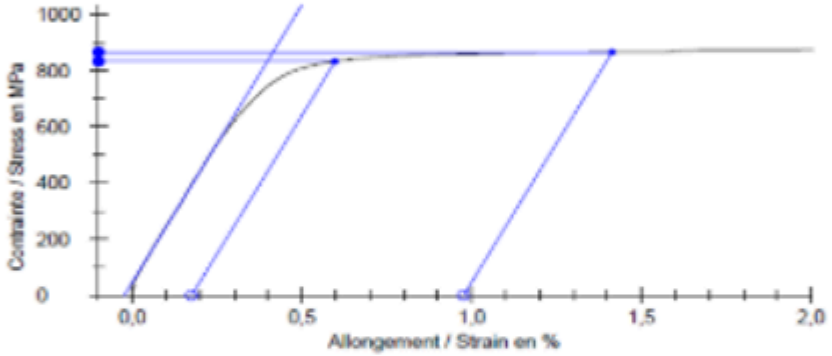
A2M INDUSTRIE

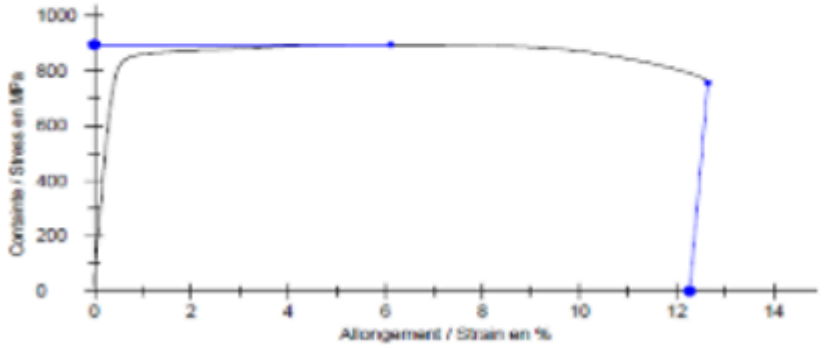
RAPPORT D'ESSAI DE TRACTION
TENSILE TEST REPORT
NF EN ISO 6892-1:2016 A224 et/ou NF EN ISO 6892-2:2011 A113

cofrac ESSAIS

N° de rapport / Report ID	:	18ZW02128
Bon de travaux / Work order	:	1812-70981
Date d'essai / Test date	:	21/12/2018

Repère Marking	Sens Direction	Position Location	Type	T °C	S_0 mm²	E* GPa	R_{eH} UYS MPa	$R_{p0,2}$ $Y_{s0,2}$ MPa	R_{p1} Y_{s1} MPa	R_m UTS MPa	L_0 mm	A/ El ext. %	Lieu de rupture/ Fracture location
70981B	See	Info	Tube	20	111,62	197	-	834	866	894	125,0	12,3	hors Soudure





Vitesse d'essai / Testing speed:Allong. régulé: 0,027 %/s Allong. régulé: 0,027 %/s Allong. régulé: 0,07 %/s zero=0,007 MPa

Figure 5 : Tensile strength test

Stiffness measurement

Fig 9A. *Stiffness measurement on a previous frame*

Measure performed in two times (distance to longitudinal axis approx. 1m):

- Apply a torque to the front and the cockpit of the frame, blocking the back
- Apply a torque at the back, blocking the front

Ergonomics and Human Factors

A dedicated ergonomic test bench was used to validate pilot positioning:

- Adjustable seat, pedal box, and steering wheel
- Use of 95th percentile male anthropometric data
- Verification of visibility, accessibility, and harness geometry

This phase ensured rule compliance (6-point harness geometry, padding, egress time) and increased comfort.