# CHAPTER 1
# INTRODUCTION

## 1.1.    Background

UAV (Unmanned Aerial Vehicle) or unmanned aircraft is a technology that is increasingly developing and is widely used for various purposes such as mapping, observation, surveillance and delivery of goods. In Indonesia, the use of UAV technology for the purposes of expanding the area of observation and mapping is also increasing.

UAVs have the advantage of being able to monitor and map a wider and more accurate area, so they can be used for various purposes such as agricultural observations, natural disaster mapping, security and defense monitoring, and other research activities. However, in their use, UAVs also require clear and strict regulations to minimize potential risks and legal problems that may arise. Therefore, techno-economic analysis and UAV regulations are very important to ensure that the use of UAV technology in Indonesia can run well and have a positive impact on the growth of the area of observation and mapping in Indonesia.

The use of UAVs in regional surveillance and mapping activities has great potential in increasing the efficiency and accuracy of these processes. UAVs can reach areas that are difficult for humans and conventional aircraft to reach, and have the ability to capture images and data with very high resolution. This can certainly be an added value in various activities such as topographic mapping, observing land conditions, environmental monitoring, as well as regional supervision and security. However, apart from the positive potential, the use of UAVs also has several challenges and obstacles, especially in terms of regulations and security. Therefore, a comprehensive technological, economic and regulatory analysis is very important to ensure that the use of UAVs for regional observation and mapping purposes can be carried out safely, effectively and efficiently in Indonesia.

LAPAN LSU 02 is an experimental aircraft developed by LAPAN (National Institute of Aeronautics and Space) Indonesia. LSU (LAPAN Surveillance UAV) is an unmanned aircraft (Unmanned Aerial Vehicle) designed for surveillance and

monitoring missions. LAPAN LSU 02 is a development of the previous model, namely LAPAN LSU 01. This aircraft has a fixed-wing shape with a wide wing design which allows it to fly for longer periods of time. LSU 02 is equipped with various sensors and remote sensing equipment that can be used for earth surface observations, including environmental monitoring, mapping and security surveillance. This aircraft is expected to support various applications, such as natural resource monitoring, border monitoring, and assistance in search and rescue operations.

Analysis of the technology, economics and regulations of the LAPAN LSU-02 UAV is important to determine the potential for using this technology in increasing the growth of observation and mapping areas in Indonesia. In this analysis, factors such as procurement and operating costs, potential time and cost savings in data collection, and applicable regulations regarding the use of UAV technology in Indonesia need to be considered..

Currently, Unmanned Aircraft Vehicle (UAV) technology has developed rapidly, including in Indonesia. LAPAN Surveillance UAV (LSU)-02 is one of the fixed-wing UAVs in Indonesia. It has been developed by LAPAN, the Indonesian National Aerospace Research Agency, for mapping and monitoring. Position paper on drones serving manufacturing systems [1] identified the following problems: mechanical integration with machines, integration in the direction of the Internet of Things, scheduling and security of collaboration with humans and robots. Given the significant momentum and current activities promoting UAVs in mobile networks, it is timely to survey this new field. [2] surveyed communications demands for various UAV applications and analyzed the suitability of existing wireless technologies, including Bluetooth, Zigbee, Wi-Fi, WiMAX, and cellular, to meet those demands. In a paper, [3] analyzes the opportunity for drones to help mobile networks, but specializes in combining drones from different heights to form multi-tier drone networks. In another paper, [4] surveys the issues and opportunities for using drones to assist wireless networks in general without a specific focus on mobile networks. Recently, [5] delivers a comprehensive tutorial on UAV wireless communications.

## 1.2. Problem Statement

1. What are the technical characteristics of the LAPAN LSU Unmanned Aircraft Vehicle (UAV) in terms of communication networks, and what is the analysis from the UAV pilot system perspective?

2. How is the cost and benefit analysis of using the LAPAN LSU Unmanned Aircraft Vehicle (UAV)?

3. What are the regulations regarding UAVs, surveillance and mapping missions, as well as frequencies in Indonesia compared to international standards?

## 1.3. Objectives

This thesis aims to create a techno-economic model to understand the costs and benefits of building the LAPAN LSU-02 Unmanned Aerial Vehicle (UAV) system as monitoring and conducting independent mapping accompanied by technical aspects of this technology, and also the application of regulations on this technology to government in Indonesian and international standards.

## 1.4. Hypotesis

This research will discuss existing technology developed by LAPAN, namely LAPAN Surveillance UAV 02 (LSU-02) as part of efforts to utilize drone technology for regional surveillance and mapping. This technology is reliable in the long term and efficient to use because it is unmanned and able to cover more areas in a shorter time. In this research, the complete specifications and characteristics of UAV technology are discussed. From an economic aspect, the feasibility of using the costs and benefits related to UAV technology will be analyzed, both short and long term. Then create national independence in surveillance so that the state's confidential data is safe because it does not rent or ride on satellites belonging to other countries. Regulations related to this technology are quite good in maintaining

the sustainability of the UAV system in Indonesia, but will always change according to technological developments and international standards.

## 1.5. Research Methodology

The methodology used in the thesis research are:

1. Literature study: This method involves analyzing documents and relevant information sources to understand the regulations, technology, economics and use of UAVs for observation and mapping in Indonesia. Sources of information can include books, journals, regulatory documents, and online information sources.

2. Interview: This method involves direct interaction with experts and stakeholders who are experienced in the use of UAVs for observation and mapping in Indonesia. Experts can provide insight and perspective on regulations, technology, economics and the use of UAVs in Indonesia.

3. Observation: This method involves direct observation of the use of UAVs for observation and mapping in Indonesia. Observations can be carried out at observation locations or in operational activities using UAVs to understand more deeply about the technology and its use in practice.

4. Surveys: Surveys of stakeholders related to observation and mapping activities can help to obtain information about their needs in the use of UAVs and find out to what extent UAVs can meet these needs.

5. Data analysis: Collecting and analyzing data on the costs and benefits of using UAVs in observation and mapping activities, including economic factors, technology, regulations, and human resource capacity, can help to evaluate the feasibility of using UAVs in Indonesia and other data that relevant.