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FEASIBILITY ANALYSIS OF N219 AIRCRAFT ROUTING IN TIMIKA

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Abstract-The Republic of Indonesia has the largest archipelago in the world. With the geographical condition, however, there are still several areas that are isolated and difficult to reach, even not accessible by road. These conditions will make it difficult for the Government in an effort to build connectivity between areas in an attempt to equitable development. PT. Dirgantara Indonesia or known as Indonesian Aerospace (IAe) is developing a new aircraft, which is suitable for the mission of the pioneer air transportation. The aircraft is the N-219, which has capacity to carry 19 passengers and cargos and will entry into service in year 2017. The aircraft route that will be discussed specifically in this study is based in Timika, Mimika Regency, Papua. The total project cost and the revenue will determine the project calculation. Then the cost and the revenue will be used to calculate the Net Present Value (NPV), Internal Rate of Return (IRR), and as well as Payback Period (PBP). After all of the calculation is done, then the calculation of the Sensitivity Analysis will be made. Then, the result of the calculation which are NPV, IRR, and PBP will show the project whether it is feasible or not. This final project presents to readers a clearly vision of financial production of a turboprop aircraft. It will also help the potential airlines, which may be interested on buying this kind of aircraft in the future. As for the conclusion, the NPV of the project is USD 37,004,404.-, the IRR is 27.3% (which good because its greater than the Minimum Acceptable Rate of Return), the Payback Period is 5 years 4 months (which is also good enough because it is still during the project lifetime). So from these results, it can be concluded that this project is feasible.

Keywords: Aviation Routing, Feasibility Study, Sensitivity Analysis

Introduction

The Republic of Indonesia has the largest archipelago in the world. With the geographical condition, however, there are still several areas that are isolated and difficult to reach, even not accessible by road. These conditions will make it difficult for the Government in an effort to build connectivity between areas in an attempt to equitable development. The air transportation is one of the pioneering efforts to open these isolated areas. But in the reality, Transportation Ministry has not been able to meet the growing demand of the community. The ability of the pioneering air transport operators on the beginning of 2010 is capable of transporting passengers in an amount up to 69%. It means there is still a chance for the new operator as well as the new route development by existing operators. In 2010, the pioneering air transport needs in Indonesia totaled 110 routes, covering 14 provinces and 89 cities.

The need for the addition of air transport pioneer in Indonesia is very high, but the number of operator does not seem to add up. One of the basic problems is the availability of the aircraft in the market, which is suitable for the special mission. Therefore, this study was made with the purpose of finding out whether the usage of the new aircraft N219 in the province Papua will be feasible or not from the financial point of view. The aircraft route that will be discussed specifically in this study is in the Province of Papua, whereby the route will be based in Timika, the capital city of Mimika Regency. Timika has the highest traffic for aviation pioneers that will benefit this project and make a huge impact on the aircraft revenue rather than other cities.

Literature Review

Feasibility Study

Feasibility study is a research method of a project designed to uncover the strengths and weaknesses of the project and determine whether the project is feasible or not. (Microsoft Encarta, 2009). The result of the feasibility study will show whether the project or business can make a profit or not, so that the project manager or owner can make a further long-term decisions about the project itself.

Present Value (PV)

Present Value (PV) is the current dollar value of a future amount—the amount of money that would have to be invested today at a given interest rate over a specified period to equal the future amount (Gitman, 2012). In this study, the Present Value will be used to calculate the project's revenue for a specified time. The revenue for the specified time will be calculated so the present value can be determined, then it will results the Net Present Value.

$$PV = \frac{FV}{(1+i)^t}$$

Net Present Value (NPV)

Net Present Value (NPV) is a sophisticated capital budgeting technique; found by subtracting a project's initial investment from the present value of its cash inflows discounted at a rate equal to the firm's cost of capital (Gitman, 2012). Net Present Value is the difference between an investment's market value and its cost.

$$NPV = \sum Present\ Value\ of\ After\ Tax\ Cash\ Flow\ - Investment + Residual\ Value$$

Internal Rate of Return (IRR)

Internal rate of return (IRR) is one of the most widely used capital budgeting techniques. It means that the discount rate that equates the NPV of an investment opportunity with $0 (because the present value of cash it inflows equals the initial investment). It is the rate of return that the firm will earn if it invests in the project and receives the given cash inflows.

