

FIREFIGHTER DRONE VEHICLE:
REMOTE CONTROLLED FIREFIGHTER-RESCUE OFFROAD VEHICLE CONCEPT
DEVELOPMENT FOR FOREST FIRES

A Thesis

Submitted for fulfilment for the Bachelor Degree in Industrial Design and Product
Management to the department of Design

Fachhochschule Salzburg University of Applied Sciences

By

Alfonso González



June 2017

Declaration by student

I, Alfonso González, hereby declare that the work presented herein is original work done by me and has not been published or submitted elsewhere for the requirement of a degree programme. Any literature date or work done by other and cited within this thesis has given due acknowledgement and listed in the reference section.

Alfonso González

Place: Fachhochschule Salzburg University of Applied Sciences

Date: June 2017

Pr. Marcus Schranzer

(Supervisor)

Associate Professor Department of Design

Certificate:

Certified that the thesis entitled “REMOTE CONTROLLED FIREFIGHTER-RESCUE OFFROAD VEHICLE CONCEPT DEVELOPMENT FOR FOREST FIRES” by Mr. Alfonso González towards fulfillment for the Bachelor’s Degree in Industrial Design and Product Management is based on the investigation carried out under our guidance. The thesis part therefore has not submitted for the academic award of any other university or institution.

Marcus Schranzer

(Supervisor)

Associate Professor

Abstract

The study attempts to investigate and create new solutions to forest fires preventing from dangerous natural catastrophes. Making possible a water sanitation remote controlled device approach to the fire focus to attack the fire from a closer distance. This will increase the effectiveness and will avoid endangering the brigade member's life.

The vehicle consists in a compact size remote controlled half-track vehicle with wide manoeuvrability and an optimized water autonomy. It will also have a space set up for people fitting in case any rescue operation is needed, providing any first aid equipment and taking people out of the danger area.

The Vehicle will be

Claims of professional firefighters were registered to come up with the best complements for the craft in order to meet all the needs that could be required in those extreme dangerous situations.

Vehicle theoretical features:

The craft structure will consist in two parts:

- The upper part: Where will be the water tank, the hoses, the people accommodation, the illumination system and the water input.
- The lower part: It will contain the wheels and their respective electric engines.

The main pint will be that these two parts will be articulated by a combined roller-sleeve bearing impelled by a stepper motor.

Also the craft will be equipped with:

- Illumination system
- Visualization system: front and back cameras.

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References

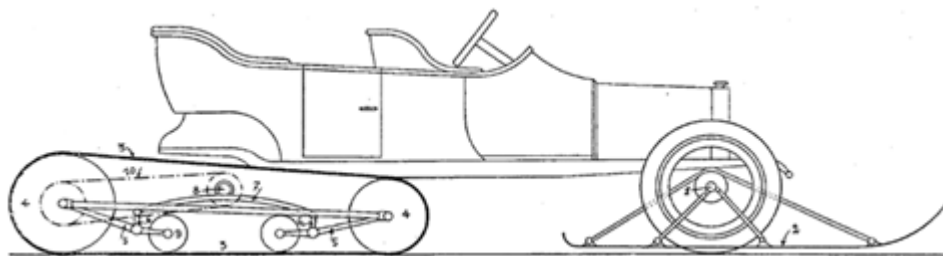
Chapter 1 – Historical background

In order to gather the best offroad features in a vehicle, I based my design in the Citroen Kégresse model. A Kégresse track is a kind of rubber or canvas continuous track which uses a flexible belt rather than interlocking metal segments. It can be fitted to a conventional car or truck to turn it into a half-track, suitable for use over rough or soft ground. Conventional front wheels and steering are used, although skis may also be fitted. A snowmobile is a smaller ski-only type.

The Kégresse propulsion and suspension system incorporates an articulated bogie, fitted to the rear of the vehicle with a large drive wheel at one end, a large unpowered idler wheel at the other and several small guide wheels in between, over which run a reinforced flexible belt. The belt is fitted with metal or rubber treads to grip the ground. It differs from conventional track systems by using a flexible belt rather than interlocking metal segments.

The name comes from the system's inventor Adolphe Kégresse, who designed the original while working for Tsar Nicholas II of Russia between 1906 and 1916. He applied it to several cars in the Royal garage including Rolls-Royce cars and Packard trucks. The Russian army also fitted the system to a number of their Austin Armoured Cars.

Bellow it is shown some of the most relevant Kégresse models, although there were almost 20 kinds produced.



Adolphe Kégresse:

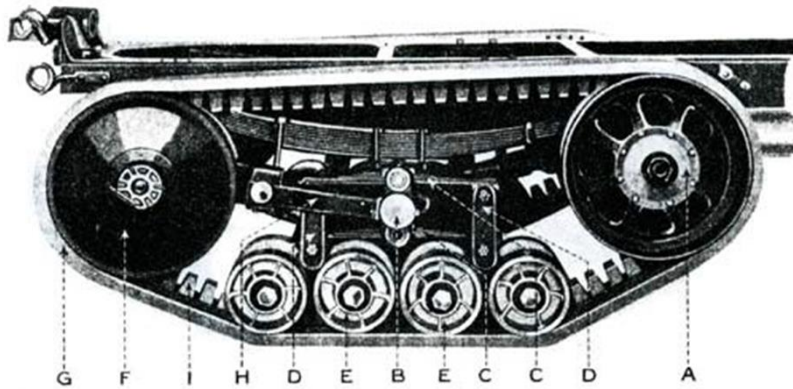
Patent drawing from 1913



Surely a proto: The car is a model A and the track system (snow type) is not the final design.

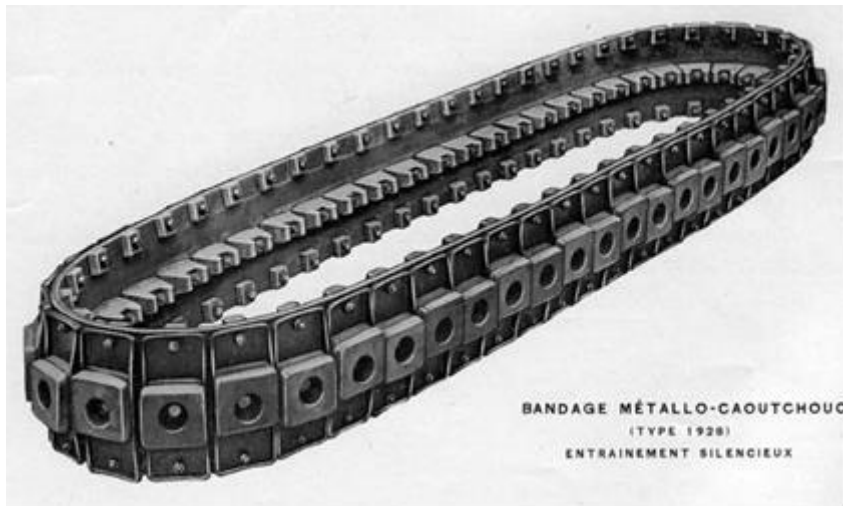
The picture is from 1920 and some sources claim that the man behind the steering wheel is none but Adolphe Kegnese himself!





The P7T is the last Kegresse equipped with the early type of one-piece moulded rubber elt and the system of springs for the four "galets", which carries the weight of the car.

