BUSINESS SCHEME ANALYSIS FOR LANDING GEAR OVERHAUL OF BOEING 737-800 NG BETWEEN PT. GMF AERO ASIA AND PT. GARUDA INDONESIA

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APPROVAL SHEET

BUSINESS SCHEME ANALYSIS FOR OVERHAUL LANDING GEAR BOEING 737-800 NG BETWEEN PT. GMF AERO ASIA AND PT. GARUDA INDONESIA

FINAL PROJECT PROPOSAL

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ASBTRACT

Referring to maintenance schedule data from Garuda Indonesia, starting from 2017 until 2021 there is a need for overhaul the Landing Gear of Boeing 737-800 NG that owned by Garuda Indonesia. GMF Aero Asia as the subsidiary of Garuda Indonesia Group has the responsibility to provide the maintenance demand from its parent company. Business agreement is developed between both parties. The business agreement arranges on several parameters. Those are, maintenance schedule, number of landing gear spares need to be provided, and the ownership combination of the spares. From the combination of those three parameters, there are 27 schemes that possible to apply. From both Garuda Indonesia and GMF Aero Asia have different preferences to choose which scheme is the best for them. Garuda Indonesia intends to choose scheme with the lowest cost. However, GMF Aero Asia prefers to choose scheme that will generate profit as high as possible. In the business practice, Garuda Indonesia as the parent company has higher authority to choose the applied scheme. According to this practice, this research intends to find scheme that gives fair benefit for both objectives. Fair scheme is scheme that does not give advantages for GMF to maximize the profit, but Garuda needs to pay at very high cost. Or else, scheme that will minimize the cost for Garuda but GMF will earns low profit. Profit and Loss Analysis is used to identify the profit and cost generated by each scheme. The fair scheme selection used two steps. First, filter the scheme that accepted by both Garuda and GMF based on the acceptance area. The chosen scheme then ranked using gap value. Scheme with lowest gap value will be chosen as the fair scheme. Next step, identify risks that possible to change the expected output from the chosen scheme. The identification includes risks that against the objective from each parties. After the risks identified, mitigation scheme is proposed to minimize the impact changes to the profit and cost generated by each party.

Keywords : fair business scheme, overhaul landing gear Boeing 737-800 NG, risk identification, risk mitigation options

Preface

Alhamdulillah, all praises are belonging to Allah SWT. By whose grace, guidance, and blessing the author can finish this final research entitled "Business Scheme Analysis for Overhaul Landing Gear Boeing 737-800 NG between PT. GMF Aero Asia And PT. Garuda Indonesia" by the end of fourth year study in Department of Industrial Engineering of Institut Teknologi Sepuluh Nopember Surabaya.

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Last, the author realizes that this research is far from perfect. Therefore, the author welcomes positive suggestion and constructive critics from anyone. May this research contribute to academic world and provide improvement for better future.

Surabaya, 27 January 2015

Author

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Chapter I
Introduction

This chapter explains the basic activity regarding the research. This chapter describes background of the research, problem formulation, research scope, objective and benefit of the research, and thesis outline in the report.

1.1 Research Background

PT. GMF Aero Asia is known as the biggest MRO (*maintenance*, *repair and overhaul*) company for aircraft in Indonesia. As, subsidiary of Garuda Indonesia Group, PT. Garuda Indonesia owns 99% of the stock. Consequently, PT. GMF Aero has responsibility to provide MRO service as PT. Garuda Indonesia needed.

Referring to maintenance data from Garuda Indonesia and engineering GMF, start from 2018-2021 there will be overhaul planning for Landing Gear (LDG) of Boeing 737-800 NG owned by Garuda Indonesia. Overhaul is one of maintenance activity that does total repair to the component or part in an aircraft. According to data from Garuda Indonesia, they own 65 aircrafts of B737-800 NG type. Therefore, GMF Aero Asia should provide the landing gear overhaul service for the current aircraft type while adjusting the capacity to meet the demand.

Landing Gear is divided into Main Landing Gear (MLG) as shown in Figure 1.1 and Nose Landing Gear (NLG) shown in Figure 1.2. Each part has its own life cycle before reaching the overhaul period. According to Boeing as the manufacturer of the aircraft, NLG maximum life cycle is 18,000 cycles and MLG maximum is 21,000 cycles before it reach the total maintenance (Federal Aviation Administration, 2008). Normally, the overhaul schedule will be adjusted with the recent condition, which influenced by the performance during take-off and landing. It might be faster or later than its schedule.

The overhaul process done by GMF will spend around 2.4 months. In MRO business, this duration is called as Turn Around Time (TAT). When the landing gear of an aircraft already reaches the overhaul period, Garuda will send the aircraft to hangar at PT. GMF Aero Asia. Since overhaul process will spend

long time, GMF needs to provide spare for the landing gear. Garuda will use the spare to make the aircraft still able to gain sales during the overhaul, unless it will be grounded for 2.4 months.