In this study, the calculation of IRR will be done by using Microsoft Excel 2007's formula, which is "=IRR(values,[guess])", where the "values" itself will be taken from the series of after tax cash flow from year 2017 until year 2036, and "guess" value will be drawn from a random guess

Payback Period (PBP)

Payback period is also known as Break Even Period. The result of the payback period can determine two conditions. The first one is if the payback period is less than the maximum acceptable payback period, then the project can be accepted. But if the payback period is greater than the maximum acceptable payback period, then the project must be rejected. Payback period also can make a huge impact to the management, which will lead to value-creating investment decisions. Below is the formula that can be used for calculating the payback period.

$$Payback\ Period = Y + \frac{A}{B}$$

Whereby:

- Y = the number of years before final payback years
- A = total remaining to be paid back at the start of the payback year, to bring cumulative cash flow to $0
- B = total (net) paid back in the entire payback year

Depreciation

Depreciation is a portion of the costs of fixed assets charged against annual revenues over time (Gitman, 2012). There are four common methods to determine depreciation; which are, Straight line method, Sum-of-the-year digits, Declining Balance, Sinking Fund, Modified Accelerated Cost Recovery System (MACRS). This study will be using the straight line method which is the simplest method calculated by taking the purchase value of an asset and subtracting it by salvage value of the asset. The result will be used as the depreciation for each of the productive years. The formula is as follows.

$$Depreciation = \frac{Cost\ of\ the\ Asset - Residual\ Value}{Useful\ Life\ of\ the\ Asset}$$

The residual value, which N-219 would have at the end of the next 20 years, would be 20% of the initial aircraft price. This value would give addition to the cash inflow on the last year of the aircraft operation.

Minimum Acceptable Rate of Return (MARR)

Minimum Acceptable Rate of Return (MARR) is a minimum returns a company will accept on the money it invests. MARR can be calculated by adding up LIBOR (London Interbank Offered Rate) and Administration Fee. In this study, the MARR that will be used is 3.5% because of the cost assumption, which was 0.5% for the LIBOR and 3% for the Administration Fee. The MARR used in this study is very low because of the currency that are used in this study is United States of American dollars and the common interest rate in USD is 3.5%. The project will be considered as feasible if the IRR of the project is greater than the MARR (IRR>MARR).

Sensitivity Analysis

Sensitivity analysis can be used to help prevent rash predictions about the outcome of plans by ensuring that the assumptions on which the plans are based were examined and the effect of changes in these assumptions is gauged (Armstrong, 2006). The result of the sensitivity analysis is to determine the sensitivity level of the aircraft on the project. In this study, the factors that will be used on this sensitivity calculation are Government Subsidy, Fuel Price, Ticket Price, Passenger Load Factor, and the Exchange Rate.

Methodology

There will be 5 steps on doing this feasibility study; which are Problem Identification, Literature Study, Data Collection, Data Processing and Analyzing, and Conclusion and Recommendation.. These steps need to be done in order to complete the project.

Data Collection

The main components of the cost are the investment cost, the direct operating cost and the indirect operating cost. The sources of the data are coming from the Indonesian Aerospace IAe, government regulation and several assumptions. The cost and revenue calculation is done route by route and all the components are calculated normalized to the flying distance or the flying hour.

Data Analysis

Investment Cost

According to the source in Indonesian Aerospace, the purchase price of the N219 aircraft is USD 4,500,000.- including the initial spares package to start the operation. The number of aircraft in this study is only 1 (one) aircraft that will serve the pioneer air transportation on the remote area in Papua province. For the simplicity of the study, it is assumed that it will be a onetime payment for the investment. The yearly depreciation that will be used to calculate the taxable income is

calculated using the equation below. Applying the depreciation period of 20 years and the residual value as 20% of the initial aircraft price, the yearly depreciation become:

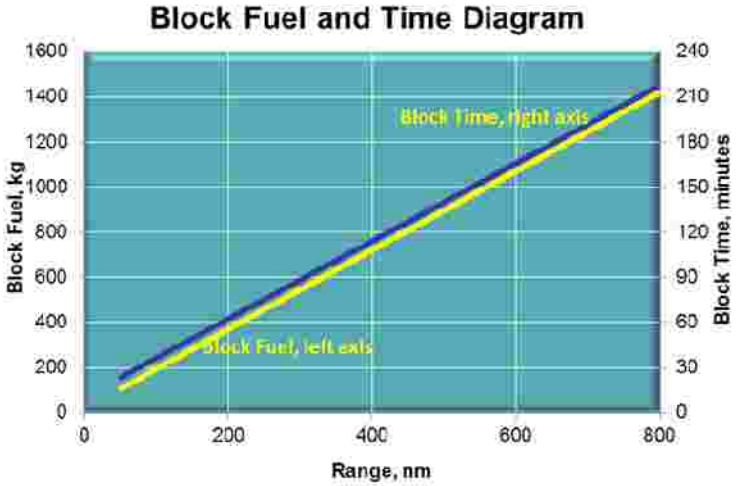
$$C_{depreciation} = \frac{4{,}500{,}000\ x\left(1 - \frac{900{,}000}{4{,}500{,}000}\right)}{20} = USD\ 180{,}000.-$$

Assuming that the London Interbank Offered rate LIBOR is 0.5% and arranger and administration fee is 3.0%, the interest rate of 3.5% per year is moderate enough in the nowadays situation.

