



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**DESIGN AND DEVELOPMENT OF TYRE EMERGENCY SUPPORTER  
FOR MOTORCYCLE**

This report is submitted in according with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Mechanical Engineering Technology (Automotive) with Honours

By

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**2019**

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**DESIGN AND DEVELOPMENT OF TYRE EMERGENCY SUPPORTER FOR  
MOTORCYCLE**

**MOHAMAD AZRIL BIN MOHD NAYAWI**

**A thesis submitted in fulfillment of the requirement of Bachelor of Manufacturing  
Engineering Technology (Process and Technology) with Honours**

**Faculty of Mechanical and Manufacturing Engineering Technology**

**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**2019**

b

## DECLARATION

I declare that this report entitled “Design and Development of Tyre Emergency Supporter” is the result of my own research except as cited in the references. The report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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Date : .....

## APPROVAL

I hereby declare that I have read this dissertation/report and in my opinion this dissertation/report is sufficient in terms of scope and quality as a partial fulfillment of degree of Bachelor Engineering Technology (Automotive) with Honours.

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Date : .....

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TAJUK: DESIGN AND DEVELOPMENT OF TYRE EMERGENCY SUPPORTER FOR MOTORCYCLE

SESI PENGAJIAN: 2019/20 Semester 2

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## **ABSTRACT**

This report represent a methodology for chassis design and development of tyre emergency supporter for motorcycle. This project design procedure concept based on three wheeler as innovation design for motorcycle purpose at having hard time during ride on the highway which kind of having tyre punctured scenario. To enhance the design of this supporter of two wheeled vehicle, a combination of various successful system in suspension like M. A. Saeedi , R. Kazemi opinion have been added to the vehicle. The mathematical structural modelling also have been added of various design part being developed. The model design is sketched using CAD software CATIA V5, Hyperwork and Solidwork thus fully made analysis for the structural using this software to determine the quality of project. It shown that for the lateral stability, the three wheeled vehicle with single front is more stable than four wheeled vehicle and this project will benefit the user to use this equipment for more safety usage during ride the highway.

## **ABSTRAK**

Laporan ini mewakili metodologi untuk reka bentuk casis dan pembangunan penyokong kecemasan tayar untuk motosikal. Konsep prosedur reka bentuk projek ini berdasarkan tiga roda sebagai reka bentuk inovasi untuk tujuan motosikal yang mengalami kesukaran semasa menaiki jalan raya yang mempunyai senario yang disentuh tayar. Untuk meningkatkan reka bentuk penyokong dua kenderaan beroda ini, gabungan pelbagai sistem yang berjaya dalam penggantungan seperti M. A. Saeedi, pendapat R. Kazemi telah ditambahkan ke dalam kenderaan. Pemodelan struktur matematik juga telah ditambah dengan pelbagai bahagian reka bentuk yang sedang dibangunkan. Reka bentuk model dilukis menggunakan perisian CAD CATIA V5, Hyperwork dan Solidwork sehingga membuat analisis sepenuhnya untuk struktur menggunakan perisian ini untuk menentukan kualiti projek. Ia menunjukkan bahawa untuk kestabilan sisi, kenderaan tiga roda dengan depan tunggal lebih stabil daripada kenderaan beroda empat dan projek ini akan memberi manfaat kepada pengguna untuk menggunakan peralatan ini untuk penggunaan keselamatan yang lebih semasa menaiki lebuhraya.

## **DEDICATION**

To my beloved mother

Hasimah Bte Che Din

Siblings

Atiqa Natasha Binti Mohd Nayawi

Shamsul Naimi Bin Mohd Nayawi

Nur Syahirah Binti Mohd Nayawi

Nurul Syuhada Binti Mohd Nayawi

Aidil Asyraf Bin Mohd Nayawi

Supervisor

En Mohd Hafizi Bin Abdul Rahman

Thank you very much for the love, support, encouragement, help, guiding and prayers



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## LIST OF SYMBOLS

D, d	-	Diameter
F	-	Force
g	-	Gravity = 9.81 m/s
I	-	Moment of inertia
l	-	Length
m	-	Mass
N	-	Rotational velocity
P	-	Pressure
Q	-	Volumetric flow-rate
r	-	Radius
T	-	Torque
Re	-	Reynolds number
V	-	Velocity
w	-	Angular velocity
x	-	Displacement
z	-	Height
q	-	Angle
$\rho$	-	Density



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# CHAPTER 1

## INTRODUCTION

### 1.1 Background

For centuries, the number of motorcycle development in Malaysia has increased rapidly due to high demand of user in this country. The population keep growth everyday make the number of vehicle recently become large in use. The main focus in this paper is to drive attention towards the people in innovation that prove to be useful for future generation. The concept of three wheeled for this project criteria will be useful for rider that having punctured during ride at the highway commonly. According to the designer of three wheeled automobile has two main types that is Delta and Tadpole (July & Christy, 2018). When there is one wheel at the front and two at rear configuration is called Delta and the opposite of one wheeled at rear and two at front is called Tadpole concept.