This illustration also shows how the pulleys are lifted from the ground when there's no load on the car.



The new belts with metal brackets and rows of rubber blocks.

This is the early design (as seen on P7 and early P10). Later the big rubber pads are hexagonal and the metal brackets simplified.

Finally, the Kégresse P17 model, the one which really gathered the features I was looking for .



Picture of a P17 French army radio-car.



Six P17s took part in the Croisière Jaune, Pamir group. Some sources mention that they were special-built, with chassis from P19, the 6-cylinder sister of P17 of which one was also used in the expedition.



Citroen Kégresse logo in 1921

1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940		
Models for tourism, commercial, agricultural and military use:																					
	K1		P4T		P7T		P7^{mb}	P10		P17 (P17 A-B-C-D-E)					< 4-cylinder models						
			6-cylinder models>						P15N						P19						
										P14											
Trucks for industrial, agricultural and military use:																					
											P26				P107						
Special cars, not commercialised, and/or produced in small numbers:																					
			P6	P2T							P21										
Military - armoured cars:																					
							P16					P28			P104	P103					

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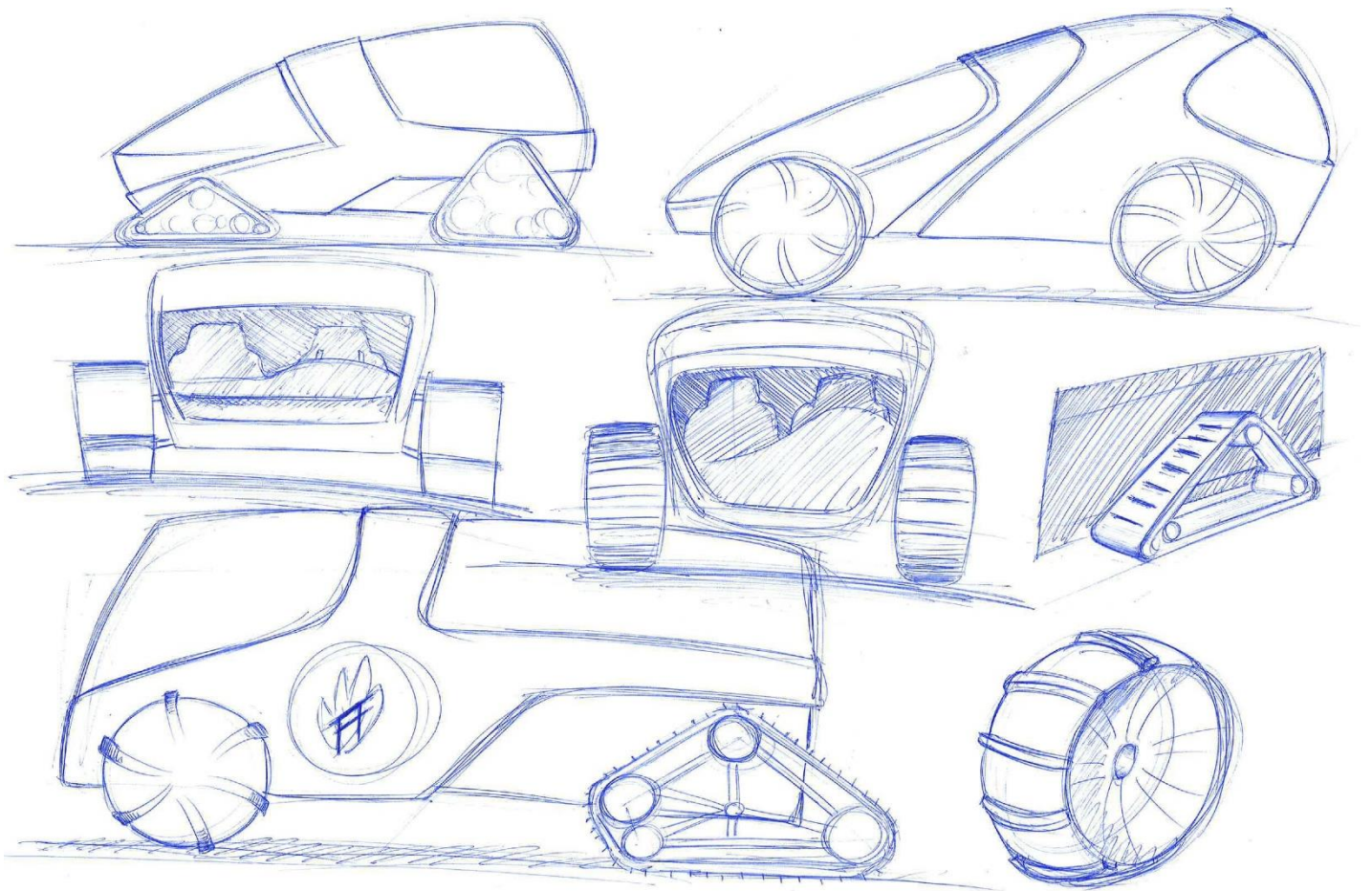
All the models from the beginning are gathered in this table.

REFERENCES: JENS MØLLER NICOLAISEN: CITROEN KÉGRESSE, ALL THE MODELS

Chapter 2 - Concept design

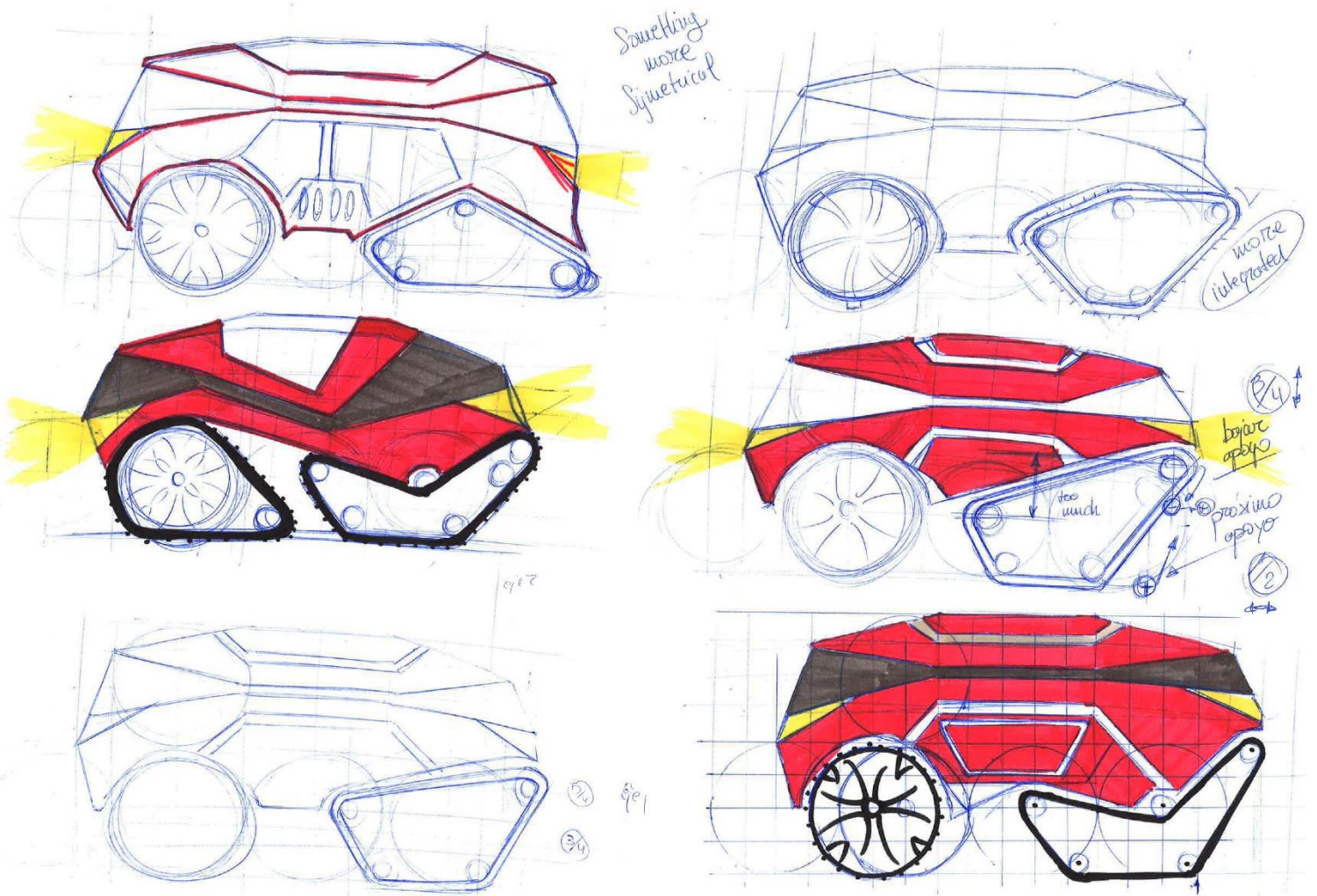
This part of the project was developed during the Visual Communication subject with Davide Tealdi as the main professor.