Direct Operating Costs

The direct operating costs consist of two components, the fix and the variable costs. The component of the fix costs is the insurance and crew cost. For small aircraft like the N219, the standard yearly insurance cost is 2% of the aircraft purchase price. With the aircraft price of USD 4,500,000.-, the yearly insurance cost will be USD 90,000.000,-.

The 2% yearly insurance rate is actually the standard rate for small aircraft that already years in operation and proven as a safe air vehicle. For a new developed aircraft, the rate of the insurance is normally higher. Because of the lack of data source from the insurance company, the normal rate of 2% is applied for the calculation in this study. To compensate the lower insurance rate, the premium for the insurance is then assumed constant every year, whereby the depreciation of the aircraft is neglected. To operate the aircraft 1 (one) set of crew consists of one pilot, one copilot and one technician is needed. The crew cost consist not only the salary, but also the local transportation, accommodation and other variable cost. The cockpit crew and technician salary are really depend on the economic region. For this study, the following assumption is applied; Pilot Salary Rp. 35.000.000,- per month; Cockpit Salary Rp. 25.000.000,- per month; Technician Salary Rp. 10.000.000,- per month; Transportation & Acc Rp. 20.000.000.- per month; Variable cost Rp. 400.000,- per hour. For the fuel cost , a fuel price of Rp. 11.000,- per liter is assumed as of the price for 2014, whereby the exchange rate of 1 USD = 11.500,- for the calculation in this study is applied. The needed fuel for a specific distance is calculated using the block fuel diagram as represented figure below. The block fuel is the amount of fuel burned by the engine to fly the certain flight distance.



The block fuel as a function of flight distance is a linear line and could be approached using a simple linear line equation.

$$Y = a + b\,x$$

For the block fuel, the next equation is then valid.

$$Block\ Fuel\ (kg) = 102.9 + 1.56\ Range\ (nm)$$

The maintenance cost is calculated in hourly basis and for the N219 the value is USD 200.- per flight hour. The block time of the N219 is also calculated using the diagram figure below. The block time is the time needed by the aircraft to fly a certain flight distance. Using equation above and the data in figure above the block time for specific route can then be calculated using the following equation.

$$Block\ Time\ (kg) = 0.253 + 0.00597\ Range\ (nm)$$

In operating a commercial aircraft, there are several fees that are related to the operation. The fee and its costs, which are applied in this study are; Landing Fee Rp. 975,- / 1,000 kg; Parking Fee Rp. 925,- / 1,000 kg; Navigation Fee Rp. 2,000.- / nm; Handling Fee Rp. 200,000.- / trip; Selling Cost & Pax Service Fee Rp. 2,000.- / pax; Selling Cost & Cargo Service Fee Rp. 1,000.- / kg; Pax Agent Commission 7 % of Ticket Sales; Cargo Agent Commission 5 % of Cargo Sales; Promotion Rp. 10,000,000,- / year.

Indirect Operating Cost

The indirect operating cost is actually the cost for the support of the operation. It consists of the cost of the office, administration and other overhead cost. For the calculation in this study, the indirect cost is assumed to be 5% from the direct costs.

Revenue Data Collection

The revenue of the project comes from three components; which are the passenger ticket sales, the cargo sales, and the Government Subsidy. From the statistic published by the Indonesian Government (DisHuBud, 2013), the number of the passenger flying for every the route is around 12 up to 17 passengers. For the calculation in this study, the load factor of the aircraft is assumed to be 70% or 13-14 passengers for every trip.

The ticket price for the pioneer aviation could be found in the minister deed No.: KM 26 THN 2010 (KemenHub, 2010) and is a function of the flight distance. The summary of the ticket price regulation is presented in table below.

Distance	IDR	
<150km (<81nm)	3,200	/ nm
150km-225km (81nm-121nm)	3,080	/ nm
226km-300km (122nm-162nm)	2,820	/ nm
301km-375km (163nm-202nm)	2,770	/ nm
376km-450km (203nm-243nm)	2,650	/ nm
451km-600km (243nm-324nm)	2,440	/ nm

For the cargo fare, a common practice in the aviation industry is applied. The cargo fare per kg is 2.5% of the economy class passenger ticket for the associated route. For this study, an assumption that the subsidy is 50% of the ticket price is applied.

Data Processing

Cost Calculation

In order to do the calculation, many assumptions are applied.

