



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DESIGN AND IMPROVEMENT EMERGENCY BRAKE

SYSTEM FOR MOTORCYCLE UNDER 150CC

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

by

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ABSTRAK

Jumlah kemalangan maut di jalan raya melibatkan penunggang motosikal di Malaysia semakin meningkat setiap tahun. Antara faktor utama penyumbang adalah kegagalan mengawal motosikal dan kegagalan sistem brek motosikal. Tahap kecekapan bagi sistem brek motosikal berkuasa 150cc (MOPED) juga di aras rendah jika dibandingkan dengan sistem brek kenderaan lain seperti kereta, bas dan lori. Projek ini dihasilkan bagi melakukan penambahbaikan terhadap sistem brek motosikal berkuasa 150cc (MOPED) bagi meningkatkan tahap kecekapan sistem brek motosikal sedia ada. Sistem brek gabungan yang direkabentuk dan dipasang pada motosikal bertujuan mengurangkan jarak membrek semasa kecemasan. Kaedah ini menggunakan brek kaki sebagai dwi tindakan membrek pada roda hadapan dan belakang tanpa membuang tuil brek hadapan pada *handle bar*. Ini dapat mempercepatkan daya membrek pada kedua dua roda hadapan dan belakang dengan satu tindakan, disusuli dengan tambahan daya membrek pada tuil brek tangan untuk roda hadapan. Ujian jarak membrek dilakukan bagi mengkaji perbezaan inovasi yang dihasilkan. Hasil ujian jarak membrek mendapati bahawa jarak membrek motosikal sewaktu membrek kecemasan dapat dikurangkan kepada 17%.

ABSTRACT

The number of road accidents in Malaysia involving motorcyclists had been increasing in the recent years. Major contributing factors include the failure to control the motorcycle and the problems in motorcycle braking system itself. For 150cc motorcycles such as mopeds, the efficiency level of braking system can be considered as low compared to other high cc vehicles such as cars, buses and lorries. This project was carried out to make improvements to 150cc motorcycle braking system (MOPED) in order to upgrade the efficiency level of an already motorcycle braking system. Combined braking system has been used in this project as to reduce the stopping distance during emergency. It is a system for linking front and rear brakes on a motorcycle where the rider's action of depressing one of the brake levers applies both front and rear brakes. This is distinct from integrated brakes, where applying pressure to brake pedal only includes application of some front brake. Stopping distance test was carried out to examine the difference between before and after the innovation was made. From the stopping distance test, it was found that the innovation carried out could help shorten the motorcycle stopping distance up to 17% where emergency situation is concerned.

DEDICATION

This project and research work is dedicated to my beloved wife and all families for their enthusiastic caring throughout my life, my loving siblings, my supervisor and also my friends for their encouragement and love

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LIST OF SYMBOLS

d	-	Distance
F	-	Force
g	-	Gravity = 9.81 m/s
m	-	Mass
V	-	Velocity
μ	-	Coefficient of Friction
\emptyset		Diameter
mm		Millimetre
kPa		Kilo Pascal
cc		Cubic capacity
kph		Kilometre per hour
mph		Miles per hour
3D		3 Dimension

LIST OF ABBREVIATIONS

CBS	Combine Brake System
ABS	Anti-lock Braking System
IBS	Integrated Braking System
LBS	Linked Brake System
BD	Brake Distance
DOT	Department Of Transportation
SAE	Society of Automotive Engineering

CHAPTER 1

INTRODUCTION

1.1 Background

Malaysia has the highest traffic accident happened among the ASEAN countries involved of the fatality risk accident and more than 50% of the road accident fatalities involve motorcyclists. Nowadays, this issue had become seriously among Malaysian citizen. According to Muhammad Marizwan Abdul Manan (2012), data of road accident involved injuries and fatalities are growing concern in Malaysia with more than 6000 killed and over 25,000 injuries yearly for the past 5 years. Road fatalities have shown a steady increase of 4% per year in the last 7 years, rising to 6745 in 2009. Malaysia has had the highest fatality risk death per 100,00 population in the world since 1996. Majority of road accident fatalities involve motorcyclist more than 50% of the total number of fatalities shown in Figure 1.1

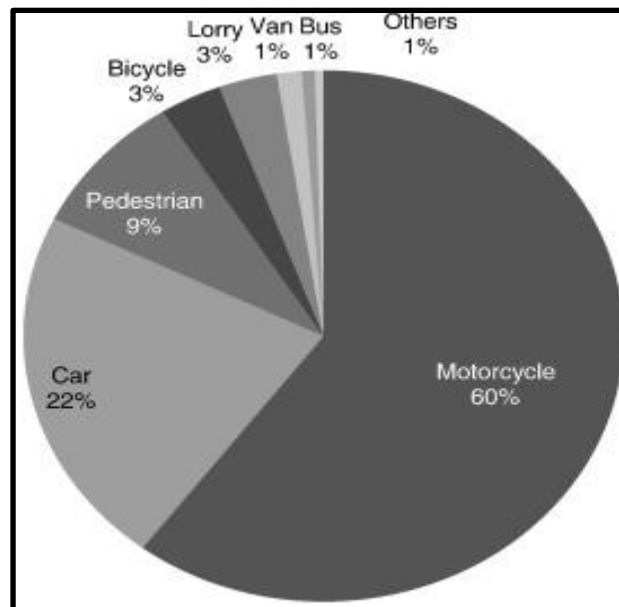


Figure 1.1 : Fatality distribution by type of vehicle

According to Kak D-Wing (P.Tech), Motorcycle Safety and Technology Symposium (21 October 2019) at Malaysian Institute of Road Safety Research MIROS, 64% fatalities involved by motorcycle user where the number of fatalities is 6284 victims. Figure 1.2 is shown of the pie chart of fatalities by road user group.

