# I INTRODUCTION

## 1.1 Background

Airplanes is aircraft that are heavier than air, have fixed winged, and can fly with their own power. There are two classes of aircraft. First, airplanes that lighter than air (aerostat). The aircraft that included in this type is airships. Second, aircraft that are heavier than air (aerodin). Aircraft including this type, namely autogiro, helicopters, experimental aircraft, transport aircraft, military aircraft and civilian passenger aircraft [1].

One of the most important components in the structure of aircraft is a landing gear. Landing gear has many types in its design studies and uses. The types of landing gear are tail wheel landing gear, tandem landing gear, landing gear tricycle, single main landing gear, quadricycle landing gear, and multi bogey landing gear. In general, the type of landing gear that is often used on commercial aircraft type Passanger Turbo Props is landing gear tricycle type. This type of landing gear has one wheel on the front of the aircraft (nose) and two wheels behind the plane (main) [2]

In general, landing gear functions to hold the load of the aircraft while on land and absorb energy due to the shock that occurs during the landing process. Impact forces arising during the landing process can cause damage to the landing gear. However, this damage can be minimized in several ways such as the use of stronger materials, adjusting system rigidity and the use of dampers that can reduce vibration. During the landing process, the plane is affected by short duration impulsive. The impact of landings has been recognized as a significant factor in structural fatigue damage, dynamic pressure on aircraft air frames and inconvenience of crew or passengers due to vibrations caused.

The need for effective vibration control techniques is felt in nearly every dynamic system. The use of damping as a vibration isolator to minimize vibration response and reduce input noise to the system is an effective alternative technique because it can reduce the amplitude. Vibration isolators can be visualized as a spring. Vibration isolation refers to the use of relatively tough elements with the aim of reducing the force of vibration or movement transmitted from one structure or

mechanical component to another. The role of the semi active spring is to isolate the mass from the movement of the wheel with shock absorbers or damper absorbing vibration and sudden shocks. Vibration isolators and vibration dampers vary greatly in configuration and complexity. The basic types can be categorized as adjustable vibration absorbers, elastic restraint insulators, fully active systems and semi-active systems [3].

Previous studies have investigated various objective functions and determined the optimal value for stiffness and damping in vibration reduction systems [3]. This research aims to determine the vibration amplitude and damping ratio of the main mass during excitation with variations in spring stiffness and main mass.

## 1.2 Problems

The variation of stiffness and mass on the landing gear system analyzed in this research aims to obtain a damper model with various characteristics needed. Characteristics of the desired landing gear are to have sufficient strength to withstand the shock load while also having good ability to absorb shock load energy so that it can reduce vibration after landing. For this reason, this research will try to find the optimal attenuation value from the landing gear system so that the above objectives can be achieved.

## 1.3 Aims

The objectives to be achieved in this research are :

1. To design a landing gear mechanism by considering the landing gear geometry and the static deflection.
2. To conduct the experimental study in determining the landing gear response and dynamic parameters such as natural frequency and damping ratio.

## 1.4 Benefits

The benefits that can be obtained from this research are :

1. Demonstrate the feasibility and effectiveness of the landing gear stiffness and adding mass variation to attenuate the impact of vibrations and improve the performance of the landing gear.

2. Reduce the structural fatigue damage on the landing gear due to the impact load.

## 1.5 Idealization

The idealization of the problem in this research are:

1. Motion is considered only in vertical direction
2. Spring is assumed linear
3. Constant damping is considered constant
4. The system model is considered one-degree-of-freedom system

## 1.6 Report Outline

This thesis is described in five chapters. In the first chapter describes the background of the final assignment, problems, aims, benefits, problem scope and the systematics of writing. In chapter two describes the literature review containing supporting theories related to the final assignment. In chapter three describes the research methodology, summarizes the stages of research in the form of flow chart, geometric modeling, and the procedure for calculating attenuation values. Chapter four contains the results and discussion. Chapter five contains the conclusions of the final assignment.