COMPONENT	Assumption	Unit
Aircraft Price	4,500,000	$
Depreciation Period	20.00	Years
Residual Value	20%	Aircraft Price
Aircraft Insurance	2.00%	/Year
Passenger Insurance	0%	/Pax
Crew Salary and Cost		
- Pilot	35,000,000	IDR/Month
- Co-Pilot	25,000,000	IDR/Month
- Technician	10,000,000	IDR/Month
- Transportation & Accomodation	20,000,000	IDR/Month
Variable Crew	400,000	IDR/Hour
Utilization Crew	1,050	Hour/Year
Fuel	11,000	IDR/litre
Landing Fee	975	IDR/1000kg
Parking Fee	925	IDR/1000kg
Inventory Cost	1,110	IDR/1000kg
Navigation Fee	2,000	IDR/nm
Handling Fee	200,000	IDR/Trip
Passenger Load Factor	70%	
Cargo Load Factor	20%	
Passenger Fee	KM 26 Th 2010	IDR/Pax
Cargo Fee	2.50%	Passenger Fee/kg
Exchange Rate	11,500	IDR/$
Aircraft Maintenance	200	$/Hour
Catering	-	IDR/Pax
Selling Cost & Passenger Service	2,000	IDR/Pax
Agent Commision (Passenger Fee Discount)	7%	
Promotion & Publication	10,000,000	IDR/Year
Selling Cost & Cargo Service	1,000	IDR/kg
Agent Commision (Cargo Fee Discount)	5%	Cargo Sales
Frequency	6	/Week
1 Year	48	Weeks
Indirect Operating Cost	5%	of DOC
Income Tax	25%	Gross Profit
Government Subsidize	50%	/Ticket
Ticket Price Increase	10%	/Yearly
Fuel Price Increase	0%	/Yearly
Aircraft Crew Cost Increase	8%	/Yearly
Other Variable Cost Increase	8%	/Yearly
Aircraft Maintenance Increase	2%	/Yearly

The cash flow is calculated yearly for the period of 20 years starting from 2017 where the aircraft N219 will entry into service. Some of the costs are increased yearly according to predicted market price and also taking into account the inflation rate in Indonesia. The unit price for the current year is calculated using the equation below, whereby ? is the yearly percentage increase and is the current year.

$$Price = Price_{base}\,(1 + \Delta)^{(n-2017)}$$

The unit prices that are varied in the calculation are ticket price with increment of 10%, aircraft crew cost with increment of 8%, other variable costs with increment 8% and the aircraft maintenance with increment of 2%. The aircraft crew and other variable cost increment is according to the projected according to the Indonesian inflation rate. For the maintenance, the increment is set to 2% because the cost is calculated directly in US dollar.

Operating Cost Calculation

Table below presents the yearly operation costs for each route. First of all, the block time for every route is calculated using the equation above. Using the weekly flight frequency for the associated route and the assumption that the maximum flyable week in a year is only 48, the yearly utilization of the aircraft can then be determined. The yearly utilization of the aircraft is the total flight hour of the aircraft. The similar step is used to calculate the yearly fuel consumption for each route, whereby the block fuel for every route is a function of the flight distance and calculated using the equation above.

Items	Unit	ROUTES																TOTAL
		TIM-WX37	WX37-TIM	TIM-WX17	WX17-TIM	TIM-ILA	ILA-TIM	TIM-NKD	NKD-TIM	TIM-DXI	DXI-TIM	TIM-BILOGAI	BILOGAI-TIM	TIM-KENYAM	KENYAM-TIM	TIM-KEI	KEI-TIM	
Aircraft Operation Cost																		
Insurance	US$/Year	5,220	5,220	5,315	5,315	5,908	5,908	2,169	2,169	8,148	8,148	3,500	3,500	5,435	5,435	9,304	9,304	90,000
Fuel	US$/Year	30,374	30,374	28,788	28,788	33,576	33,576	12,120	12,120	41,969	41,969	20,342	20,342	29,345	29,345	47,352	47,352	487,733
Aircraft Crew	US$/Year	10,061	10,061	10,244	10,244	11,388	11,388	4,180	4,180	15,703	15,703	6,746	6,746	10,475	10,475	17,933	17,933	173,461
Maintenance	US$/Year	16,199	16,199	16,493	16,493	18,334	18,334	6,730	6,730	25,282	25,282	10,861	10,861	16,865	16,865	28,872	28,872	279,272
Airport Ground Handling	US$/Year	2,504	2,504	1,670	1,670	2,504	2,504	835	835	1,670	1,670	1,670	1,670	1,670	1,670	1,670	1,670	28,383
Control & Communication	US$/Year	1,298	1,298	1,695	1,695	1,609	1,609	627	627	2,975	2,975	874	874	1,749	1,749	3,498	3,498	28,649
Landing & Parking Cost	US$/Year	264	264	176	176	264	264	88	88	176	176	176	176	176	176	176	176	2,990
Total Aircraft Operating Cost	US $/Year	65,921	65,921	64,382	64,382	73,584	73,584	26,749	26,749	95,922	95,922	44,169	44,169	65,714	65,714	108,804	108,804	1,090,488
Passenger Service Cost																		
Service & Selling	US$/Year	333	333	222	222	333	333	111	111	222	222	222	222	222	222	222	222	3,775
Commision	US$/Year	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Promotion	US$/Year	50	50	51	51	57	57	21	21	79	79	34	34	53	53	90	90	870
Total Passenger Service Cost	US $/Year	384	384	273	273	390	390	132	132	301	301	256	256	275	275	312	312	4,644
Cargo Service Cost																		
Commision	US$/Year	475	490	425	372	542	544	195	190	219	-	319	329	425	366	4	3,999	8,894
Service & Selling	US$/Year	1,236	1,276	565	495	1,139	1,143	351	342	166	-	821	847	548	472	3	2,577	11,981
Total Cargo Service Cost	US $/Year	1,710	1,766	990	867	1,681	1,687	547	533	384	-	1,140	1,176	974	838	7	6,575	20,875
Total Indirect Operating Cost	US $/Year	3,296.04	3,296.04	3,219.08	3,219.08	3,679.18	3,679.18	1,337.45	1,337.45	4,796.08	4,796.08	2,208.46	2,208.46	3,285.71	3,285.71	5,440.20	5,440.20	54,524
Total Operation Cost	US $/Year	71,311	71,367	68,864	68,741	79,334	79,340	28,765	28,751	101,403	101,018	47,773	47,809	70,248	70,113	114,563	121,132	1,170,532

