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Calculation of the Maximum Flight Cycle of the Cessna 208B Aircraft on the Commuter Route Network in Kalimantan

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ABSTRACT

Regional flights in Indonesia, particularly in Kalimantan, are vital for connecting remote communities and supporting economic activity. This study aims to calculate the maximum number of flight cycles that the Cessna 208B aircraft can perform on commuter routes in Kalimantan using three operational strategies: full tank, full passenger, and refueling. The methodology includes identifying specific commuter routes across Kalimantan, measuring distances between airports using SkyVector, and calculating aircraft fuel consumption and payload based on data from the Pilot Operating Handbook (POH) and the Cessna 208B Information Manual. Each strategy is simulated by calculating the aircraft's weight distribution and fuel usage during all phases of flight—take-off, initial climb, cruise, descent, and landing—under varying payload and fuel configurations. The outcomes are then used to determine the maximum achievable flight cycles for each strategy. The results show that the refueling strategy—where fuel is replenished at each airport—yields the highest number of flight cycles (8 cycles), compared to 4 cycles for the full tank strategy and 2 cycles for the full passenger strategy. These findings highlight the operational efficiency of adopting flexible fuel strategies for regional commuter routes and provide a basis for optimizing short-haul aviation logistics in archipelagic regions like Kalimantan.

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INTRODUCTION

Transportation plays a critical role in facilitating the movement of people and goods for various social and economic purposes. Among the different modes of transportation, air travel stands out for its ability to overcome geographical barriers such as mountains and oceans, offering faster travel over both short and long distances compared to other alternatives like maritime or land-based transport [5], [8]. This is particularly relevant in Indonesia, an archipelagic nation comprising over 17,000 islands, where efficient and reliable regional air connectivity is essential for equitable development and access to services [1].

Turboprop aircraft, such as the Cessna 208B, are especially suitable for regional operations in archipelagic and remote areas due to their fuel efficiency, ability to operate on shorter runways, and relatively low operating costs [11], [14]. The Cessna 208B is widely used in regional and commuter aviation, offering operational flexibility for short-haul routes with moderate passenger capacity. Powered by a Pratt & Whitney Canada PT6A-114A engine and equipped with a McCauley 3-blade propeller, the aircraft can reach a range of up to 810 nautical miles, making it ideal for connecting isolated areas in regions such as Kalimantan [12].

Fuel consumption and operational cost optimization are key concerns in modern aviation, especially for commuter routes where frequent take-offs and landings significantly influence aircraft wear and efficiency. Several studies have highlighted the importance of flight cycle optimization and fuel strategy selection to enhance operational sustainability [2], [9], [14]. However, limited studies have focused specifically on short-range turboprop aircraft like the Cessna 208B in the Indonesian context, particularly in underserved regions such as Kalimantan.

This study aims to address this gap by analyzing the maximum number of flight cycles that can be achieved by the Cessna 208B aircraft using three distinct operational strategies: (1) full tank fuel loading, (2) full passenger loading, and (3) refueling at each stop. Using flight performance data from the Pilot Operating Handbook (POH) and the Cessna Information Manual, this research evaluates how varying payload and fuel configurations impact fuel consumption and operational efficiency. The findings are expected to provide useful insights for regional airline operators, aircraft planners, and policymakers to enhance route planning and fleet utilization in Indonesia's regional aviation sector.

METHODS

This study applies a quantitative approach to evaluate the flight cycle performance of the Cessna 208B aircraft across various commuter route strategies in Kalimantan. The methodology is structured to simulate and compare three operational scenarios—full tank, full passenger, and refueling—based on flight performance data, aircraft specifications, and realistic route parameters. The following subsections outline the research stages, aircraft characteristics, reference documents, and flight strategy simulations used to obtain the results.

Research Stages

In this research, several steps are taken, as shown in the flowchart. The process begins at this stage by determining the flight network, routes, and airports to be used in the study. Next, specific routes in the Kalimantan region are identified. This is divided into three strategies: full tank, full passenger, and refueling. Then, the weight of the aircraft for each specified route is calculated. After that, the amount of fuel needed for each route from the take-off phase to landing is calculated. The number of flight cycles within a certain period is also calculated. Next, the total fuel consumption for each route, both burned and remaining, is calculated. The next stage determines whether all routes and strategies are appropriate. If so, the process continues to the next stage; if not, it returns to the step of calculating the aircraft weight for each route. Analysis: After all data is collected and calculated, an analysis is conducted to determine the number of flight cycles and the fuel burned in each strategy. Completion: The research has been completed.