These sketches will show the design process as well as the vehicle development:



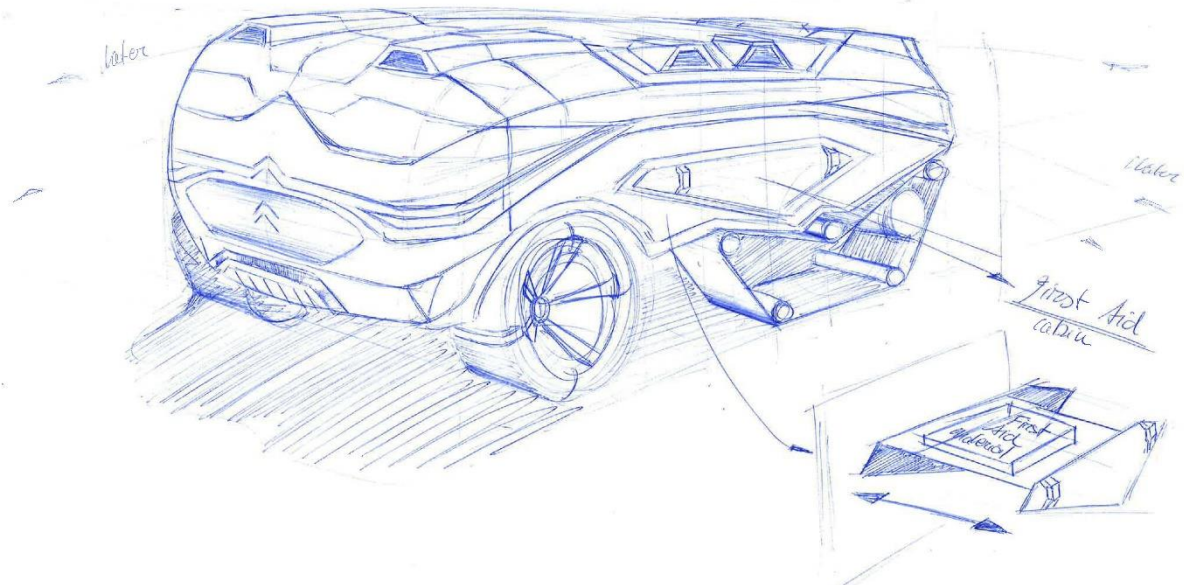
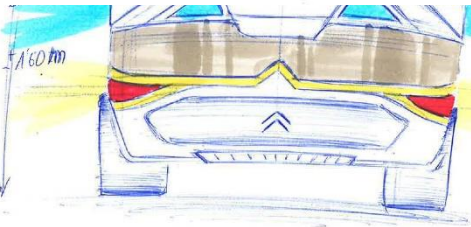
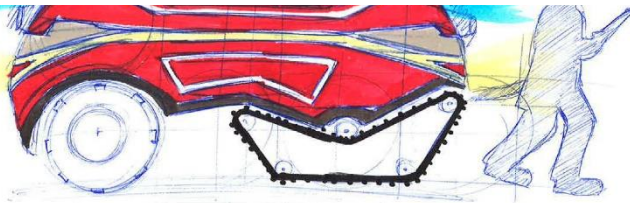
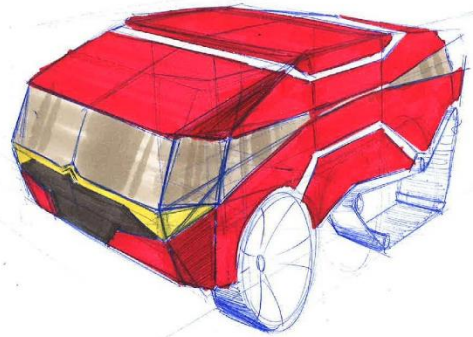
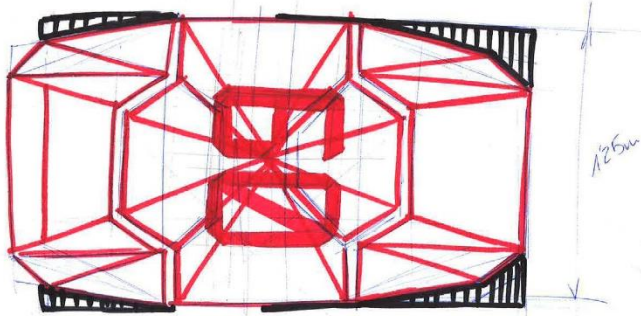
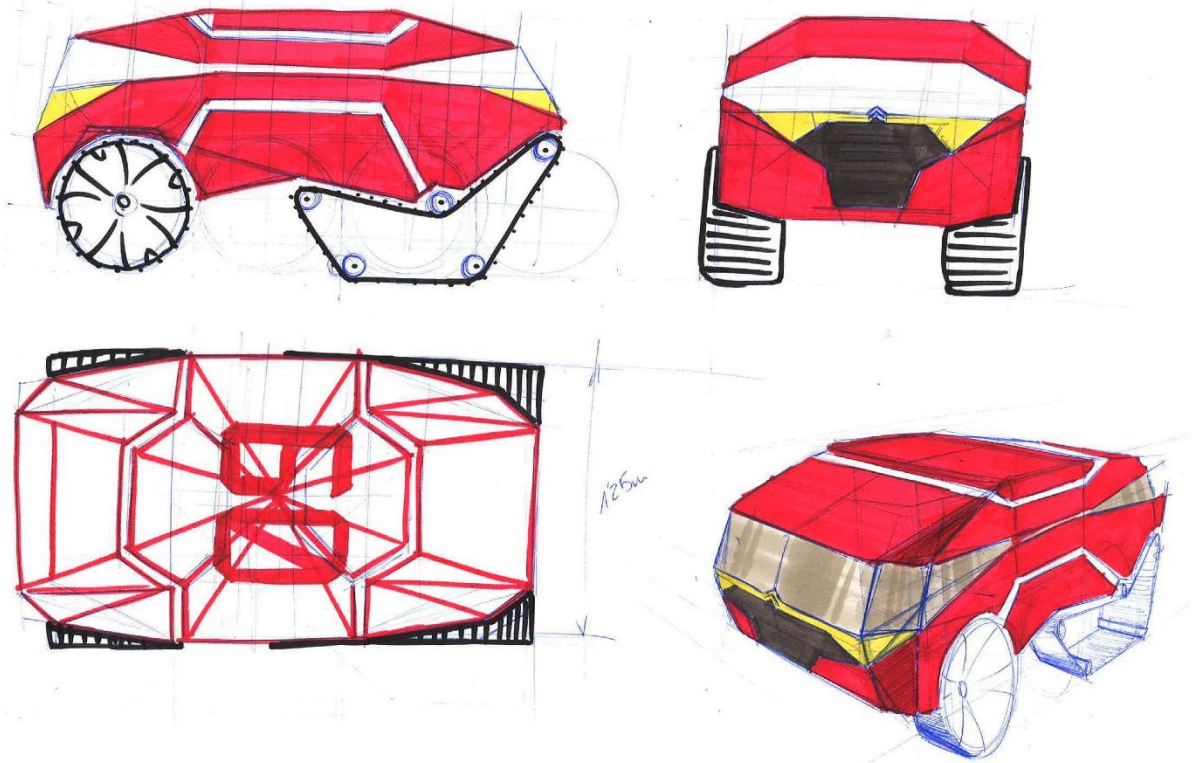
This is the first sketching paper, a kind of brainstorming trying to find a shape base.