The fix operating cost of the aircraft, i.e. the insurance and the crew costs for every route are calculated for every year by normalize its yearly total cost to the aircraft yearly flight hour using the equation below.

$$Cost_{route} = \frac{Yearly\ flight\ Hour_{route}}{Total\ Yearly\ Flight\ Hour} . Total\ Cost$$

The total fuel cost for every route is determined by multiplying the fuel consumption for every route with the yearly flying frequency and the fuel price. The yearly maintenance of the aircraft is determined by multiplying the yearly flight hour for each route by the hourly maintenance cost. The airport ground-handling fee is a charge by the airport authority for every trip, so the yearly ground handling fee is calculated by multiplying the yearly flight frequency for each route by the handling fee. The navigation fee or the control and communication fee that is charge by the air traffic authority is a function of the flight distance. So the yearly navigation fee for every route is simply the multiplication of the yearly flying distance with the basic charge per nautical mile.

The yearly landing, parking fee and inventory fee are charge by the airport authority for every landing. The total yearly fee is the yearly flight frequency for each route times the total fee per landing. The passenger service fee is a function of the passenger number. The total yearly passenger service fee is the yearly number of passenger for each route times the charged fee. The commission or agency fee is not applied because the ticket sales are not through agencies, but only direct sell at the airport. The promotion fee is assumed to be constant every year and to get the yearly promotion cost for every route the calculation is similar with the calculation of the insurance. The cargo commission fee is a function of the cargo weight. The total yearly cargo commission fee is the total cargo for each route times the charged fee per kg. The similar calculation is applied for the cargo service and selling fee. The indirect cost is assumed to be 5% of the direct operating costs.

Revenue Calculation

The revenue consists of three components, i.e. the passenger sales, government subsidy and the cargo sales. The calculation for passenger sales is the number of passenger for each route times the

ticket price. The government subsidy is assumed as percentage of the ticket price. The cargo revenue is the number of cargo in kg multiplied by the cargo fare per kg. The revenue calculation for the year 2017 is USD1,871,521.

Projected Cash Flow

Combining the revenue and operation cost results in the projected cash flow. Table 4.5 presents the cash flow for year 2017.

