CHAPTER I
INTRODUCTION

1.1 Background

Unmanned aerial vehicle (UAV) is one type of unmanned aerial rover robot. Because it does not have a crew, the UAV must be controlled remotely using a remote control from outside the vehicle or so-called remotely piloted vehicle (RPV). Besides, the UAV can also move automatically based on the program that has been embedded in the computer [1] .

Fixed-wing unmanned aircraft is one type of aircraft that is being researched at this time, this is because this type of aircraft has an investment in research, manufacture, and operation that is easier and more widely used. UAVs have functions, for mapping and monitoring land, intelligence missions, surveillance and reconnaissance in the military field.

Unmanned aircraft have many parameters in the design process that can affect the characteristics of the drone, such as the type of airfoil, wing configuration, and other geometries. Selecting the correct wing configuration can result in effective aerodynamic performance in the complex relation of range and endurance to aircraft energy consumption [2]. The choice of wing configuration can also affect the speed and ability of the aircraft to maneuver.

Various ways have been made to improve the aerodynamic performance of the aircraft, one of which is by modifying the wing with the addition of slat. The slat is an extensible leading edge device that offers a solution against the increased risk of stall encountered at low speeds or high angles of attack by reducing the flow circulation around the surface of the main element [3].

Research by Granizo [3] on the effect of adding slats on aerodynamic performance was carried out by examining the geometry for the slats and then finding the best position for the slats. This study shows that there is a change in the aerodynamic characteristics of the airfoil, namely the lift coefficient and drag coefficient. This helps with the design of a slot that allows an aircraft to land and take-off at lower speeds, fly at higher angles of attack in maneuvering flight.

In another study by Weick dan Wenzinger [4] explains that a slotted wing is capable to obtain a higher lift coefficient and fly at higher angles of attack than the

one of the plain wings. However, the drag generated by a slotted wing is typically three times larger than the unslotted configuration at low angles of attack. To reduce the increment of the drag coefficient generated by slotted wings at low angles of attack, started by modifying the shape of the slot. Weick and Wenzinger concluded from the study that fixed slotted wings could be applied in aircraft with low landing speeds or excessively large wings. Slotted wings allow aircraft to obtain the desired minimum speed without stalling, and reduce the needed wing area (smaller wings). Also, fixed slots could be used only at the wing tips, to improve lateral stability and control at high angles of attack. With this, the maximum speed of the airplane would be less affected by the increased in the drag coefficient of the slot-wing combination.

To find precisely the aerodynamic performance of an aircraft equipped with an additional slat, it is necessary to test aerodynamics in designing an unmanned aircraft model. The test was carried out on a wind tunnel with an approximate 1: 4 scale AFRG 015 drone by adding slats to the wings. After testing, the aircraft was not produced and tested for flight.

Experiment on this unmanned aircraft model is to determine the lift coefficient, coefficient drag with variations in the angle of attack, wind velocity, and find the optimal drag and lift characteristics also flight tests are carried out to see the aircraft's ability to maneuver so that the AFRG 015 unmanned aircraft can run Fast on Track missions with less time.

1.2 Problem Formulation

The problem formulation for this research are:

1. How is the effect of the slat position on the unmanned aircraft on the lift coefficient and the drag coefficient.
2. How is the effect of the addition slat on an unmanned aircraft to the maneuver motion.

1.3 Objectives

The Objectives of this research are:

1. Knowing the effect of adding a slat to the wing on drag and lift coefficient in unmanned aircraft.

2. Knowing the effect of the addition slat on an unmanned aircraft to the maneuver motion.
3. Obtain additional slat position on an unmanned aircraft wing to reduce maneuver radius.

1.4 Outcomes

1. The benefit of this research is to obtain a modified wing unmanned aircraft design from the Gonjong Tujuah AFRG 015 aircraft which is capable of flying at high speed and can maneuver easily.
2. Gonjong Tujuah Team can apply the result of this research for the next competition.

1.5 Problem Scopes

The problem scopes of designing this aircraft wing are:

1. Calculations for the aircraft model Gonjong Tujuah AFRG 015 is used 1: 4 scale with a modification of the addition of a slat on the wing.
2. The type of airfoil used in the model is the same airfoil as the Gonjong Tujuah AFRG 015 unmanned aircraft, namely the ht08-il airfoil
3. The test was carried out by varying the angle of attack, between 0° to 30°.
4. The test was carried out in a wind tunnel test room with dimensions of 45 x45 cm with variations in wind speed ranging from 6 m / s - 12 m / s (blower frequency 15 Hz - 40 Hz).
5. The study did not include an analysis of the materials used.
6. The aircraft model used in this experiment is a rigid object that is not easily deformed.
7. Aircraft flight testing is conducted to see the aircraft's ability to maneuver at low speed and the turning radius of the aircraft.

1.6 Report Outlines

The research report consists of five chapters. CHAPTER I describe the background, problem formulation, objectives, outcomes, problem scopes, and report outlines. Then, CHAPTER II namely a literature review, contains theories that support experiments which will later become basic references in testing and analyzing data. CHAPTER III In this chapter, namely the methodology, which describes the steps taken to achieve goals such as design, testing, data collection,

and data processing and analysis. CHAPTER IV describes the result of the research. And the last chapter, CHAPTER V is conclusion.