



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**EXPERIMENTAL STUDY ON THERMAL EFFECT**

**USING SUNSHADES IN VEHICLE PASSENGER**

**COMPARTMENT**

This report is submitted in accordance 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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IN VEHICLE PASSENGER COMPARTMENT

Sesi Pengajian: 2019

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Date:

## **APPROVAL**

This report is submitted to the Faculty of Mechanical and Manufacturing Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Mechanical Engineering Technology with Honours. The member of the supervisory is as follow:

Signature: .....

Supervisor : Ts. Dr. MOHD ZAKARIA BIN MOHAMMAD  
NASIR

## **ABSTRACT**

In vehicles that are parked, no ventilation or air conditioning, if a vehicle is exposed to direct solar radiation, an immediate temperature rise occurs. The high cabin air temperature can threaten children and animals that are left unattended in vehicles. In Malaysia, 22 cases of heatstroke (hot red or flushed dry skin, nausea or vomiting, coma) include two deaths reported as a result of heatstroke. In addition, temperature-sensitive goods (e.g. drugs in ambulances and veterinary vehicles) can be adversely affected by high temperatures.

From this project, the objective of this paper is to determine the method in reducing the car interior temperature. The method was experimentally studied by using sunshades. There are two tests on sunshades application; outside and inside windshield. A 1.6 national sedan car was used in this study where it was exposed to direct sunlight for a period of 8 hours for two different orientations; south and east. The temperatures measured by thermocouple type K strategically located within the car were obtained and analyzed. From the analysis and observation, the usage of sunshades outside the windshields is the best in reducing both windshields, dashboard, steering wheel and rear deck temperature. The sunshade has blocked most of the solar radiation from hitting the windshields, causing the windshields, dashboard, steering wheel and rear deck absorbed less heat and give better comfort to the driver when entering the vehicle.

## ABSTRAK

Di dalam kenderaan yang diletakkan, tiada pengudaraan atau penyaman udara, jika kenderaan terdedah kepada sinaran suria secara langsung tanpa berteduh, kenaikan suhu segera akan berlaku. Suhu udara kabin kenderaan yang tinggi boleh mengancam anak-anak dan haiwan peliharaan jika ditinggalkan tanpa pengawasan. Di Malaysia, 22 kes strok haba (kulit panas merah atau kering kering, mual atau muntah, koma) termasuk dua kematian yang dilaporkan akibat stroke haba. Di samping itu, barangan sensitif suhu (misalnya ubat dalam ambulans dan kenderaan veterinar) boleh terjejas oleh suhu tinggi.

Dari projek ini, objektif kertas ini adalah untuk menentukan kaedah mengurangkan suhu dalaman kereta. Kaedah ini dikaji secara eksperimen dengan menggunakan pelindung matahari. Terdapat dua ujian pada aplikasi pelindung matahari; di luar dan dalam cermin depan serta belakang. Kereta 1.6 sedan nasional digunakan dalam kajian ini di mana ia terdedah kepada cahaya matahari langsung tanpa berteduh selama 8 jam untuk dua orientasi yang berbeza; selatan dan timur. Suhu yang diukur dengan jenis thermocouple K yang terletak di dalam kereta strategik yang diperolehi akan dianalisis. Dari analisis dan pemerhatian, penggunaan pelindung matahari di luar cermin depan dan belakang adalah yang terbaik dalam mengurangkan kedua-dua cermin depan dan belakang, papan pemuka, stereng dan suhu dek belakang. Pelindung matahari telah menyekat kebanyakan sinaran matahari daripada memasuki kaca depan dan belakang, menyebabkan kaca depan serta belakang, papan pemuka, stereng dan dek belakang menyerap kurang haba dan memberi keselesaan lebih baik kepada pemandu semasa memasuki kenderaan.

## **DEDICATION**

To my beloved father and mother,  
Eddy Barkley Fatani Bin Zakaria and Siti Hawa Binti Haji Minhat

The reasons for what I become today,  
Thank you for all your great supports, sacrifices, patience for me.