I started sketching from the side view. I decided to use a tracking wheel on the back part and a normal one at the front. That would aloud the vehicle to go through any offroad landscape.

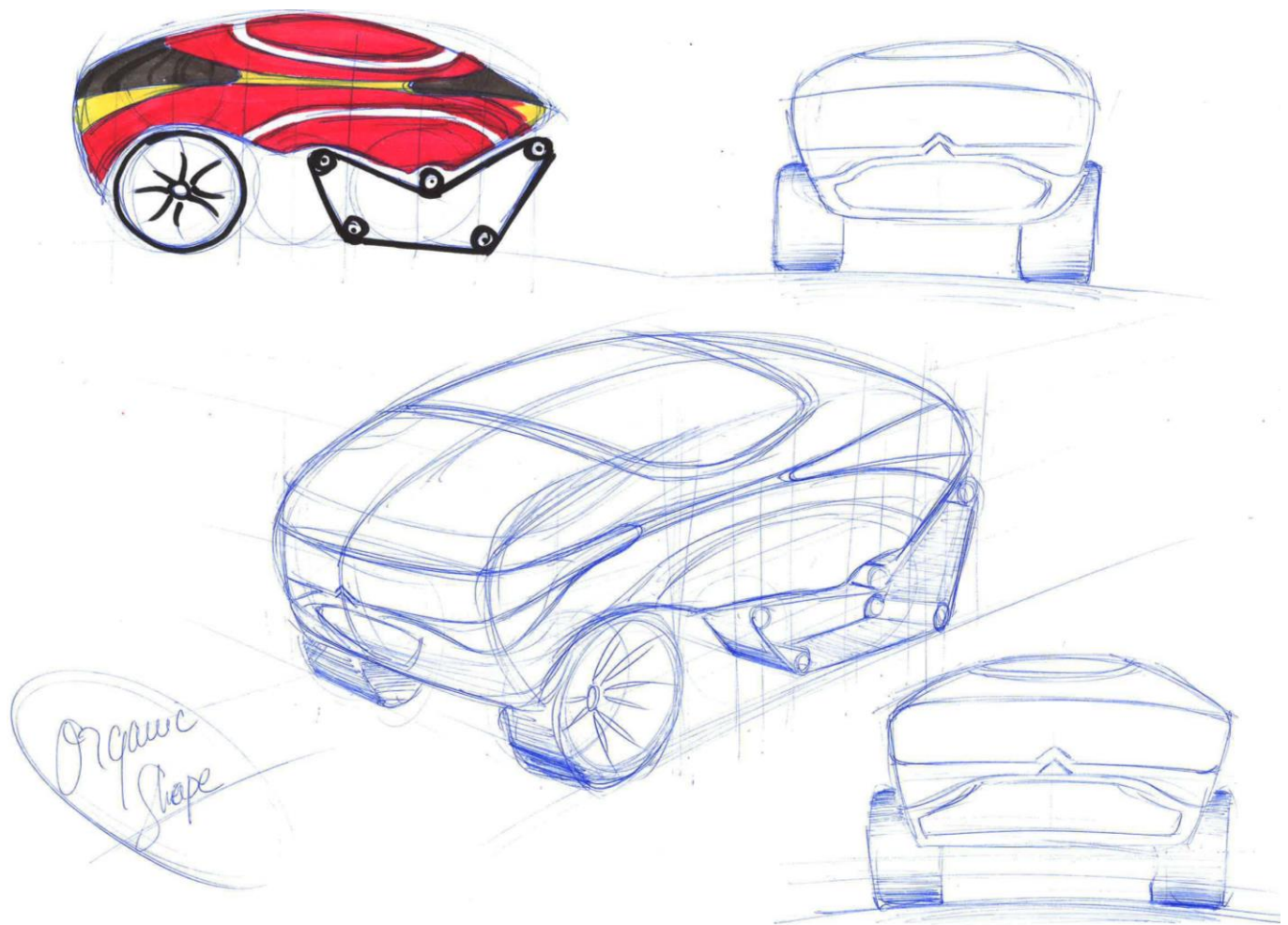


One thing was clear, the vehicle should have a geometric styling in order to look strong and solid against any extreme situation.

After this, I defined a kind of armored battle craft as a possible solution.