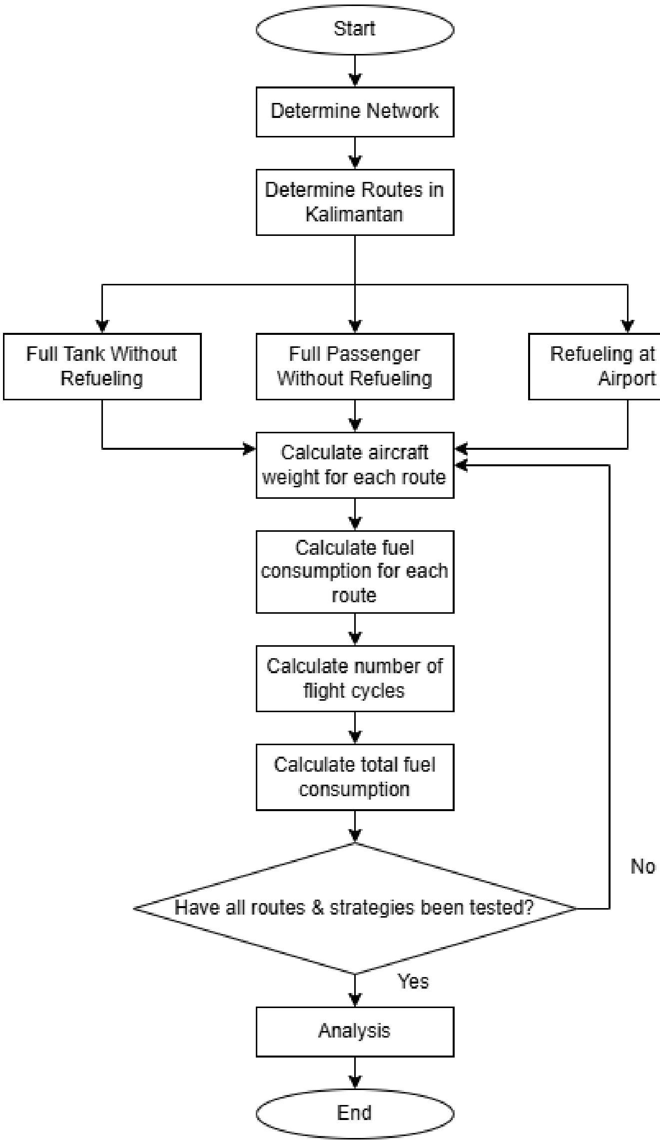

Figure 1 Flowchart

Cessna 208B

The Cessna 208B Grand Caravan is a single-engine turboprop aircraft widely used in regional and commuter aviation due to its simplicity, reliability, and ability to operate on short, unprepared runways [11], [12]. Manufactured by the Cessna Aircraft Company and powered by a Pratt & Whitney Canada PT6A-114A engine producing 675 SHP, the aircraft is equipped with a McCauley 3-blade constant-speed propeller (3GFR34C703/106GA-0), allowing for stable performance under various operating conditions [12].

This aircraft is frequently deployed in Indonesia's archipelagic regions, such as Kalimantan, where short-haul connectivity between remote airports is essential. In this study, the Cessna 208B was selected based on its operational prevalence and suitability for commuter missions. The aircraft's performance parameters were obtained from the official Pilot Operating Handbook (POH) and Information Manual, which served as the primary references for calculating payload, fuel trade-offs, and fuel consumption across multiple flight segments.

The calculation of flight cycles under various operational strategies—namely full tank, full passenger, and refueling—relies on the balance equation:

$$MTOW = OEW + Fuel + Payload \tag{1}$$

For each strategy, this equation is adapted to solve for either fuel or payload, depending on which variable is prioritized. Fuel consumption for each flight phase (take-off, initial climb, cruise, descent, and landing) is extracted from POH tables, and when exact data are unavailable, interpolation is used. Route distances were determined using SkyVector for eight commuter segments in Kalimantan. Flight altitudes between 4,000 and 16,000 feet were assigned based on segment length and standard operating procedures for regional aircraft.

The detailed aircraft specifications used as a basis for all calculations are as follows:

Weights

Max. take-off weight : 8.750 lbs (3.969 kg)
Max. landing weight : 8.500 lbs (3.855 kg)
Operational empty weight : 5.270 lbs (2.390 kg)
Max. payload : 3.230 lbs (1.465 kg)
Max. fuel load : 2.244 lbs (1.018 kg)

Dimensions

Overall length : 41 ft 7 in (12,67 m)
Overall height : 15 ft 5 in (4,70 m)
Wing span : 52 ft 1 in (15,68 m)
Wing area : 279,4 ft2 (25,96 m2)
Entrance door : 24 x 50 in (0,61 x 1,27 m)
Cargo door : 49 x 50 in (1,244 x 1,27 m)

Performance

ISA- sea level MTOW for take-off : 1.405 ft (428 m)
ISA- sea level MTOW for landing : 915 ft (279 m)
Power Plant : Pratt & Whitney Canada PT6A-114A
Take-off power one engine : 675 SHP
Propeller : McCauley 3-bladed (3GFR34C703/106GA-0)
Range with max pax : 789 NM
Max. climb : 675 SHP
Max. cruise : 675 SHP