To my honored supervisor,  
Ts. Dr. Mohd Zakaria Bin Mohammad Nasir  
and all UTem's lecturers and staff,  
Thank you for always giving me guidance and persistence help to complete  
this project thesis.



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## **CHAPTER 1**

### **INTRODUCTION**

#### **1.0 Purpose**

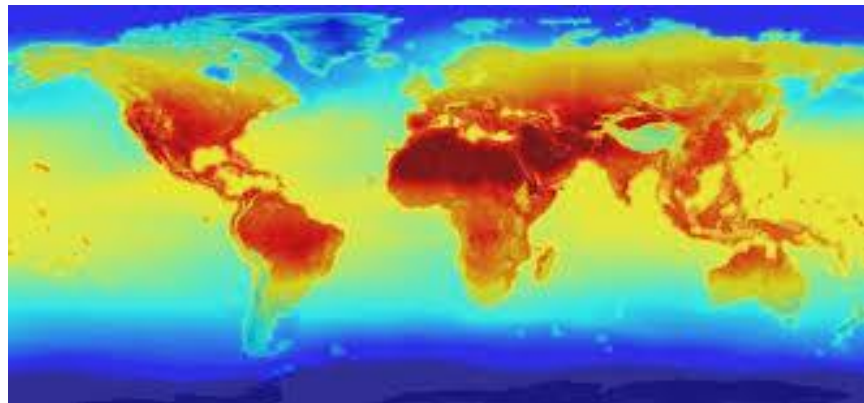
This chapter will discuss background information, problem statement, objective, scope, and the significance of the study on the topic of this report. The purpose of this report is to experiment and study on thermal effect using sunshades in the vehicle passenger compartment.

#### **1.1 Background**

Climate change has already been named the most pressing environmental difficulties that the world will face within the 21<sup>st</sup> century. The increases in the global average ocean and air temperature, widespread melting of snow and ice, and rising global average sea level during the 20<sup>th</sup> century have been shown and observed in collected data. (dan Keragaman et al., 2012). For our country, Malaysia is in the equatorial region and has a tropical rainforest climate. The average temperature of 27°C with high humidity and temperature can be risen to and above 30°C during the day every year. Every vehicle user is uncomfortable with this hot burning weather because it boils up their vehicle when parked outside.

## 1.2 Problem statement

In the millennium world, pollution on the environment caused by humans' actions has gotten worst day by day. Their vigorous action may lead to the destruction of the surrounding ecosystem. For the effect of pollution, global warming increases gradually by year, and it is affecting the human environment and ecology.



**Figure 1. 1: Global warming on Earth**

Most people prefer cheap and low-cost parking area, or they are unable to find any indoor parking, they will be looking for outdoor parking space. It will cause the heat rising on the vehicle when parked on the open parking lot especially when the sun strikes directly on the vehicle. The central part of the vehicle can quickly rise to 80°C, and these heat accumulations will cause distressing sensation to the driver and passenger while entering the car. (M. A. Jasni and F. M. Nasir, 2012). Various modes of heat transfer, such as conduction, convection, and radiation, are the main factors of the stooping temperature rise of the vehicle. (G. K. Jaiswal, M. Gandhu, S. Phalgaaonkar, H. Upadhyay, A. Agrawal, V. Rajamohan and K. Ganesan, 2012).

All the car equipment and parts will absorb all the solar radiation and will heat the car. Thus, it will make it impossible to cool down within a short period. For the first 10 minutes, the boiling temperature will cause most of the car passenger sweaty and feel very uncomfortable until the car cabin starts to cool down.

As a result, they must run the air-conditioning before starting their journey. Until now, every vehicle owner, especially in Malaysia, is facing this issue where the temperature is too hot for their car under the scorching sun. Many have come up with solutions such as air-conditioning, sunshades, solar-powered ventilator, and installation of window tint or solar reflective film to reduce the risk of heat accumulated in the car cabin. (M. A. Jasni and F. M. Nasir, 2012).