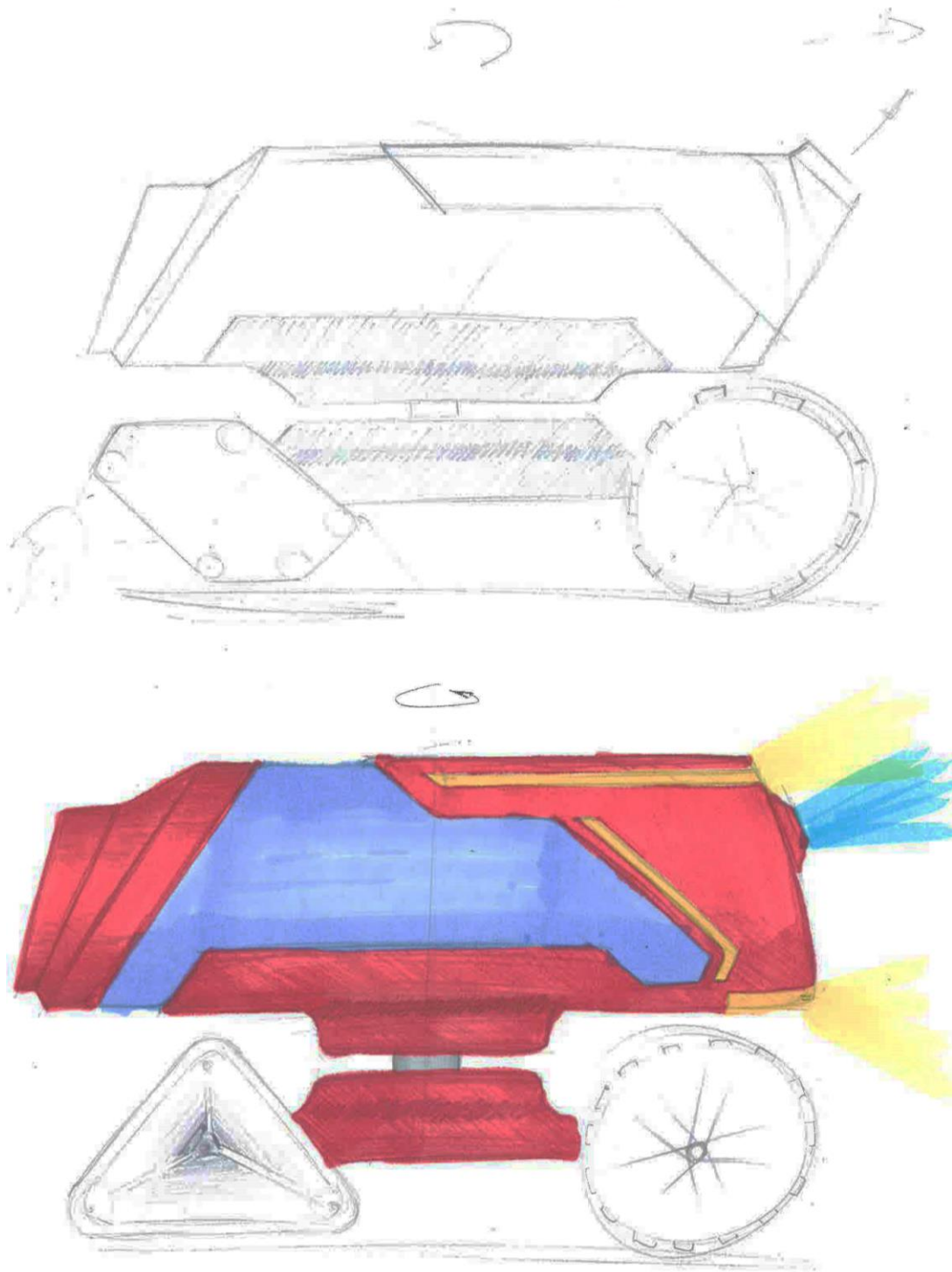


The I decided to add just a bit more of organic styling and this was the result

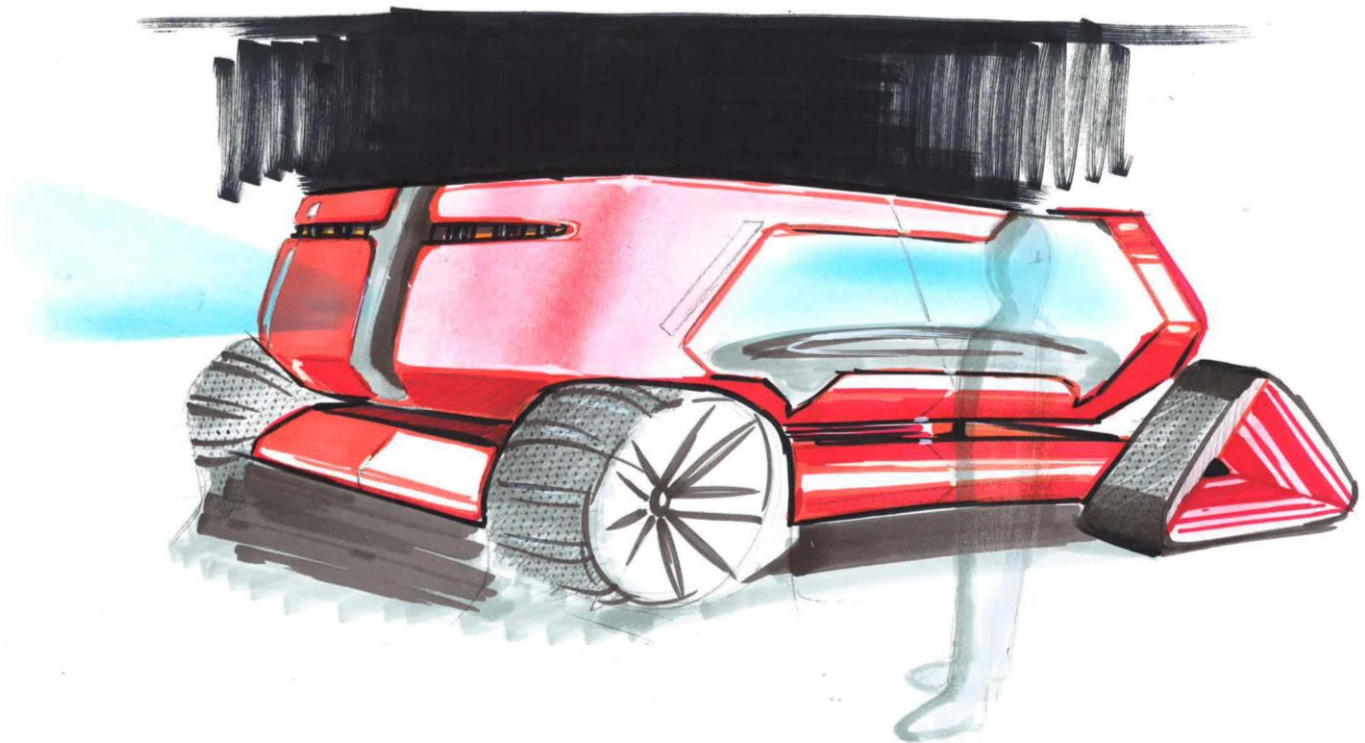
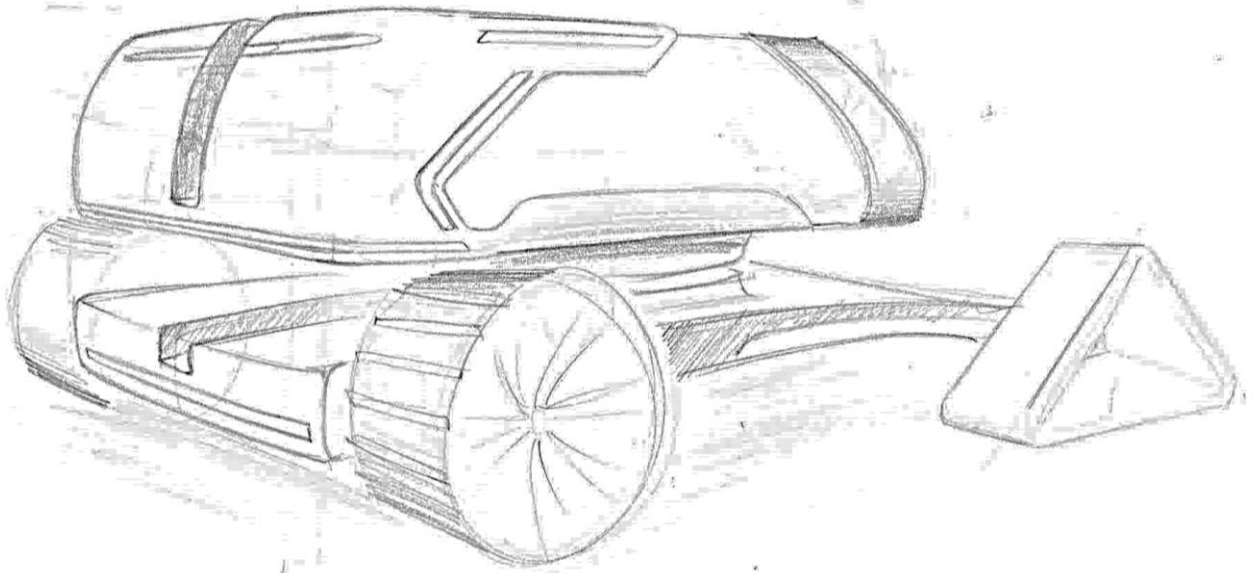


