# DESIGN AND DEVELOPMENT OF LOCKING DEVICE FOR PROTON WAJA GLOVE BOX

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‘I / we admit that have read this work and in my / we opinion this work satisfied the scope and quality aspect for the
Bachelor of Mechanical Engineering (Automotive) awarded’

Signature :……

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Date :……

# DECLARATION

"I admit this report is my own work except for the summary and passage which each of it already been explained it source"

Signature :
Name of the Writer : JAMARIZAN BIN MOHD ISA
Date : 27/03/2008

# DEDICATION

Thanks to ALLAH S.W.T because with His blessings, I manage to finish this report according to the dateline. I dedicate this report to my beloved family who has always supported me in my whole life.

# ACKNOWLEDGEMENT

Alhamdulillah thanks to God for giving me the opportunity in order to complete my Project Saujana Muda (PSM). I would like to express my gratefully for the entire person that involves in completely my final project.

For the first, I am grateful to my project's supervisor En Mohd Zakaria B. Mohammad Nasir for his support and guidance me to complete the project. Any suggestion, ideas, any opinions from and what ever came from him are the learning process for me as a student. To the technician who spend a lot of time to help me to finish my project.

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Not forget to all my friends and person who involving whether direct and indirect to contributed their ideas and advices in this thesis. May God bless you alls. Thank you very much.

# ABSTRAK

Tujuan projek ini dilaksanakan adalah untuk mengatasi masalah alat kekunci bagi kotak sarung tangan Proton Waja bagi menentukan rekabentuk dan memperbaiki alat kekunci bagi kotak sarung tangan Proton Waja, selain itu projek ini bertujuan untuk mencari penyelesaian bagi meningkatkan kualiti alat kekunci dan sedikit ubah suai dilakukan terhadap alat kekunci agar dapat berfungsi dengan lebih baik. Model asal diukur menggunakan CMM (Coordinate Measurement Machine) and Vernier Calliper. Model asal dilukis semula menggunakan perisian CATIA. Setelah selesai melukis model itu akan di analisis menggunakan perisian MSC Nastran Patran di dalam menentukan bahagian yang yang bermasalah. Bahagian yang bermasalah ini mempunyai kebarangkalian untuk patah. Setelah bahagian yang bermasalah dikenal pasti sedikit perubahan akan dilakukan samada dari aspek ukuran, bentuk atau system kekunci itu sendiri perlu di ubahsuai.

# ABSTRACT

The purpose of this project is to overcome glove box problem and perform an improvement a locking devices of Proton Waja glove box. In order to determine the design and development of a locking devices of Proton Waja glove box, besides that this project aims to find a solution to improve the quality of the locking device and make a modification for locking device so it can function with much finer. The current model was measured by using CMM (Coordinate Measurement Machine) and Vernier Calliper. The current model will be redrawn by using catia. Once over draw product use catia, product will analyzed using MSC Nastran Patran software to determine the critical part. Those critical part have potential to break. After critical area has been pinpointed then slight modification would be made either from the aspect dimension, form, substance used or system key that need to modify.

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# CHAPTER I

# INTRODUCTION

## 1.1 Background

This project is to perform an improvement a locking devices for Proton Waja glove box process in order to determine the design and development of a locking devices for Proton Waja's glove box, besides that this project aims to find a solution to improve the quality of the locking device and make a little modification for locking device so can function with much finer. The current model was measured using Vernier Calipers and ruler (manual handling) .After all part dimension have been measured by the tools.

The current model will be redrawn by using CATIA. Once over draw model use CATIA, product will analyzed using software MSC Nastran Patran to determine critical component. Those critical components have potential to break. After critical area has been pinpointed then slight modification would be made either from the aspect dimension, form, substance used or system key that need to modify.

The new model will be redrawn in CATIA with new modification. The new model will be analyzed by using finite element to ensure those model will not failure for the second time testing. The improvement based on analysis and design characteristic will be done. After all process the product would be produced by using rapid prototyping machine. The rapid prototyping model also can used to get an accurate result from analysis as the raw material is the same material used in production.

## 1.2 Objective

- An improvement a locking device for Proton Waja's glove box.

## 1.3 Scope

- Measure coordinates via measurement tools CMM/3D scanner, Vernier calipers and ruler.
- Design and modeling locking device system in CATIA/Solidwork.
- Perform an analytical study on critical component by using MSC Nastran Patran.
- New improvement based on analysis and design characteristic (dimension or material).
- Print as prototype model by using rapid prototyping machine (RP).

## 1.4 Problem Statement

- Complaint from customers Proton Waja's, they have difficult to open the glove box because it always stuck especially at the right side chock.
- Some time the lever at the handle glove box was break because of the over force that imposed to the latch.
- Material used are not suitable to used, may be need replace to the another material are more strong.
- The design of locking device system exposing system not so suitable with energy which will be imposed.

