

ANALYSIS OF THE PERFORMANCE OF THE AMPHIBIOUS CESSNA 172 SP

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ABSTRACT

Amphibious aircraft are aircraft with the ability to take off and land on water, other than on the runway like airplanes in general. This type of aircraft will be one of the transportation options to reach islands throughout Indonesia. Performance is a term used to describe the ability of an aircraft to meet certain limitations that make it useful for a particular purpose. The subject of aircraft performance includes speed, altitude, range and fuel efficiency, required take-off distance, rate of climb and also aircraft control speed. The purpose of this study was to analyze the factors that affect performance on the Cessna 172 SP amphibious aircraft based on weight, analyze the factors that can normalize the performance of the Cessna 172 SP amphibious aircraft to be normal, and analyze the takeoff performance and landing performance on the Cessna 172 SP type amphibious aircraft. The research method used in this research uses the method of observation and literature study, with the stages of data collection followed by processing to get the results of the research analysis. The research results obtained in the study of factors that affect the decrease in the performance of the aircraft are the addition of float which has a weight of 212 kg. The results of the takeoff performance analysis based on the weight of the additional float is that the empty weight of the aircraft has increased from 767 kg to 979 kg, thus affecting the ground roll during takeoff which was originally 931 ft to 1,012 ft. The results of the landing performance analysis based on the weight of the added float is that the empty weight of the aircraft has increased, which was originally 767 kg to 979 kg, thus affecting the landing distance during landing which was originally 605 ft to 612 ft.

Keywords: Cessna 172 SP amphi, performance, takeoff, landing

1. INTRODUCTION

The strengthening of transportation connectivity is needed to improve access for the entire population of Indonesia, which is an archipelagic country, so that productivity and competitiveness can increase evenly. The growth of the population, the improvement of economic prosperity, and Indonesia's unique geographical location increase the "tendency to engage in air travel." Considering these factors, air transportation services are a very important and efficient means of connecting nearly 240 million people in Indonesia, as well as people in other parts of the world. Like in other service sectors, trade barriers in the air transportation service sector are implemented through government policies and various regulations.

Aircraft performance is a crucial consideration when designing and testing aircraft to ensure they can operate efficiently and economically. The subject of aircraft performance covers aspects such as aircraft speed, altitude, range, fuel efficiency, required takeoff distance, rate of climb, and aircraft control speed. Aircraft

manufacturers will publish performance data in the aircraft maintenance manual, detailing the behavior of the aircraft under various conditions, such as different speeds, weights, air temperatures, pressures, and densities.

Performance data includes information related to takeoff, climb, range, endurance, descent, and landing. Aircraft performance is also influenced by atmospheric conditions. Climbing performance will decrease in hot and humid conditions because higher temperatures and humidity, along with lower pressure, reduce air density.

When an aircraft is flying in the air, there are several factors that can affect its performance, and one of them is weight. Weight is a combination of the aircraft's load and its own weight. When weight increases, the engine must generate greater thrust to compensate for the added weight. Amphibious aircraft like the Cessna 172 use floats as additional equipment, which serves the purpose of landing on both water and land. This has an impact on

increasing the aircraft's weight. The ability to carry heavy loads, fly at high altitudes at high speeds, or cover long distances is crucial for performance.

The Cessna 172 SP can accommodate a baggage load of up to 54.4 kg. It has a standard cruising speed ranging from 90 to 100 knots and can fly at a maximum altitude of up to 13,000 feet. It is equipped with two fuel tanks located on the right and left wings, with a capacity of 42 gallons (160 liters) of avgas. This aircraft can stay airborne for up to 4 hours (Source: Aircraft Company). Currently, the Cessna 172 SP is widely used as a mode of transportation for short distances to places that are difficult to reach. It is also utilized for educational and recreational purposes.

2. METHODS

2.1 Research Design

Research methodology is a framework for problem-solving that outlines the stages of problem resolution briefly along with their explanations. In general, research methodology is structured to achieve the predetermined research objectives. The stages in the identification process are Observation and Literature Review. Observation is a research activity carried out to understand and gather information related to the performance data of the Cessna 172 SP floating aircraft located at API Banyuwangi. This data will then serve as the research object. The research object to be studied is the differences in performance data of the Cessna 172 SP floating aircraft. Literature Review is used as the theoretical foundation for solving the problem scientifically. Once the topic is determined, this stage involves conducting a literature review to support the research work. Relevant journals and references are used in this stage to enhance the research material.

2.2 Place and Time of Research

This research has been conducted from May 2023 to July 2023 at the campus of the Indonesian Flight Academy in Banyuwangi. More specifically, the preparation of the academic work began in December 2022.

2.3 Data Testing Techniques

The data testing techniques in this research are conducted through simulation and field testing.

3. RESULTS

3.1 Hasil dan Pembahasan

Factors affecting the decrease in performance of the amphibious Cessna 172 SP aircraft include the addition of floats, which weigh 212 kg, making the aircraft heavier after the floats are installed. This, in turn, increases the

drag on the aircraft as floats are large structures that add to the aircraft's surface area. To analyze the factors affecting the performance of the Cessna 172 SP amphibious aircraft, one approach is to increase the diameter of the propeller. This produces greater lift to reduce the drag caused by the floats.

The analysis results for takeoff and landing performance, based on the added weight of the floats, indicate that the empty weight of the aircraft increases from its original 767 kg to 979 kg. Consequently, this affects the takeoff speed, requiring the aircraft to reach a speed of 75 knots during takeoff with a ground roll of 1,163 ft (354 m). The landing distance, which was originally 725 ft, decreases to 605 ft due to the heavier aircraft weight, allowing the aircraft to stop within a shorter distance.

4. DISCUSSION

If you want to modify the takeoff and landing performance of the aircraft after adding floats, here are some suggestions to consider: Evaluate other components that can potentially be reduced in weight, such as fuel capacity restrictions to decrease the fuel load and replacing the original passenger seats with lighter composite materials like carbon fiber to help reduce seat weight. Consider how changes in Maximum Takeoff Weight (MTOW) will affect other components within the aircraft, such as the fuel system, control system, and others. Ensure that all components can operate effectively. This research is limited to analyzing takeoff speed and ground roll during takeoff, landing distance, and landing speed during landing. Further research may explore other parameters.

AUTHORS' CONTRIBUTIONS

J. M. T. S berkontribusi dalam semua proses penelitian, mulai dari pengeajuan judul, perencanaan, pembuatan bahan uji, pengujian spesimen, analisis data, serta penulisan karya ilmiah.

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