CHAPTER 1

INTRODUCTION

1.1 PROJECT BACKGROUND

Over past the decade, the aircraft technology already evolves into various types of shape and design which is base on the usage of the aircraft itself. There are two types of aircraft that widely be used which are the manned aircraft or aviation and unmanned aerial vehicles (UAV). The UAV is an aircraft without a pilot where it fly on its own if there is flight plans been programmed, but if not it will be controlled from a remote controller.

UAV can be divided into six categories of role which are Target and Decoy, Reconnaissance, Combat, Logistics, Research and Development, and Civil and Commercial UAV. Most of the categories are belong to the military field where there is certain part of military mission that cannot be completed by men. There are widely usages of the UAV in the military works but less in civil area. In the market place, the UAV can be divided by various sizes such as the small scale the hand-held Micro Air Vehicle (MAV), (Hwang, H.C. et al., 2004), the Mini UAV such as Dragon Eye, (Cambone, S.A. et al., 2005) and also the large-scaled UAV such as Predator, (Park, K. et al., 2008).
The widely usage of the UAV has increased the number of the UAV design itself where we can see different types of wing, control systems, and shapes used in the UAV itself. The most important part of the UAV is the wing or airfoil, where the wing itself will control the stability and determine whether the UAV will fly or not.

If the aerodynamic efficiency and optimization of aircraft structures can be improved, the cost of the construction can be reduced and minimized (Goraj, Z. 2005). This feature has stated the important role of the wing itself to the UAV. Thus, this study will cover up the wing or airfoil area of the UAV only which discusses the best airfoil to be used in certain parameters, such as angle of attack, wing aspect ratio, wing type, and others.

Specifically, this research will cover all the processes needed in the aircraft engineering subject from the conceptual design, preliminary design, and detail design until the result shown the best wing configuration to be used for the new UAV.

1.2 PROJECT OBJECTIVE

The main objective of this project is to design a suitable wing configuration for the new type reconnaissance UAV.

1.3 PROJECT SCOPES

This project will cover all the project scopes below:

a. Airfoil selection (NACA, Clark Y, Aquila, etc)
b. Airfoil properties ($C_L$, $AC$, $C_M$, etc)
c. Type of wing (Delta, Straight, etc)
d. Wing configuration (position, center of gravity, etc)
e. Wing placement
1.4 PROBLEM STATEMENTS

In this project, the major problems that need to be handled are to design a new UAV that will have the configuration based on the project assumptions and also the technical task. In developing new type of UAV, many criteria need to be taken into considerations. The criteria that must be taking care are the external design, conceptual design, preliminary design, detail design, flight testing and manufacturing. All of these criteria cannot be completed if each part of the UAV have not been analyze completely.

For UAV, beside the control system, the most important part of the UAV is to have perfect wing configuration, where it needs to be fit with the external design of the UAV project as to make sure it can provide the UAV to fly very smoothly. Therefore, in this project, all of these problems will be taken very positively into considerations and will be analyze later on, so that the target to build a UAV that will fly will be achieve.

1.5 PROJECT ASSUMPTIONS

In this project, few resolutions will be used in the conceptual design as to generate the Matching Diagram in next chapter:

- Cruise Speed, $V_{cr}$ : 60 km/h
- Loiter Speed, $V_{ltr}$ : 45 km/h
- Endurance, $E$ : 1 hour
- Range, $R$ : 10 km (for 30 minutes surveillance work)
- Altitude, $h$ : 1000ft
- Take off distance, $s_{TO}$ : 10m (launch by hand)
- Landing distance, $s_{L}$ : 100m