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# Designing the chassis for an electric *Brütsch Mopetta* replica

This thesis focuses on designing and developing a chassis for an electric replica of the *Brütsch Mopetta*, a microcar originally produced in limited numbers in the 1950s. The project was commissioned by 3P Pedalo Power Parts, which aims to revive this classic vehicle with modern technology while retaining its iconic exterior. The original Brütsch Mopetta was a three-wheeled microcar with two rear wheels and one front wheel, primarily powered by a small engine that drove one of the rear wheels. This project's goal was to develop a new chassis that accommodates an electric motor, providing power to both rear wheels, a significant departure from the original design. The chassis design needed to support the exterior body of the Mopetta while addressing challenges such as limited space, powertrain adjustments, and structural stability. The thesis outlines a structured approach involving analysis, ideation, concept development, prototyping, and testing. The design process was guided by specific requirements related to structural integrity, spatial constraints, and user interaction, aiming to deliver a road-legal electric vehicle that combines modern performance with vintage aesthetics.

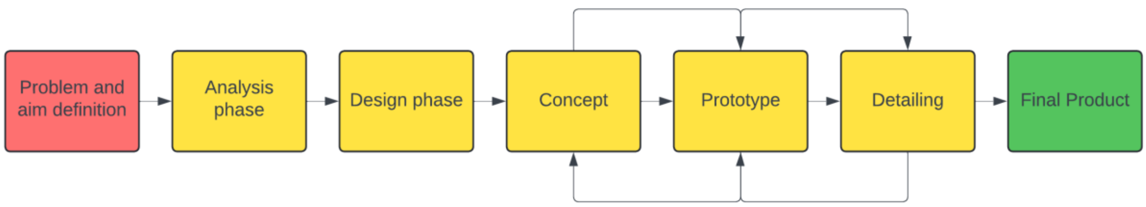


Figure 1: Flowchart process

The analysis phase involved examining existing chassis designs and identifying the changes required for the Mopetta replica. Key constraints included a fixed wheelbase, track dimensions limited by the bodywork, and the need for power transfer to both rear wheels. Several suspension systems were evaluated, including dependent, independent, and semi-independent suspensions, with dependent suspension chosen due to its simplicity and space efficiency. The ideation phase generated multiple design directions using CAD software. The swingarm, which holds the motor and rear axle, was a critical component of the chassis. Different configurations of swingarms and chassis structures were iteratively tested to

Figure 2: Rendering Final Concept

optimize fit and functionality within the limited space. The swingarm was ultimately designed to support dependent suspension with two shock absorbers, enhancing the driving comfort of the replica. Finite Element Analysis (FEA) simulations were performed on the chassis and swingarm to verify their structural integrity under static load conditions. These simulations identified areas of high stress and displacement, allowing for further refinement of the design.

The prototype phase involved manufacturing and assembling the designed components alongside off-the-shelf parts, including the motor, rear axle, and suspension elements. The prototype was tested in various driving conditions to evaluate structural stability, suspension performance, and overall driving behavior. Initial test drives confirmed that the prototype functioned as intended, but some adjustments were needed to improve

Figure 3: Prototype front view

Figure 4: Prototype side view

alignment and reduce vibrations.Feedback from these tests will inform future adjustments, enhancing the design's robustness and user experience.

The project successfully developed a functional chassis for the electric Brütsch Mopetta replica, meeting the requirements set out at the beginning. The prototype demonstrated that the proposed design solutions were feasible, with potential for refinement in future iterations. Recommendations include addressing minor alignment issues, conducting more extensive dynamic testing, and exploring alternative materials to further optimize the chassis's performance. Overall, this thesis contributes valuable insights into the challenges and solutions associated with retrofitting classic vehicle designs with modern electric powertrains, offering a blueprint for similar projects in the future.

Figure 5: Prototype chassis