Items	Unit	ROUTES																Total
		TIM-WX37	WX37-TIM	TIM-WX17	WX17-TIM	TIM-ILA	ILA-TIM	TIM-NKD	NKD-TIM	TIM-DXI	DXI-TIM	TIM-BLG	BLG-TIM	TIM-KNM	KNM-TIM	TIM-KEI	KEI-TIM	
REVENUE																		
Passengers	US $/Year	51,161	51,161	66,793	66,793	63,418	63,418	24,692	24,692	117,244	117,244	34,462	34,462	68,925	68,925	137,850	137,850	
Government Subsidize	US $/Year	25,580	25,580	33,397	33,397	31,709	31,709	12,346	12,346	58,622	58,622	17,231	17,231	34,462	34,462	68,925	68,925	
Cargo	US $/Year	9,491	9,802	8,499	7,446	10,841	10,881	3,908	3,806	4,375	-	6,372	6,573	8,509	7,324	80	79,977	
Total Revenue	US $/ Year	86,232	86,544	108,689	107,636	105,968	106,008	40,947	40,845	180,240	175,865	58,065	58,267	111,896	110,711	206,855	286,752	1,871,521
																	-	
Aircraft Operation Cost																	-	
Insurance	US $/Year	5,220	5,220	5,315	5,315	5,908	5,908	2,169	2,169	8,148	8,148	3,500	3,500	5,435	5,435	9,304	9,304	90,000
Fuel	US $/Year	30,374	30,374	28,788	28,788	33,576	33,576	12,120	12,120	41,969	41,969	20,342	20,342	29,345	29,345	47,352	47,352	487,733
Aircraft Crew	US $/Year	10,061	10,061	10,244	10,244	11,388	11,388	4,180	4,180	15,703	15,703	6,746	6,746	10,475	10,475	17,933	17,933	173,461
Maintenance	US $/Year	16,199	16,199	16,493	16,493	18,334	18,334	6,730	6,730	25,282	25,282	10,861	10,861	16,865	16,865	28,872	28,872	279,272
Airport Ground Handling	US $/Year	2,504	2,504	1,670	1,670	2,504	2,504	835	835	1,670	1,670	1,670	1,670	1,670	1,670	1,670	1,670	28,383
Control & Communication	US $/Year	1,298	1,298	1,695	1,695	1,609	1,609	627	627	2,975	2,975	874	874	1,749	1,749	3,498	3,498	28,649
Landing & Parking Cost	US $/Year	264	264	176	176	264	264	88	88	176	176	176	176	176	176	176	176	2,990
Total Aircraft Operating Cost	US $/Year	65,921	65,921	64,382	64,382	73,584	73,584	26,749	26,749	95,922	95,922	44,169	44,169	65,714	65,714	108,804	108,804	1,090,488
																	-	
Passenger Service Cost																	-	
Service & Selling	US $/Year	333	333	222	222	333	333	111	111	222	222	222	222	222	222	222	222	3,775
Commision	US $/Year	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Promotion	US $/Year	50	50	51	51	57	57	21	21	79	79	34	34	53	53	90	90	870
Total Passenger Service Cost	US $/ Year	384	384	273	273	390	390	132	132	301	301	256	256	275	275	312	312	4,644
																	-	
Cargo Service Cost																	-	
Commision	US $/Year	475	490	425	372	542	544	195	190	219	-	319	329	425	366	4	3,999	8,894
Service & Selling	US $/Year	1,236	1,276	565	495	1,139	1,143	351	342	166	-	821	847	548	472	3	2,577	11,981
Total Cargo Service Cost	US $/ Year	1,710	1,766	990	867	1,681	1,687	547	533	384	-	1,140	1,176	974	838	7	6,575	20,875
Total Indirect Operating Cost	US $/ Year	3,296.04	3,296.04	3,219.08	3,219.08	3,679.18	3,679.18	1,337.45	1,337.45	4,796.08	4,796.08	2,208.46	2,208.46	3,285.71	3,285.71	5,440.20	5,440.20	54,524
Total Operation Cost	US $/ Year	71,311	71,367	68,864	68,741	79,334	79,340	28,765	28,751	101,403	101,018	47,773	47,809	70,248	70,113	114,563	121,132	1,170,532
Profit Before Tax / Year	US $/ Year	14,922	15,177	39,825	38,895	26,635	26,668	12,181	12,094	78,838	74,847	10,292	10,457	41,648	40,599	92,293	165,620	700,989
Depreciation	US $/Year	10,441	10,441	10,630	10,630	11,817	11,817	4,338	4,338	16,295	16,295	7,000	7,000	10,870	10,870	18,609	18,609	180,000
																	Taxable Income	520,989
																	Tax	130,247
																	Profit After Tax / Year	570,742

The sum up of revenue for every flown route gives the total revenue for 2017 and the sum up of the operation cost for every flown route gives the total operation cost. The deduction of the total revenue with the total operating cost results in the profit before tax. The taxable income is then obtained by deduction of the depreciation from the profit before tax. Subtracting the 25% income tax (from the taxable income) from the profit before tax results in the profit after tax for the project. The yearly projected cash flow is then calculated for the year 2018 up to 2036, whereby the results of every year calculation can be found in the appendix.

Cash Inflow

Month	Cash Inflow
January	155,960.06
February	155,960.06
March	155,960.06
April	155,960.06
May	155,960.06
June	155,960.06
July	155,960.06
August	155,960.06
September	155,960.06
October	155,960.06
November	155,960.06
December	155,960.06
Total	1,871,521

The total revenue for the year 2017 is USD 1,871,521.-. The revenue for the year 2017 up to 2036 can be seen in table below.