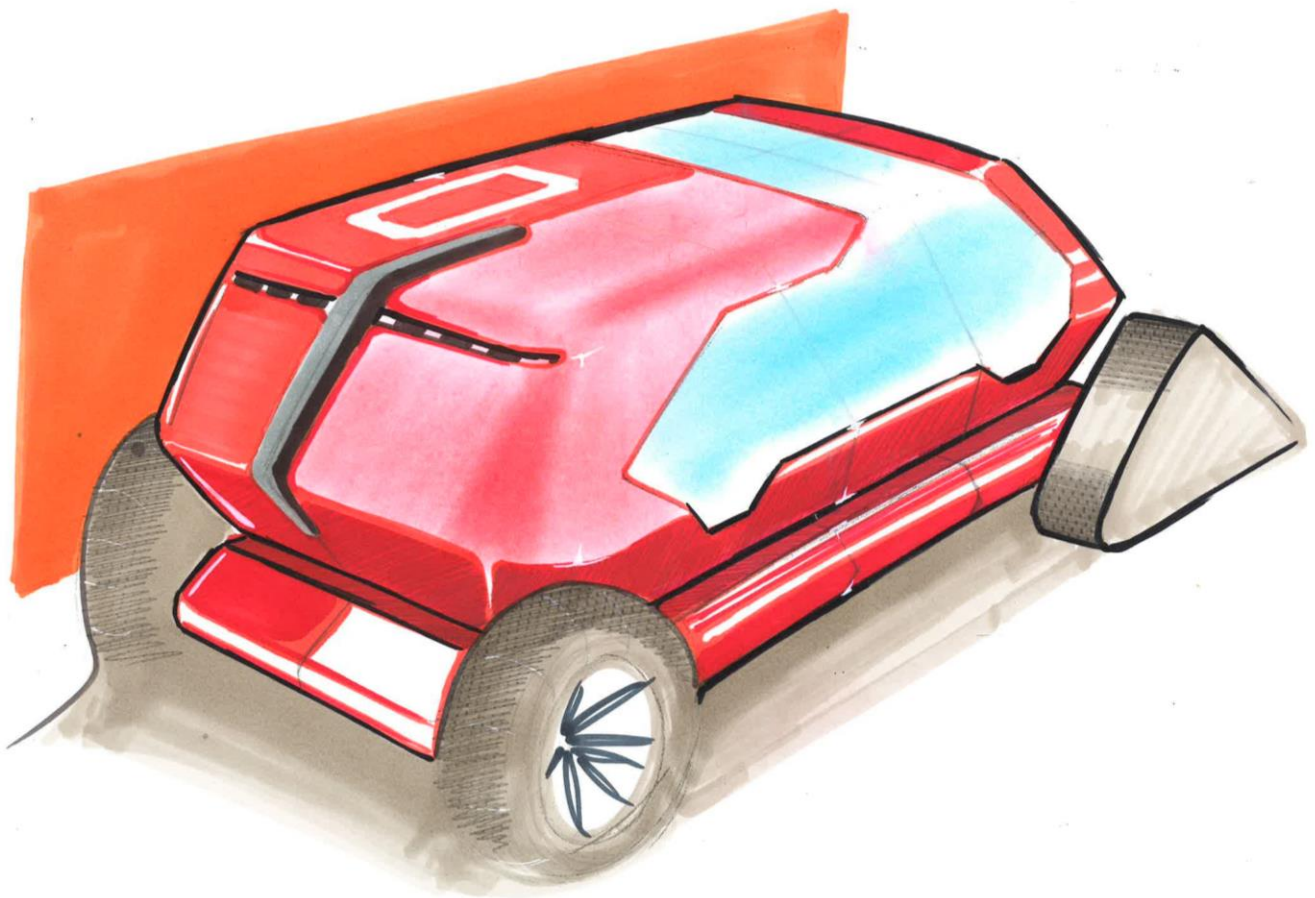
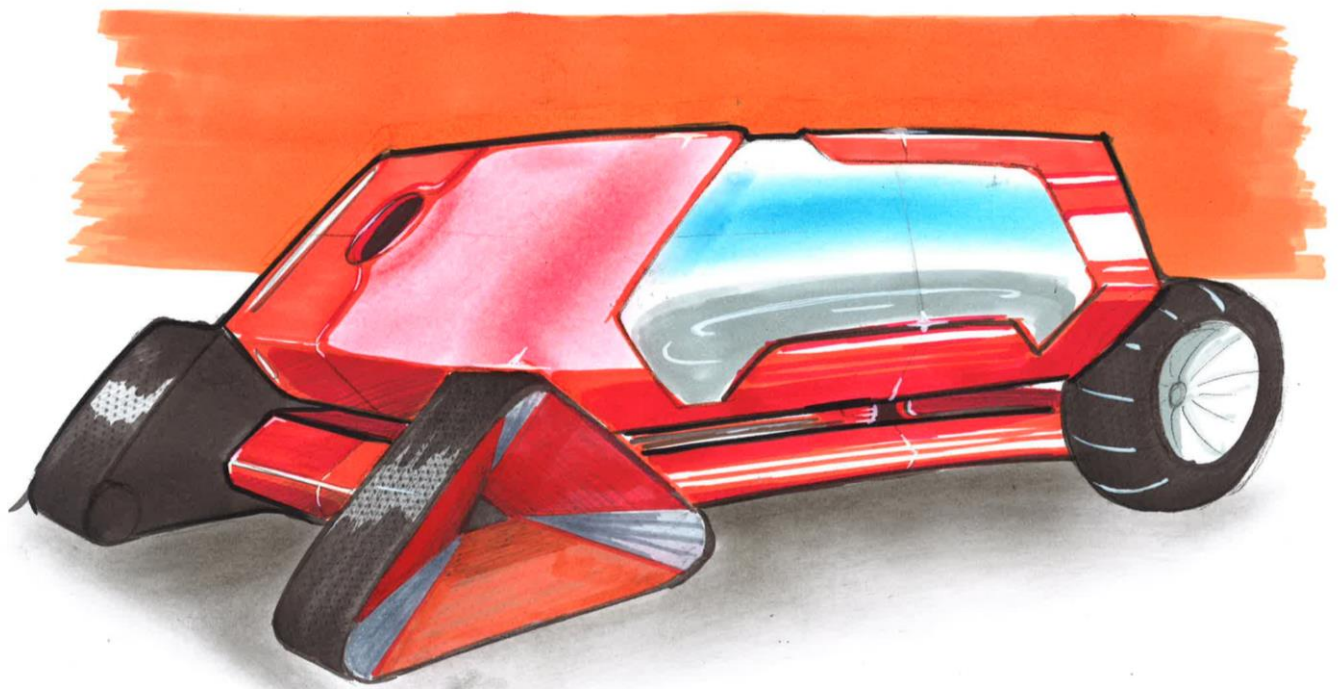
I realised about the need of going in both directions. Depending on the difficulties in the landscape, the vehicle would face the trouble with the track wheel at the front when is needed or with the regular wheel.