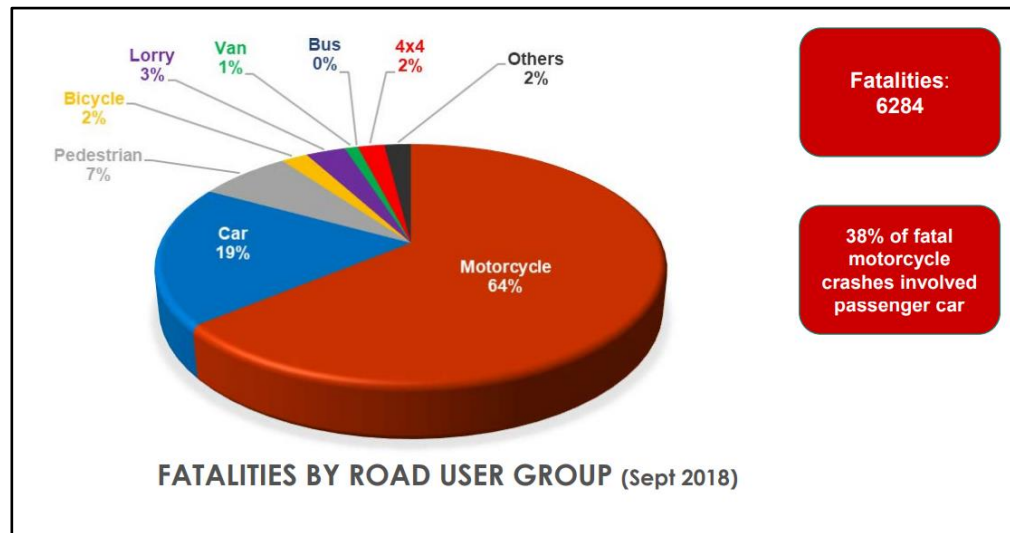


Figure 1.2 : Fatalities involves motorcycle in Malaysia

The road accident involved of the motorcycle in Malaysia is the highest number compare by the other type of vehicle such as car, van, truck, bus and lorry. Road accident involved motorcyclist fatalities could occurred due to many factors such as the rider awareness, careless while riding, faulty the function of motorcycle and no less involved of illegal racing.

According to the traffic branch Bukit Aman, the total numbers of motorcycle accident happen in each year are increasing from 0.05% at 2007-2008 until 9.5% at 2015-2016. That means, the total accident for motorcycle are increasing 1% every year from 2007-2016. Table 1.1 had shown total motor vehicle involved in road accident by type of vehicle in Malaysia 2007-2016.

Royal Malaysian Police and the other government sector such as The Road Safety Department of Malaysia has done any type of road safety campaign among motorcyclist in Malaysia to reduce accident such as a giving the free helmet for motorcyclist, the discount the price to take driving license for B2 motorcycle below 250 cc and other campaign to reduce the amount of motorcycle accident in Malaysia. Likewise, the other improvement has be done by the company of motorcycle developer in the world to improve the safety feature for example the headlight is all time running such as daylight at a car to get easy view the motorcycle from the other driver vehicle on the road. This is a simple method and low cost to improve the safety of motorcycle.

On the other hand, other motorcycle like a motorbike has already applied the advance safety features Anti-locking Braking System (ABS) for emergency brake system. But the system can only attach with cost different with the motorcycle itself. Among the motorcyclist under 150 cc are low income and unable to use the motorbike above 250cc with full of safety due to expensive. Therefore, a motorcycle among the lowest cc categorize such as 150c.c and below must be applied the safety features within the lowest cost and also the simple system to improve the safety system for the motorcycles today.

Table 1.1 : Total motor vehicle involved in road accident by type of vehicle in Malaysia 2007-2016.

TAHUN Year	MOTOSIKAL Motorcycle	MOTOKAR Motocar	VAN Van	BAS Bus	LORI Lorry	PEMACU 4 RODA Four Wheel Drive	TEKSI Taxi	BASIKAL Bicycle	LAIN-LAIN Others	JUMLAH Total
2007	111,765	426,941	21,109	10,285	47,696	21,823	8,809	2,690	14,909	666,027
2008	111,819	435,665	20,392	9,356	48,250	22,793	8,769	2,463	11,571	671,078
2009	113,962	472,307	19,220	9,380	46,724	23,581	8,669	2,486	9,294	705,623
2010	120,156	511,861	18,788	9,580	50,438	25,777	9,899	2,178	11,756	760,433
2011	129,017	546,702	17,916	9,986	53,078	30,828	11,197	2,033	16,394	817,151
2012	130,080	655,813	15,143	10,617	42,158	32,891	11,680	1,310	21,540	921,232
2013	121,700	632,602	17,148	10,123	39,276	52,512	11,651	1,370	15,441	901,823
2014	125,712	617,578	15,041	9,193	37,481	41,464	10,856	1,275	27,743	886,343
2015	123,408	625,758	14,565	8,804	34,942	46,163	9,591	1,119	29,924	894,274
2016	135,181	670,935	14,470	9,462	35,064	48,907	8,399	1,318	36,833	960,569

Source : Traffic Branch Bukit Aman