Figure 1.1. The Main Landing Gear in B737-800NG

Figure 1.2 The Nose Landing Gear in B737-800NG

As mentioned, life cycle between NLG and MLG is different. In the same aircraft, NLG will reach overhaul earlier than MLG. Hence, Garuda has authority to determine the overhaul schedule, whether NLG and MLG overhaul will be in separated schedule or merged in one schedule. Indeed, suggestion from GMF perspective is important. Maintenance schedule adopted will affect the line capacity and number of spare that need to be provided.

From GMF perspective, if NLG and MLG overhaul is separated, it will effect to demand variability. In first period, domination of NLG will happen and it will change to MLG domination in last period. However, in the middle interval, the demand is very high by the combination of MLG and NLG. When the demand is fluctuate, it will difficult for GMF to adjust their capacity to meet demand. Besides, number of spare provided will be another problem when demand between NLG and MLG is vary each year.

For Garuda Indonesia, when MLG and NLG is separated it will affect the grounded time. One overhaul even needs to be grounded for two times. The first grounded done for the LDG disassembly and the second grounded is for re-assembly the LDG to the aircraft. Each grounded spend two days. When MLG

and NLG are in separated schedule, it equals with four times grounded or eight days. With total 65 aircrafts, it is estimated equal with 520 days of loss sales.

Option to combine MLG and NLG in one schedule is proposed by GMF Aero Asia. Merging MLG and NLG will give positive impact for GMF for the capacity adjustment to meet demand. Compared with previous option, total demand each year is lower and smoother. Smooth demand will make GMF easier to calculate the need of LDG spare.

From Garuda Indonesia perspective, merge MLG and NLG will effect on less grounded times. Here, one aircraft will only need to be grounded for two times, which equal with four days. Converted to loss sales, it is equal with 260 days. In airline business, profit margin generated per passenger per aircraft is very low. Thus, maximize revenue by reducing the grounded time for each aircraft is very important.

After determine the overhaul schedule scenario, GMF need to determine the number of spare provided and how the ownership toward the spare. The capacity Landing Gear workshop is 12 LDG/year, which equal with only three spares needed. The problem in spare provision is about the ownership of the spare. GMF may invest to buy, rent from third party, or mix the ownership between invest and rent.

For GMF, decision to invest on spare will give an income in term of rent cost paid by Garuda Indonesia, which called as availability fee. Higher investment in spare will affect to greater availability fee. In long term, the fee toward the investment will meet payback period. Thus, the availability fee will generate 100% profit for GMF. However, price of LDG is very high, more spare purchased will lead to higher investment.

The second scheme beside investment is GMF will rent from third party. Consequently, the profit generated from rent fee is smaller. Since the rent fee from third party is nearly the same with availability fee. Rent from third party, GMF can only rent for one shipset (MLG and NLG). GMF cannot rent only one part of LDG. Connected to maintenance schedule scenario, when MLG and NLG overhaul is separated, it will make GMF hard to provide spare.

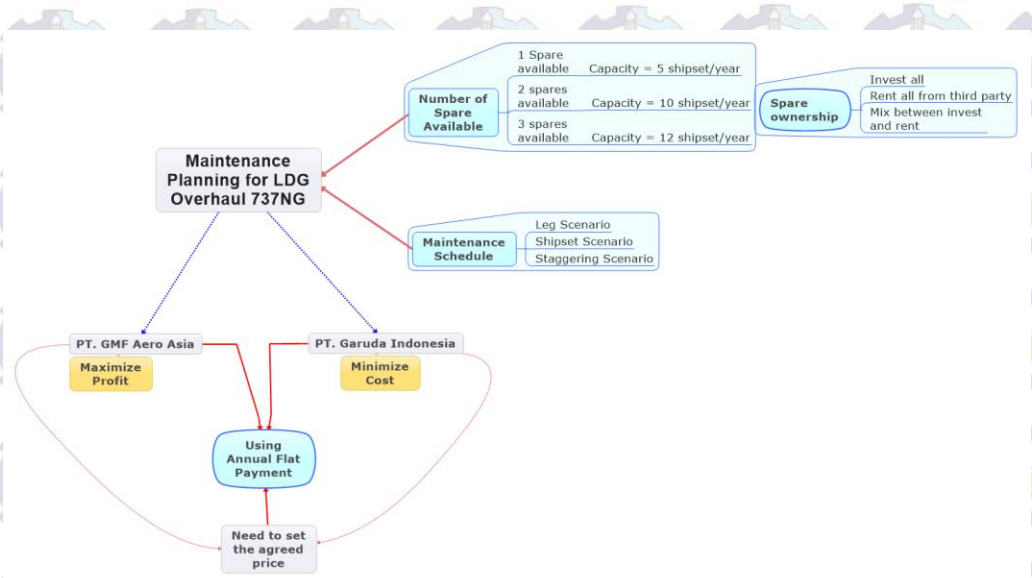


Figure 1.3 Rich Picture for Maintenance Planning Development for Landing Gear Overhaul between PT. Garuda Indonesia and PT. GMF Aero Asia