## 1.5 Gantt Chart

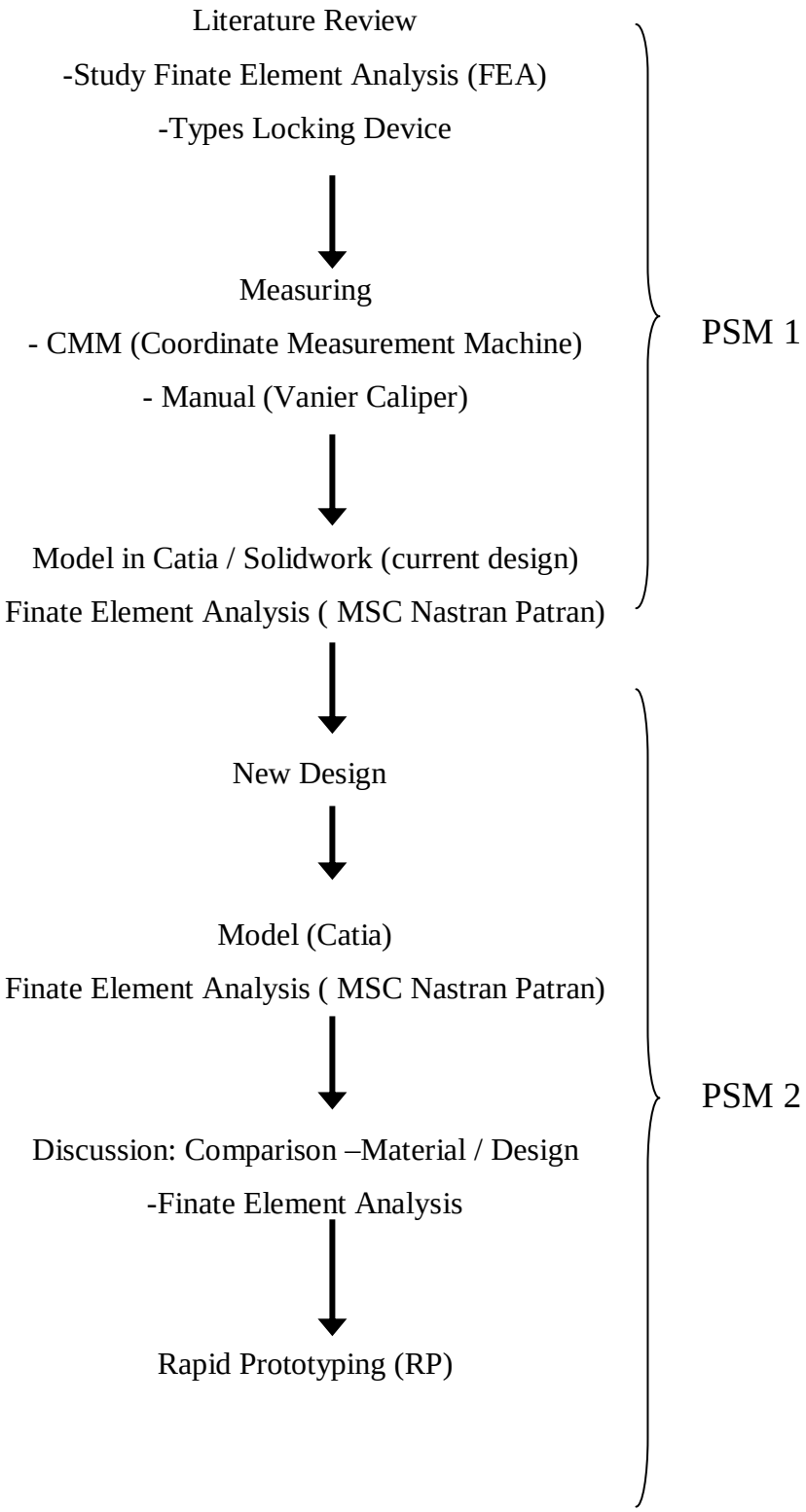
### PSM 1

| Task | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.Selection Title PSM | | | | | | | | | | | | | | | | |
| 2.Literature Review | | | | | | | | | | | | | | | | |
| 3.Measuring | | | | | | | | | | | | | | | | |
| 4.Model in Catia/solidwork for old design | | | | | | | | | | | | | | | | |
| 5.Finate Element Analysis (FEA) using Nastran Patran | | | | | | | | | | | | | | | | |
| 6, Submit draf report | | | | | | | | | | | | | | | | |
| 7.Submit Report | | | | | | | | | | | | | | | | |
| 8. Presentation Prepairation | | | | | | | | | | | | | | | | |
| 9. Presentation | | | | | | | | | | | | | | | | |

### PSM 2

| Task | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.Model in Catia/solidwork for New design | | | | | | | | | | | | | | | | |
| 2.Finate Element Analysis (FEA) using Nastran Patran | | | | | | | | | | | | | | | | |
| 3.Fabricate | | | | | | | | | | | | | | | | |
| 4.Print Model using RP | | | | | | | | | | | | | | | | |
| 5.Report Prepairatian | | | | | | | | | | | | | | | | |
| 6.Submit Report | | | | | | | | | | | | | | | | |
| 7.Presentation Prepairation | | | | | | | | | | | | | | | | |
| 8.Presentation | | | | | | | | | | | | | | | | |

## 1.6 Project Planning



# CHAPTER II

# LITERATURE REVIEW

## 2.1 Introduction

This thesis aim improvement of the Proton Waja glove box with a new design. Previous information and different glove box design are been collected and studying to find the most suitable design and technical analysis to overcome the previous failure in order to achieved a new design concept that can avoid the failure. This chapter will explain detail the concept design that will be achieved.