Year	Cash Inflow
2017	1,871,521
2018	2,033,992
2019	2,212,710
2020	2,409,300
2021	2,625,549
2022	2,863,423
2023	3,125,085
2024	3,412,912
2025	3,729,522
2026	4,077,794
2027	4,460,892
2028	4,882,300
2029	5,345,850
2030	5,855,754
2031	6,416,648
2032	7,033,632
2033	7,712,314
2034	8,458,865
2035	9,280,070
2036	10,183,396
Total Cash Inflow	97,991,528

The revenue for the 2018 onward is always increasing because the ticket price is assumed to be increase every year by a factor of 10%. The total amount of the revenue after year 2036 is USD 97,991,528.-.

Cash Outflow

The summary of the operation cost as the cash outflow for the year 2017 can be seen in table below.

Month	Year	Investment Cost	Fixed Cost	Variable Cost	Indirect Operating Costs	Cash Outflow (Total Cost)
January	2017	4,500,000	21,955	71,046	4,544	4,597,544
February	2017		21,955	71,046	4,544	97,544
March	2017		21,955	71,046	4,544	97,544
April	2017		21,955	71,046	4,544	97,544
May	2017		21,955	71,046	4,544	97,544
June	2017		21,955	71,046	4,544	97,544
July	2017		21,955	71,046	4,544	97,544
August	2017		21,955	71,046	4,544	97,544
September	2017		21,955	71,046	4,544	97,544
October	2017		21,955	71,046	4,544	97,544
November	2017		21,955	71,046	4,544	97,544
December	2017		21,955	71,046	4,544	97,544
Total		4,500,000	263,461	852,546	54,524	5,670,532

The total cash outflow for the year 2017 including the investment is USD 5,670,532.-. The summary of the cash outflow for the year 2017 up to 2036 can be found in table below.

Year	Investment Cost	Fixed Cost	Variable Cost	Indirect Operating Costs	Cash Outflow (Total Cost)
2017	4,500,000	263,461	852,546	54,524	5,670,532
2018		277,338	864,264	55,738	1,197,339
2019		292,325	876,583	57,031	1,225,939
2020		308,511	889,546	58,411	1,256,468
2021		325,992	903,198	59,884	1,289,073
2022		344,871	917,586	61,457	1,323,914
2023		365,261	932,762	63,137	1,361,160
2024		387,281	948,783	64,934	1,400,998
2025		411,064	965,708	66,855	1,443,627
2026		436,749	983,601	68,911	1,489,262
2027		464,489	1,002,534	71,112	1,538,135
2028		494,448	1,022,581	73,469	1,590,498
2029		526,804	1,043,823	75,993	1,646,620
2030		561,748	1,066,347	78,699	1,706,795
2031		599,488	1,090,249	81,601	1,771,338
2032		640,247	1,115,629	84,712	1,840,589
2033		684,267	1,142,598	88,051	1,914,915
2034		731,808	1,171,272	91,634	1,994,714
2035		783,153	1,201,781	95,480	2,080,414
2036		838,605	1,234,261	99,611	2,172,478
Total	4,500,000	9,737,910	20,225,654	1,451,243	35,914,807

It can be seen that the outflow for the year after 2017 is slightly increasing because the increase of the operation cost which already discussed above in explanation about Cost Calculation above.

Net Cash Flow

Subtracting the total cash outflow from the total cash inflow results in the Net Cash flow in the amount USD 43,602,469.- by the end of 2036. It is to be noticed that this amount is actually the future value and not the present value.

NPV

To calculate the Net Present Value, all the data need to be converted to the Present Value PV. The equation of Present Value is used to calculate the present value and the result is presented below.

Investment	(4,500,000)				
Year	After Tax Cash Flow	Present Value	Cumulative After Tax Cash Flow	Cumulative Present Value	
2017	570,742	570,742	570,742	570,742	(3,929,258)
2018	706,406	682,518	1,277,147	1,253,259	(3,246,741)
2019	856,524	799,574	2,133,671	2,052,834	(2,447,166)
2020	1,022,585	922,313	3,156,256	2,975,146	(1,524,854)
2021	1,206,229	1,051,159	4,362,485	4,026,305	(473,695)
2022	1,409,262	1,186,561	5,771,747	5,212,866	712,866
2023	1,633,677	1,328,997	7,405,424	6,541,863	2,041,863
2024	1,881,667	1,478,973	9,287,090	8,020,836	3,520,836
2025	2,155,648	1,637,024	11,442,739	9,657,860	5,157,860
2026	2,458,285	1,803,720	13,901,023	11,461,580	6,961,580
2027	2,792,510	1,979,663	16,693,533	13,441,243	8,941,243
2028	3,161,556	2,165,494	19,855,089	15,606,737	11,106,737
2029	3,568,982	2,361,893	23,424,071	17,968,630	13,468,630
2030	4,018,711	2,569,581	27,442,782	20,538,210	16,038,210
2031	4,515,063	2,789,324	31,957,845	23,327,534	18,827,534
2032	5,062,796	3,021,935	37,020,641	26,349,469	21,849,469
2033	5,667,152	3,268,280	42,687,793	29,617,749	25,117,749
2034	6,333,903	3,529,275	49,021,696	33,147,024	28,647,024
2035	7,069,408	3,805,895	56,091,104	36,952,919	32,452,919
2036	7,880,671	4,099,176	63,971,776	41,052,095	36,552,095