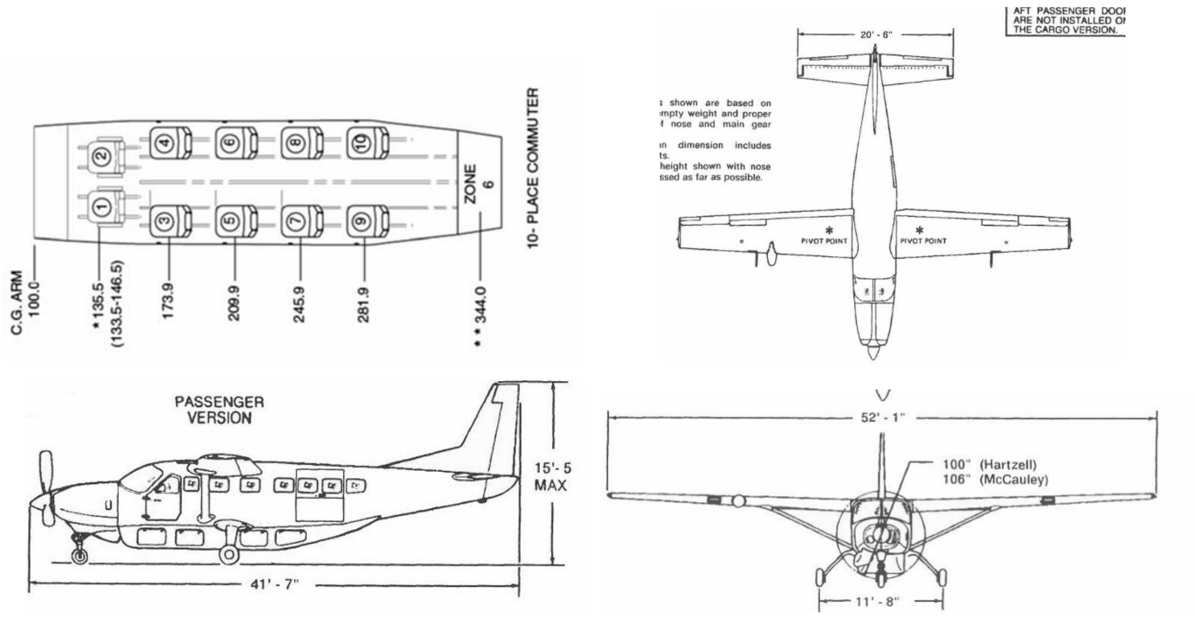

Figure 2 Dimensions Cessna 208B

Pilot Operating Handbook (POH)

The Pilot Operating Handbook (POH) is a critical reference document that provides comprehensive operational information required by pilots to operate an aircraft safely, effectively, and in compliance with airworthiness standards. It includes detailed data such as aircraft specifications, operational limitations, standard and emergency procedures, aircraft performance charts, and weight and balance information [12]. For the Cessna 208B, the POH is used as the primary source for calculating fuel consumption across flight phases—take-off, climb, cruise, descent, and landing—under various load and altitude conditions. The POH also supports mission planning by offering performance tables that allow for estimation based on interpolated inputs, which is particularly useful in commuter operations involving short and variable routes.

Commuter Route

Commuter routes refer to short-distance air transportation services, typically operated using small turboprop aircraft like the Cessna 208B. These services connect remote or secondary airports to regional hubs and are essential in areas with limited ground infrastructure. Commuter aircraft generally carry fewer than 19 passengers, making them ideal for flexible, low-volume, high-frequency operations in geographically challenging environments such as Indonesia [13], [14]. In Indonesia's archipelagic regions, commuter routes enhance connectivity, support socioeconomic development, and serve as lifelines for medical, educational, and administrative access [1], [9].

Flight Strategy

This study analyzes three distinct flight operation strategies to evaluate the maximum flight cycles achievable by the Cessna 208B: (1) Full Tank, (2) Full Passenger, and (3) Refueling at each airport. Each strategy represents a different operational priority—fuel endurance, revenue maximization, or fuel efficiency.

1. Full Tank Strategy involves loading the aircraft with the maximum fuel capacity (1,018 kg), which reduces allowable payload but provides range flexibility. This strategy is advantageous when flying to remote airports without refueling facilities, though it increases takeoff weight, thereby reducing fuel efficiency [14].
2. Full Passenger Strategy prioritizes maximizing payload with 11 passengers onboard (approx. 990 kg), which limits fuel capacity to 589 kg. This approach is suited for peak-demand periods where maximizing ticket revenue is critical. However, this strategy requires precise planning to avoid fuel shortages and may reduce operational range [1], [9].
3. Refueling Strategy allows the aircraft to carry only the necessary fuel for each leg and refuel at every stop. This reduces take-off weight and improves fuel efficiency per segment. However, it depends heavily on the availability and cost of fuel infrastructure at each destination, and may increase turnaround time [9], [14].