Davide and I came out with this idea. The craft will have two different parts which would rotate around a central axis.



These were the results which I rendered with markers.

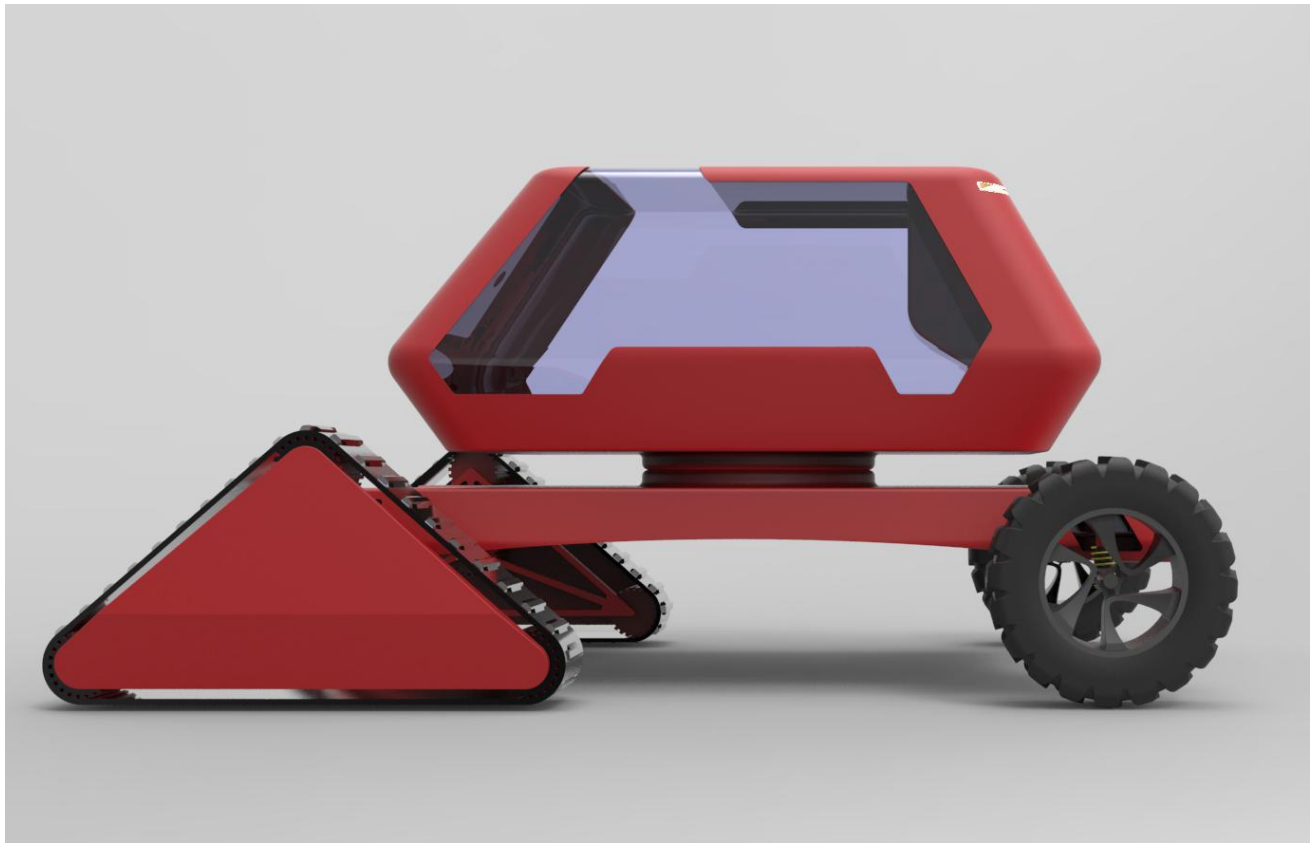
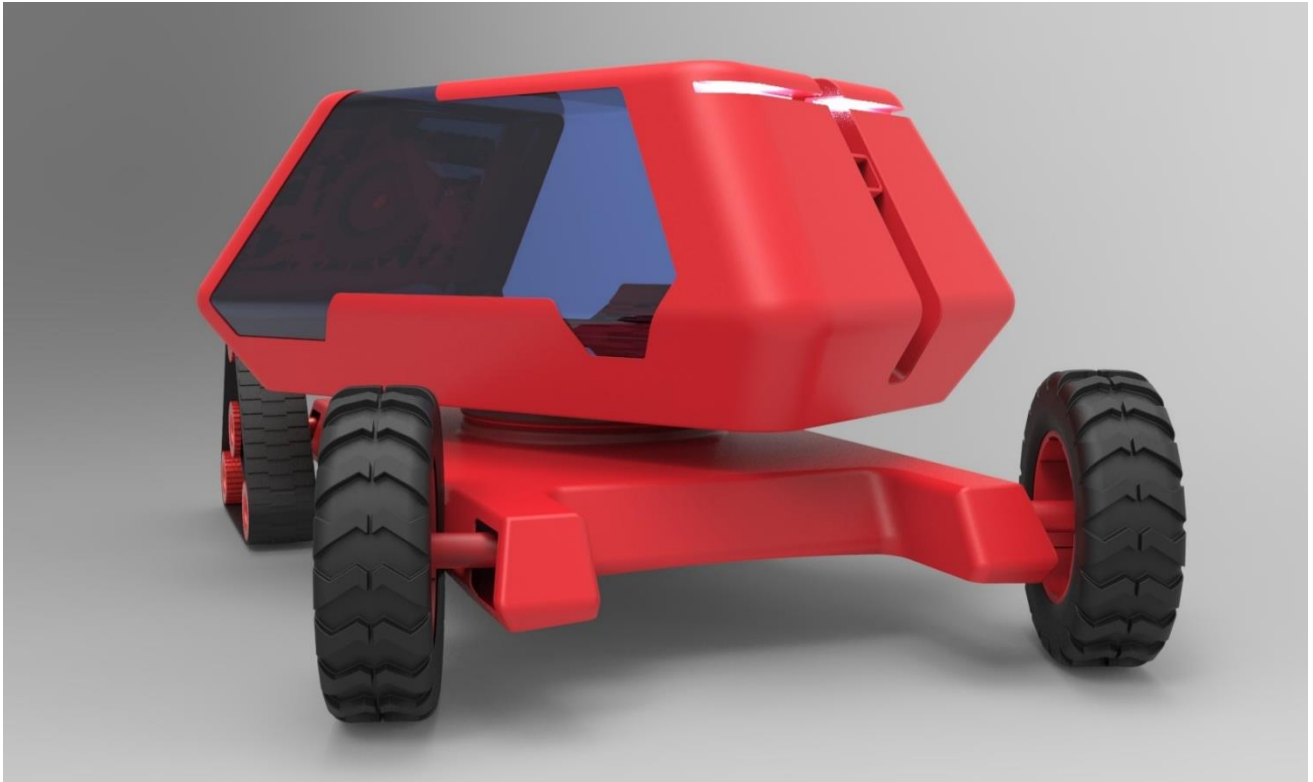




Chapter 3 – CAD design

This was the first CAD model. After this, some changes were made in order to improve the effectiveness as well as the appearance.