After converting the yearly profit after tax to its present value, the next step is to determine the cumulative present value, which is the sum up of the present value for the year 2017 up to 2036. The cumulative present value is USD 36,552,095.-. The Net Present Value NPV of the project is the cumulative present value subtracted by the investment and added by the residual value. The residual value should also be converted to its present value. The future residual value after 20 years operation is assumed to be 20% of the investment with the amount of USD 900,000.-. Its present value is USD 452,309.-. So, the Net Present Value or NPV of the project is USD 37,004,404,-

Data Analyzing

NPV Analysis

The NPV of the project is USD 37,004,404,- which means that the present value of the profit is be higher with the factor of almost 8.2. From the basic principal of the NPV that the project is rated as feasible if the NPV is greater than zero, therefore it can be concluded that the project is feasible.

IRR Analysis

The IRR of the project is 27.3%, which is much higher than the set cost of money, which is set to be equal of the assumed interest rate 3.5%. The project is then rated to be feasible.

PBP Analysis

In the common practice of airline operation, similar to other transportation business, the average payback period is about 5 years. This project PBP is 5 years 4 months, which mean the project is interesting to the investor.

Sensitivity Analysis

In this study, the input value of the above variable is varied from 70% up to 130% from its basic value with increment of 15%. For example if the base value of the fuel price is IDR 11,000.-, the variation of the variable will be IDR 7,700.- ; IDR 9,350.- ; 11,000,- ; IDR 12,650.- and IDR 14,300.-. The results of the variation of the 5 variables are presented in table below.

Government Subsidy			
Percentage	NPV	IRR	PBP
70%	31,914,048	23.1%	6.09
85%	34,459,226	25.2%	5.62
100%	37,004,404	27.3%	5.34
115%	39,549,582	29.4%	5.09
130%	42,094,760	31.5%	4.73

Exchange Rate			
Percentage	NPV	IRR	PBP
70%	56,494,840	41.9%	3.80
85%	45,029,877	33.3%	4.57
100%	37,004,404	27.3%	5.34
115%	31,072,532	22.8%	6.11
130%	26,509,554	19.2%	6.69

Fuel Price			
Percentage	NPV	IRR	PBP
70%	39,885,849	32.4%	4.56
85%	38,572,249	30.0%	4.85
100%	37,004,404	27.3%	5.34
115%	35,182,314	24.3%	5.82
130%	33,105,978	21.1%	6.55

Passenger Load Factor			
Percentage	NPV	IRR	PBP
70%	20,120,204	12.3%	8.48
85%	28,562,304	20.2%	6.56
100%	37,004,404	27.3%	5.34
115%	45,446,504	34.4%	4.44
130%	53,888,604	41.8%	3.77

Ticket Price			
Percentage	NPV	IRR	PBP
70%	19,530,094	11.4%	8.73
85%	28,267,249	19.7%	6.66
100%	37,004,404	27.3%	5.34
115%	45,741,559	35.0%	4.38
130%	54,478,714	43.0%	3.68

The variation of the variable Government Subsidy from 70% to 130% of its base value will change the IRR from 23.1% to 31.5% and the NPV from USD 31.9 Mio to USD 42.09 Mio. The PBP will vary from 6.09 to 4.73 years. The variable Fuel Price changes the IRR from 32.4% to 21.1% and NPV from USD 39.88 Mio to USD 33.1 Mio, whereby the PBP change from 4.56 to 6.55 respectively. The influence of both variables on the IRR, NPV and the PBP moves the opposite way because the nature of the variable that change the revenue and cost. The lower the fuel price variable that change the revenue and cost. The lower the fuel price results in lower operation cost whereby the lower the subsidy will lower the revenue.

The change in Ticket Price will change the IRR, NPV and the PBV in the same direction like the Government Subsidy. The IRR moves from 11.4% to 43%, the NPV from USD 19.53 Mio to USD 54.47 Mio, and the PBP from 8.73 to 3.68 years. The Exchange Rate variation will act as the ticket price. It can be explained because the revenue is in IDR whereby the investment and maintenance is in USD. The value for IRR is ranging from 41.9% to 19.2%, the NPV is from USD 56.49 Mio. to USD 26.5 Mio and the PBP is from 3.8 to 6.69 years.

The last variable is the Passenger Load Factor, which influences the revenue in the same way like the Ticket Price variation. The IRR is ranging from 12.13% to 41.8%, the NPV is from USD 20.12 Mio to USD 53.88 Mio and the PBP is from 8.48 to 3.77 years.