## 2.2 Failure Part of Proton Waja's Latch

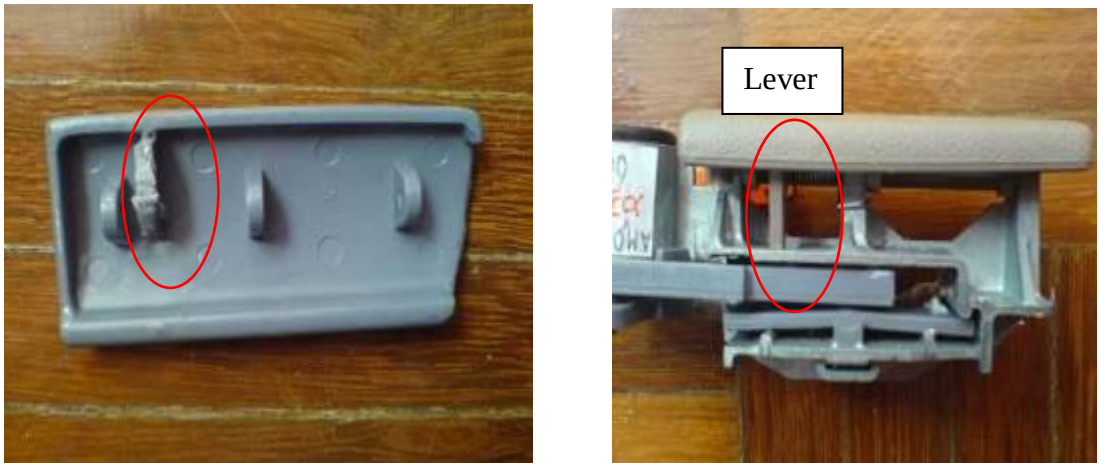



Figure 2.1: Latch failure

The red circle shows the failure part. Figure 2.1 shows the lever was received maximum force from the hand. The spring does not support the latch to absorb the force to minimize the force value and avoid the latch from brake. Actually the function of spring is to ensure that the latch back to its position or retract.

## 2.3 Finite Element Analysis (FEA)

Finite element analysis (FEA) is a computerized method for predicting how a part or assembly will react to environmental factors such as force, vibration and heat. Though it is called "analysis," in the product design cycle, it is used as a virtual prototyping tool to predict what is going to happen when the product is used.

Finite element analysis, as related to the mechanics of solids, is the solution of a finite set of algebraic matrix equations that approximate the relationships between load and deflection in static analysis and velocity, acceleration, and time in dynamic analysis.

In 1678, Robert Hooke set down the basis for modern finite element stress analysis as Hooke's Law. Stated simply, an elastic body stretches (strain) in proportion to the force (stress) on it. There are only one equation needs to understand linear finite element stress analysis and mathematically, the formula is as follow:

$$F = kx \text{----------(1)}$$

Where: F = force
k = proportional constant
x = distance of stretching

The finite element method works by breaking a real object down into a large number of elements (1000s or 100,000s of cubes) or meshing such as Figure 2.2. The behavior of each little element, which is regular in shape, is readily predicted by a set of mathematical equations. The summation of the behavior of each individual element produces the expected behavior of the actual object.

The finite element is a small, but not infinitesimal, part of the mechanical structure being modeled. The mechanical structure applied complex strength of materials formulations on simple geometric shape. The simplest examples are rods, beams, and triangular plates. More complicated elements include quadrilateral plates, curved shells, and 3D solids such as hexahedrons (bricks).

The word "finite element analysis" indicates that there are a finite number of elements in a model, such as Figure 2.2. Prior to the development of FEA tools, engineers employed integral and differential calculus techniques to solve engineering analysis problems. These techniques break down objects into an infinite number of elements for problem solving.

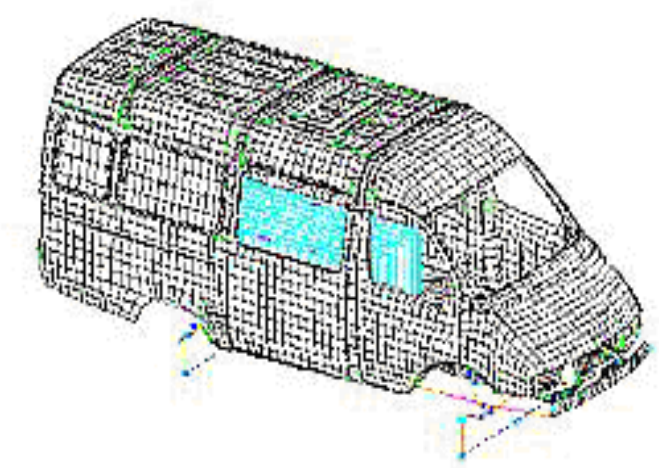


Figure 2.2: Example of meshing