These strategies are examined in relation to aircraft performance data to determine which yields the highest number of flight cycles under realistic commuter route conditions. The Cessna 208B aircraft has a Maximum Takeoff Weight (MTOW) of 3,969 kg, a fuel capacity of 1,018 kg, and an Operating Empty Weight (OEW) of 2,390 kg. The average weight of an adult passenger is 70 kg, while the baggage weight per passenger is 20 kg, making the total weight considered per passenger 90 kg. The maximum payload of the Cessna 208B is 1,465 kg.

RESULT AND DISCUSSION

The results of this study are presented and discussed in this section to evaluate the performance of the Cessna 208B aircraft across various commuter route strategies in Kalimantan. The analysis includes the structure of the route network, distance calculations between airports, and detailed fuel consumption assessments for each operational scenario. Through simulations of full tank loading, full passenger capacity, and refueling at each airport, this section provides a comparative evaluation of flight cycles and fuel efficiency. Each sub-section systematically presents the findings, supported by calculations and operational data, followed by an overall analysis to determine the most effective strategy for regional flight operations.

Commuter Route Network in Kalimantan

The commuter route network in Kalimantan, served by regional operators such as Susi Air, plays a vital role in providing access to remote areas. This study considers eight key routes typically flown by the Cessna 208B: Tarakan, Long Apung, Tanjung Selor, Malinau, Samarinda, Nunukan, Maratua, Datah Dawai, and Melak. These routes were selected based on their operational feasibility and regional significance. The selection criteria included route accessibility, available airstrips, average passenger volume, and alignment with existing commuter flight schedules in East and North Kalimantan.

Figure 3 Commuter Route Network in Kalimantan

Calculation of Distances Between Airports

Distances between airports were calculated using **SkyVector**, a recognized flight planning and navigation tool. The measured great-circle distances ranged from 63 NM (Tanjung Selor–Malinau) to 270 NM (Samarinda–Nunukan), representing typical short-haul commuter legs in Kalimantan. The full set of distances is presented in Table 1.

Table 1 Distance of the Commuter Routes in the Kalimantan Area

No	Route	Distance (NM)
1	Tarakan – Long Apung	184
2	Long Apung – Tanjung Selor	159
3	Tanjung Selor – Malinau	63
4	Malinau – Samarinda	239
5	Samarinda – Nunukan	270
6	Nunukan – Maratua	128
7	Maratua – Datah Dawai	258
8	Datah Dawai – Melak	96

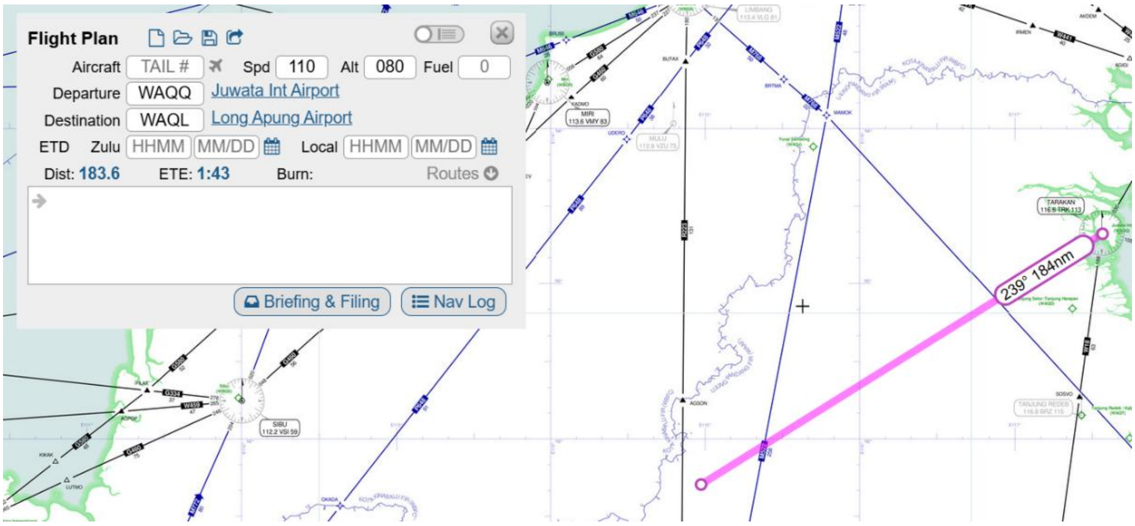

Figure 4 Tarakan – Long Apung route using SkyVector.

Fuel Consumption Calculation

Fuel consumption for each route was calculated using data from the Cessna 208B Pilot Operating Handbook (POH), covering all flight phases: take-off, climb, cruise, descent, and landing. For values not directly available, interpolation was applied. Each of the three strategies—full tank, full passenger, and refueling—was analyzed to determine its operational efficiency in terms of fuel usage and maximum achievable flight cycles.