Chapter 4 – Vehicle specifications

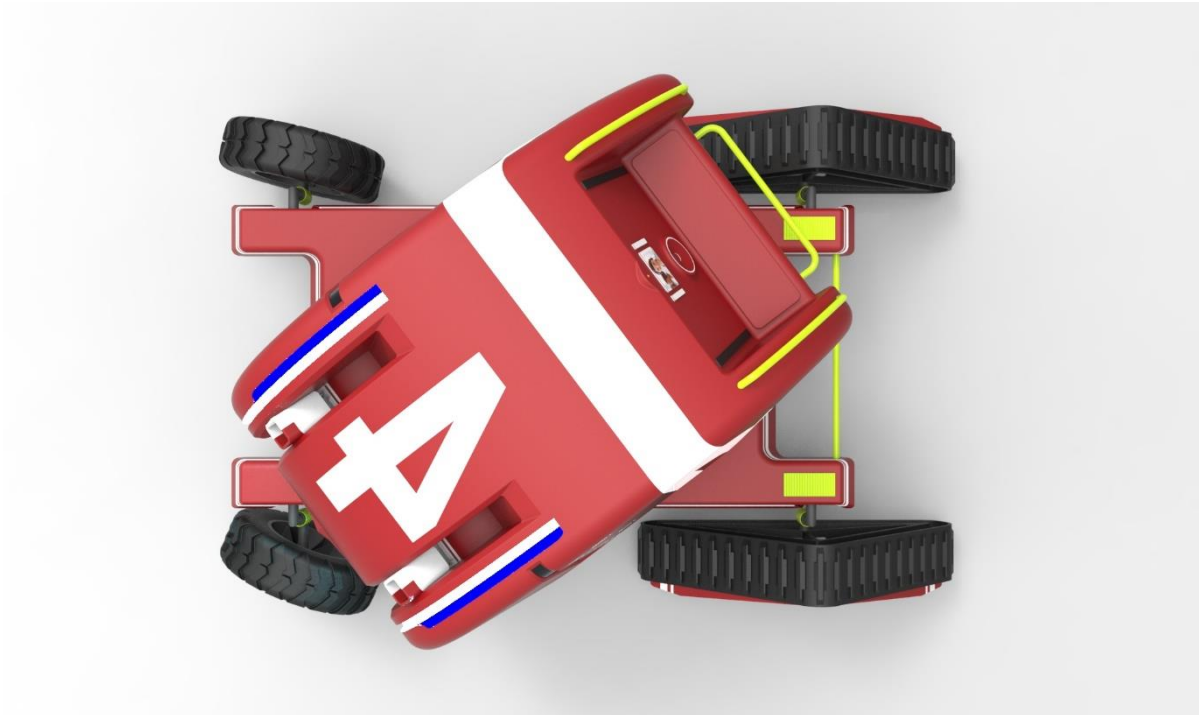
The final product renders contain all the improvement that I have been doing through iteration processes. The styling appearance as well as several functional aspects were changed dramatically improving the overall vehicle features.



Front-side perspective vehicle view

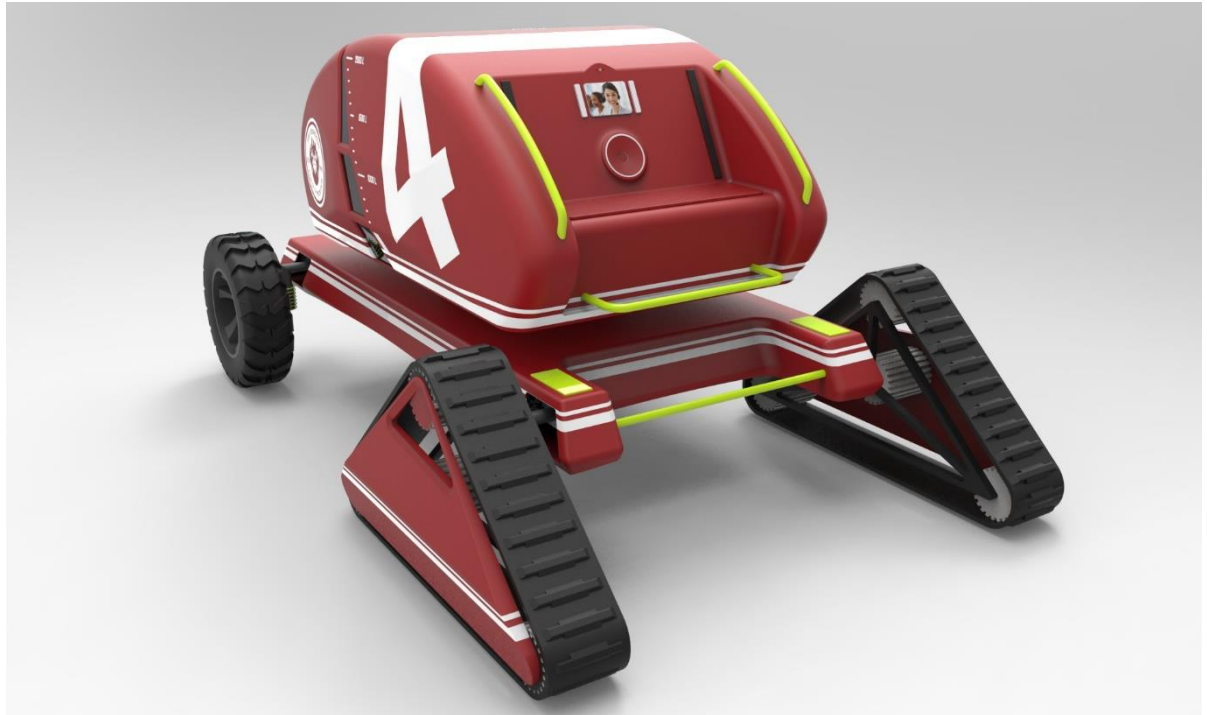


Side vehicle view



In this picture, we can appreciate how the upper structure rotates around the central axis in order to provide a 360° range with water.





This picture shows the back part, fitted out for any people surrounded by flames needed to be taken out from the danger area. It will be provided with security belts, holding bars, first aid stuff and live audio-visual interface device with the command centre.





The holding bars will help to the aided to get onto the craft as well as being properly hold. I wanted to make this device as much simply as I could in order to be intuitive, able for people to perceive exactly how to get up there in a short period of time.



Me, presenting the concept design phase in front of the teachers.