Figure 1 : Concept of Delta and Tadpole design

In this report, a tyre emergency support for motorcycle based on two wheeled at the rear is stable dynamically, while braking, turning, simple in design and fabricating. At the first step, design of product to start the concept and searching the material also component needed. The most important part of vehicle is the chassis and its physical frame or structure of a vehicle are attached together. Generally, vehicle are rear wheel drive so according to Davis steering mechanism they have implement differential on rear wheel so that outer wheel travel with higher speed than the inner wheel (Cicero, Lacalle, Cicero, Fernández, & Méndez, 2011).

## **1.2 Statement of the Purpose**

This paper provide knowledge about the stability of tire supporter to hold the punctured tire to prevent damage to the rim cause losses. It basically a suitable component that is light but literally strong in strength to hold the capacity and friendly user. The model of this two wheeled are sketched using CATIA V5 and provide the analysis by Hyperwork software. The analysis is being made to achieve the desired characteristic friendly user. Therefore, the objective for this project were to develop an emergency on-road especially for person that ride on highway.

## **1.3 Problem Statement**

Project emergency tire supporter is innovation design for people need especially for motorcyclist. This innovation purpose is method to solving problem for those people who ride on highway that having tire punctured. They can use this product to get them into the closest R&R or go workshop nearby to get replacement for tire instead of changing at middle of highway. Riders especially cannot ride while having tire punctured that will cause injury if still ride the motor and also will effected the rim of tire being crooked. This product surely solve the issue of safety rider when having this problem as temporary solution.

#### **1.4 Objective**

1. To design tire emergency supporter for motorcyclist.
2. To develop the tire emergency supporter for motorcyclist.

#### **1.5 Work Scope**

- i. The design has been made of using Catia V5 software.
- ii. The analysis being made using software Hyperwork and Solidwork
- iii. The product concept is created according benchmark analysis
- iv. The process of fabrication were main process of this product builder
- v. The virtual test were to determine the performance of product created

## **1.6 Organization of Report**

This report consist of five chapters begin with report introduction and end with conclusion. The remainder chapters are literature review, methodology and results as well as discussion. Literature review covers overview and method to development and analysis of making and completing product of Tire Emergency Supporter. Methodology shows sequences of works in order to develop this project. Results of implementation of this project will be written in chapter four along with discussion. Chapter five will delivers conclusion and recommendation for future planning. However, results with discussion and conclusion will be continued in Bachelor Degree Project II.

## **1.7 Summary**

This chapter covers the background of the project and the problem statement which encourage this project to be conducted. The goals of this project report also deliberated in this chapter. Furthermore, the scope of this project report also discussed to make sure this project report was conducted systematically and guided according to its objectives.

**CHAPTER 2**  
**LITERATURE REVIEW**

**2.1 Design Criteria**

**2.1.1 Benchmarking Design and analysis**

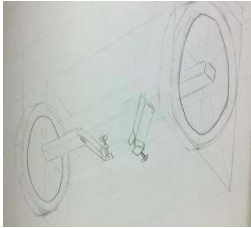
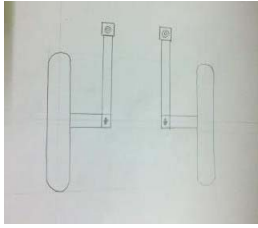
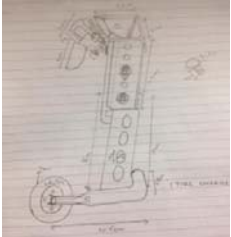
No	Criteria	Rating		
		Model 1	Model 2	Model 3
				
1	Weight	3	4	4
2	Strength	4	4	4
3	Design	2	3	4
4	Stability	4	3	4
5	Performance	3	3	4

Table 1 : Benchmark of product model

Rate:

1. Low
2. Moderate
3. Good
4. Excellent

## 2.2 SOFTWARE DESIGN

### 2.2.1 Vehicle Modelling

#### 1) Catia V5

Catia V5 software literally uses this concept of design as a sketch model for this project. The project was sketched in 2D and 3D by this software design. The frame body in the project's equipment is made of steel and has angular motion on it. Each wheel has z-direction translational motion and y-direction wheel spin. An analysis to see the result of the load and strength of material use is also being done for this design project. Part of model is shown as the product development in figures 2.2, and 2.2.1 below. (Zo'ller, Wagner, & Winner, 2017)

There is two types of wheel suggestion to use on this product : -

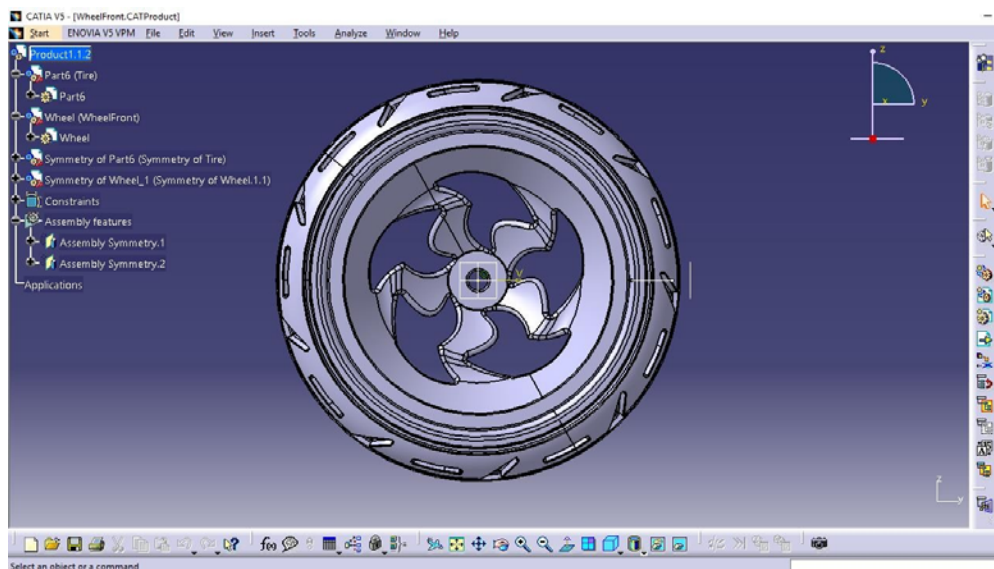


Figure 2 : Tire of motorcycle

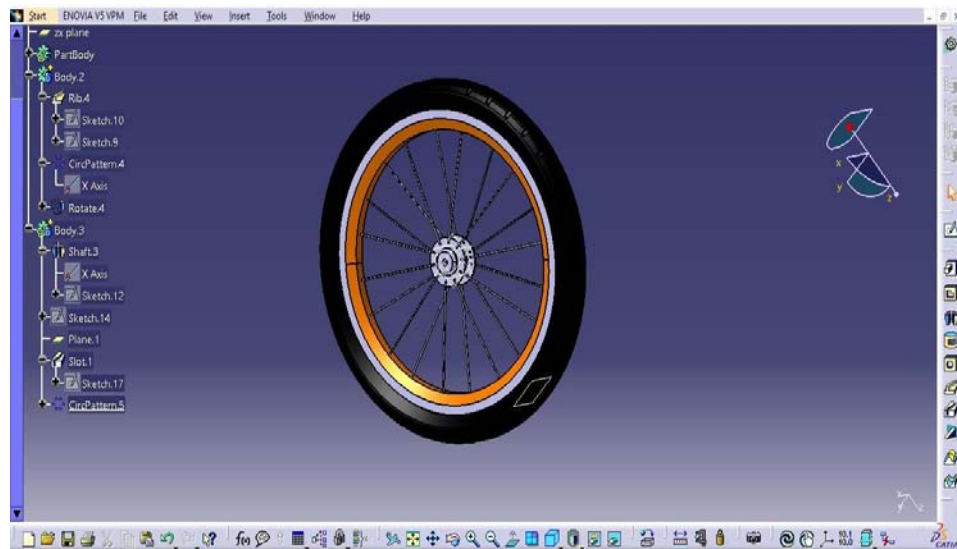


Figure 3: Tire of bicycle

It is to determine the best use of wheel whether using motorcycle or bicycle tire for these two types of tire design. After finishing the manufacturing process, this example tires will be tested in virtual test to obtain the required result. For this project assembly, the perfect tire between these two will be chosen. (Zoëller et al., 2017)