Calculation of Full Tank on Kalimantan Routes

In the full tank strategy, the aircraft starts the flight with a full fuel load, with the remaining passenger weight calculated from the MTOW (Maximum Take-Off Weight). The Cessna 208B has a full tank MTOW of 3,948 kg, a fuel weight of 1,018 kg, and an OEW (Operating Empty Weight) of 2,390 kg. Thus, the equation is as follows:

$$\mathrm{MTOW} = \mathrm{OEW} + \mathrm{FUEL} + \mathrm{PAYLOAD}$$

$$\mathrm{PAYLOAD} = \mathrm{MTOW} - \mathrm{OEW} - \mathrm{FUEL}$$

$$\mathrm{PAYLOAD} = 3.948 - 2.390 - 1.018$$

$$\mathrm{PAYLOAD} = 540\ \mathrm{Kg}$$

The average weight of an adult passenger is 70 kg, while the baggage weight per passenger is 20 kg, making the total weight considered per passenger 90 kg. To determine the number of passengers, the following calculation is used:

$$\mathrm{PASSENGER} = \frac{\mathrm{PAYLOAD}}{\mathrm{LOAD\ PER\ PASSENGER}} = \frac{540}{90}$$

$$= 6\ \mathrm{Passenger}$$

Table 2 Full Tank Strategy

TOW (kg)	OEW (kg)	Fuel (kg)	Baggage Weight per Passenger (kg)	Weight per Passenger (kg)	Passenger
3.948	2.390	1.018	20	70	6

Example calculation for the Tarakan – Long Apung route:

Distance : 184 NM
Flight Level : 12.000 ft (assuming cruising altitude)
TOW : 3.948 kg

a. Calculating Fuel for Take-off and Initial Climb:

The fuel required for Take-off is 35 pounds (15 kg) and for Initial Climb is 132 pounds (60 kg), based on data from the Pilot Operating Handbook (POH) in Table 2.1 for each route in Kalimantan, assuming International Standard Atmosphere (ISA) at 20°C.

Climb Speed KIAS (Knots Indicated Air Speed) : 102 knots
Time : 22 min
Fuel : 15 + 60 = 75 kg
Distance : 43 nm

b. Calculating Fuel for Cruise:

The fuel required for Cruise is 129 kg based on data from the Pilot Operating Handbook (POH) in Table 2.2 for each route in Kalimantan, assuming International Standard Atmosphere (ISA) at 20°C:

KTAS (Knots True Air Speed) : 148 knots
Fuel : 284 lbs (129 kg)

c. Calculating Fuel for Descent:

The fuel required for Descent is 32 kg based on data from the Pilot Operating Handbook (POH) in Table 2.4 for each route in Kalimantan, assuming International Standard Atmosphere (ISA) at 20°C:

KIAS (Knots Indicated Air Speed) : 160 knots
Time : 15 min
Fuel : 71 lbs (32 kg)
Distance : 43 nm

Trip fuel Tarakan-Long Apung = Fuel Take-Off and Initial Climb+ Fuel Cruise + Fuel Descent

Trip fuel Tarakan-Long Apung = 15 + 60 + 129 + 32 = 236 Kg

Table 3 Calculation Results for Fuel with Full Tank Strategy

Aircraft	**Route**	**Distance (NM)**	***Flight Level***	***Take Off Weight* (kg)**	***Trip Fuel* (kg)**
Cessna 208B	Tarakan - Long Apung	184	12000	3948	236
	Long Apung - Tanjung Selor	159	8000	3712	209
	Tanjung Selor - Malinau	63	4000	3503	205
	Malinau – Samarinda	239	16000	3298	230
***Total Trip Fuel* (kg)**					**880**

From Table 3, the trip fuel is obtained from the sum of fuel for take-off, initial climb, and descent from the route Tarakan to Samarinda. The calculation results in a total fuel amount of 1,018 kg without any refueling at each route. The total fuel burned from the calculations is 880 kg, leaving a remaining fuel of 138 kg. The full tank strategy requires a trip fuel of approximately 205 – 236 kg.

Calculation of Full Passenger on Kalimantan Route

In this strategy, the aircraft starts the flight with less than full fuel, allowing for a full passenger load. The aircraft carries 11 passengers with an average weight of 70 kg each, and the baggage weight per passenger is 20 kg. Therefore, the total weight considered per passenger is 90 kg. In this study, data for the Cessna 208B is used, with an Operating Empty Weight (OEW) of 2,390 kg, which is appropriate for this aircraft type.

To determine the fuel carried, the following formula is used:

$$\mathrm{MTOW} = \mathrm{OEW} + \mathrm{FUEL} + \mathrm{PAYLOAD}$$
$$\mathrm{FUEL} = \mathrm{MTOW} - \mathrm{OEW} - \mathrm{PAYLOAD}$$
$$\mathrm{FUEL} = 3.969 - 2.390 - 990$$
$$\mathrm{FUEL} = 589\ \mathrm{Kg}$$

Table 4 Full Passenger Strategy on Kalimantan Route

TOW (kg)	OEW (kg)	Passenger	Average Weight per Passenger (kg)	Baggage Weight per Passenger (kg)	Fuel Weight (kg)
3.969	2.390	11	70	20	589

Example Calculation for the Tarakan – Long Apung Route
Distance : 184 NM
Flight Level : 12.000 ft (assuming cruising altitude)
TOW : 3.969 kg

a. Calculating Fuel for Take-off and Initial Climb:

The fuel required for Take-off is 35 pounds (15 kg) and for Initial Climb is 132 pounds (60 kg), based on data from the Pilot Operating Handbook (POH) in Table 2.1 for each route in Kalimantan, assuming International Standard Atmosphere (ISA) at 20°C.
Climb Speed KIAS (Knots Indicated Air Speed) : 102 knots
Time : 22 min
Fuel : 15 + 60 = 75 kg
Distance : 43 nm

b. Calculating Fuel for Cruise:

The fuel required for Cruise is 129 kg based on data from the Pilot Operating Handbook (POH) in Table 2.2 for each route in Kalimantan, assuming International Standard Atmosphere (ISA) at 20°C:
KTAS (Knots True Air Speed) : 148 knots
Fuel : 284 lbs (129 kg)

c. Calculating Fuel for Descent:

The fuel required for Descent is 32 kg based on data from the Pilot Operating Handbook (POH) in Table 2.4 for each route in Kalimantan, assuming International Standard Atmosphere (ISA) at 20°C:
KIAS (Knots Indicated Air Speed) : 160 knots
Time : 15 min
Fuel : 71 lbs (32 kg)
Distance : 43 nm
Trip fuel Tarakan-Long Apung = Fuel Take-Off and Initial Climb+ Fuel Cruise + Fuel Descent
Trip fuel Tarakan-Long Apung = 15 + 60 + 129 + 32 = 236 Kg

Table 5 Fuel Calculation Results for Full Passenger Strategy

Aircraft	Route	Distance (NM)	Flight Level	Take Off Weight (kg)	Trip Fuel (kg)
Cessna 208B Grand Caravan	Tarakan - Long Apung	184	12.000	3.969	236
	Long Apung - Tanjung Selor	159	8.000	3.733	209
Total Trip Fuel (kg)					**445**

From Table 5, the trip fuel is obtained by summing the fuel for take-off, initial climb, and descent from the Tarakan to Tanjung Selor route. The calculation shows that the amount of fuel for the initial departure, with less than a full tank and without refueling, is 589 kg. The total fuel consumed from the calculations is 445 kg, leaving a remaining fuel of 144 kg. The full passenger strategy requires a trip fuel of approximately 209 – 236 kg.

Calculation of Refueling Strategy on Kalimantan Route

In the refueling strategy, fuel data carried is used similarly to the full passenger strategy at each transit. Below is an example of fuel consumption calculations for the specified route, assuming refueling at each stop.

$\mathrm{MTOW} = \mathrm{OEW} + \mathrm{FUEL} + \mathrm{PAYLOAD}$

$\mathrm{FUEL} = \mathrm{MTOW} - \mathrm{OEW} - \mathrm{PAYLOAD}$

$\mathrm{FUEL} = 3.969 - 2.390 - 990$

$\mathrm{FUEL} = 589\ \mathrm{Kg}$

Tabel 6 Refueling Calculation on Kalimantan Route

Passenger	Average Weight per Passenger (kg)	Average Baggage Weight per Passenger (kg)	Weight of Fuel (kg)	OEW (kg)	TOW (kg)
11	70	20	589	2.390	3.969

In Table 6, the total weight calculation and fuel determination for passengers on the Kalimantan route using a refueling strategy is specified. It is assumed that the weight of an adult passenger is 70 kg, consisting of 11 passengers with a total weight of 770 kg, and the baggage weight per passenger is 20 kg, totaling 220 kg. This study uses data from the Cessna 208B aircraft with an Operating Empty Weight (OEW) of 2,390 kg, carrying varying amounts of fuel. Below is an example of how to calculate the fuel consumption for the specified route based on weight variations.

Example Calculation of the route from Samarinda to Nunukan

Distance : 270 NM
Flight Level : 16.000 ft (assuming cruising altitude)
TOW : 3.969 kg

a. Calculating Fuel for Take-off and Initial Climb:

Fuel obtained for Take-off is 35 pounds (15 kg) and Initial Climb is 202 lbs (92 kg) based on the POH (Pilot Operating Handbook) in Table 2.1 for each route in Kalimantan, assuming + International Standard Atmosphere (ISA) 20°C is obtained:

Climb Speed KIAS (Knots Indicated Air Speed) : 96 knots
Time : 35 min
Fuel : 15 + 92 = 107 kg
Distance : 71 nm

b. Calculating Fuel for Cruise:

Fuel obtained for Cruise is 116 kg based on data from the POH (Pilot Operating Handbook) in Table 2.3 for each route in Kalimantan, assuming + International Standard Atmosphere (ISA) 20°C is obtained:

KTAS (Knots True Air Speed) : 141 knots
Fuel : 256 lbs (116 kg)

c. Calculating Fuel for Descent:

Fuel obtained for Descent is 43 kg based on data from the POH (Pilot Operating Handbook) in Table 2.4 for each route in Kalimantan, assuming + International Standard Atmosphere (ISA) 20°C is obtained:

KIAS (Knots Indicated Air Speed) : 140 knots
Time : 20 min
Fuel : 95 lbs (43 kg)
Distance : 59 NM

Trip fuel Samarinda - Nunukan = Fuel Take-Off and Initial Climb+ Fuel Cruise + Fuel Descent
Trip fuel Samarinda - Nunukan = 15 + 92 + 116 + 43 = 266 Kg

Table 7 Results of the Refueling Strategy

Aircraft	Route	Distance (NM)	Flight Level	Take Off Weight (kg)	Trip Fuel (kg)
Cessna 208B	Tarakan - Long Apung	184	12000	3765	229
	Long Apung - Tanjung Selor	159	8000	3765	211
	Tanjung Selor - Malinau	63	4000	3765	208
	Malinau - Samarinda	239	16000	3969	266
	Samarinda – Nunukan	270	16000	3969	266
	Nunukan – Maratua	128	8000	3600	207
	Maratua – Datah Dawai	258	16000	3680	240
	Datah Dawai – Melak	96	4000	3538	169
***Total Trip Fuel* (kg)**					**1796**

From Table 7, there are results of the simulation calculations for the Full Passenger Strategy with Refueling at each airport for the Kalimantan route, from Tarakan to Melak. The trip fuel is obtained from the sum of fuel for take-off, initial climb, and descent from the Tarakan to Melak route. The result of the calculation is the total fuel from the initial departure route with fuel (bahan bakar) not fully loaded, with refueling varying for each route. The total fuel burned from the calculations is 1,796 kg. The refueling strategy requires trip fuel of approximately 169 – 266 kg.

Analysis

In the fuel consumption calculations, data from the POH (Pilot Operating Handbook) for the Cessna 208B was used, with varying weights and flight levels for the Kalimantan route.

In the full tank strategy (fuel on board 1,018 kg), the aircraft can perform 4 routes (cycles) in Kalimantan without refueling, with a fuel requirement of 880 kg and a remaining fuel of 138 kg. The full tank strategy at the initial departure is aimed at flights without refueling at the next airport (small airports) where fuel prices are higher or where there are no refueling facilities.

In the full passenger strategy (fuel on board 589 kg), the aircraft can perform 2 routes (cycles) in Kalimantan without refueling, with a fuel requirement of 445 kg and a remaining fuel of 144 kg. The full passenger strategy is used during high demand periods when revenue is greater.

In the refueling strategy during passenger transit (fuel on board varies), the trip fuel calculation yielded 1,796 kg. The refueling strategy is applied when the aircraft approaches the MTOW (Maximum Take-off Weight) for long distances.

Table 8 Results of the total trip fuel calculation and flight cycle

Strategy	Fuel On Board	Flight Cycle	Trip Fuel Total (Kg)
Full Tank	1,018 kg	4	880
Full Passenger	589 kg	2	445
Refueling	Varies per route	8	1,796

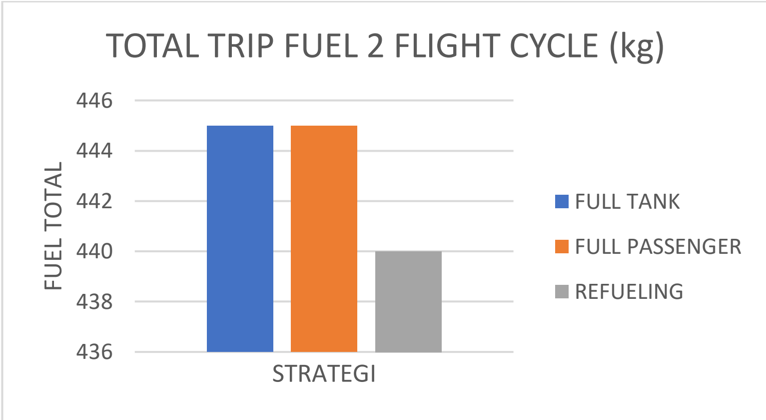

Figure 5 Comparison chart of total fuel for 2 Flight Cycles of the full tank strategy, full passenger strategy, and refueling strategy for the Kalimantan route

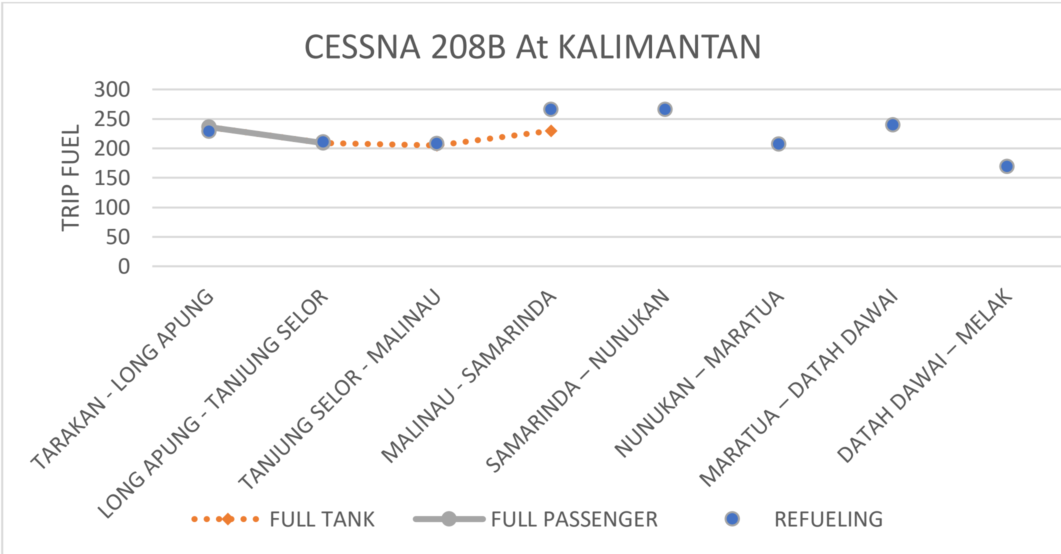

Figure 6 Trip fuel chart for the full tank strategy, full passenger strategy, and refueling strategy for the Kalimantan route

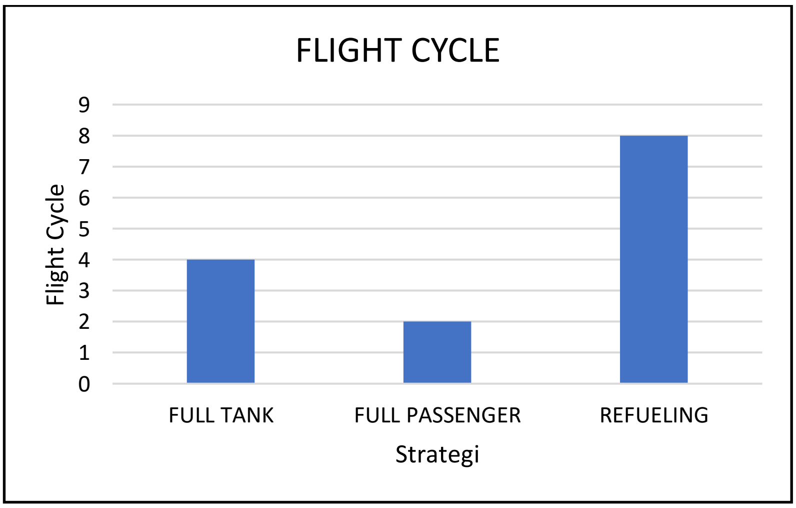

Figure 7 Comparison chart of flight cycles in Kalimantan

From Figure 3, the comparison for 2 flight cycles shows that the most efficient strategy is the refueling strategy, with fuel consumption of 440 kg, which is 5 kg more economical compared to the full passenger and full tank strategies. In Figures 4 and 5, it can be seen that the refueling strategy has a greater number of flight cycles, totaling 8 flight cycles, compared to the other strategies, such as full tank and full passenger.

CONCLUSION

Based on the results and analysis in the previous chapters, the following conclusions can be drawn:

1. Based on fuel consumption analysis, the refueling strategy is the most optimal, enabling 8 flight cycles with a full load of 11 passengers and total fuel usage of 1,796 kg. In comparison, the full tank strategy achieves 4 cycles with 6 passengers (880 kg of fuel), while the full passenger strategy results in only 2 cycles using 445 kg of fuel.
2. Each strategy presents specific advantages depending on route conditions. The refueling strategy is recommended for routes with fuel facilities, while the full tank approach is better suited for remote destinations. Future studies should incorporate variables such as fuel price, ground time, and environmental impact to support more sustainable and efficient regional flight operations.

SUGGESTIONS

Based on the findings and analysis conducted in this study, several suggestions are proposed to improve the efficiency and sustainability of regional flight operations using the Cessna 208B aircraft. These suggestions may also serve as input for future research and aviation planning:

1. Airlines should apply the refueling strategy on routes with available fuel facilities to maximize flight cycles and passenger capacity.
2. Fuel infrastructure at small airports should be improved to support efficient operations.
3. Future research should consider fuel prices, turnaround time, and passenger demand variability.
4. Use optimization methods (e.g., simulations or linear models) for better planning.
5. Include carbon emission analysis to support sustainable aviation practices.

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