In Garuda perspective, when GMF decide to invest for all spare, it will make the availability fee higher. Nevertheless, when GMF decide to rent, there will be no availability fee. The fee will be only for rent cost and it is lower than availability fee. Further, when Garuda analyze the availability fee with the number of aircraft will be overhauled. There will be point that the fee paid exceeds the amount of investment by GMF. In long term, this is a disadvantage for Garuda.

The maintenance-planning contract will done in eight years' time span, from 2014 until 2021. Nevertheless, the first overhaul will performed in year-2018. Thereby, there should be an agreement for the payment method. The payment option is very important for both parties. For Garuda, annual payment is preferred to avoid any bubble cost in years with high overhaul even. For GMF, the annual payment is preferred when the set price can cover all the cost of maintenance and still give profit.

From the problem of Maintenance-planning between PT. GMF Aero Asia and PT. Garuda Indonesia, both need to agree on several decisions. They need to reach agreement on maintenance schedule option, number of spare available and the ownership, and the contract for the payment scheme.

Figure 1.4 shows the money flow in the system between GMF, Garuda and the third party. Third party will take over the aircraft that cannot done the overhaul process by GMF, or the capacity of GMF less than the demand. The money paid by Garuda will give to GMF Aero Asia. Then from that money, GMF will spend according to the need for performing overhaul. Moreover, GMF will decide how much will be paid to third party for the offloaded overhaul even.

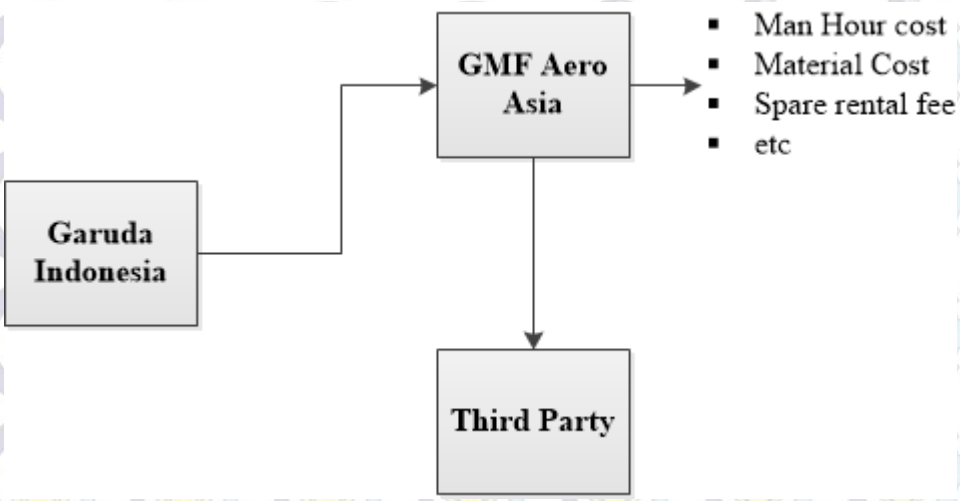


Figure 1.4 Money Flow in the system for the Landing Gear Overhaul Business

From all decision variables, will be developed negotiation range for the maintenance planning business development for both party. First, will be analyzed which scheme will result on best profit for GMF. Then, analyze which scheme will give lowest cost for Garuda. Net Present Value (NPV) is used to compare the result in each scenario. From the graph of cost from Garuda and profit from GMF, we can determine the negotiation range. The range is separated into three phases, range which best for Garuda, best for GMF and the fair point for Garuda and GMF.

After find the fair scheme for both PT. GMF Aero Asia and PT. Garuda Indonesia, the next step is analyzing the risk and finds the mitigation to minimize the impact to each objective. The risk identification and its mitigation is separated for each perspective. The separation for risk identification and the mitigation is done because each perspective has different objective to reach.

1.2 Problem Formulation

Based on the background, this research is aiming to develop business scheme and find the fair negotiation range between PT. GMF Aero Asia and PT. Garuda Indonesia in Landing Gear Overhaul Maintenance Planning for 737-800 NG. As mentioned in background, there are several aspect need to determine, maintenance schedule scenario, number of spare provided and its ownership, and the payment scheme.

1.3 Objective of the Research

The objective of this research is,

1. To analyze business scheme that will give best advantages for PT. GMF Aero Asia and PT Garuda Indonesia in maintenance planning landing gear overhaul Boeing 737-800 NG by using each preferences.
2. To give recommendation for the fair scheme based on the negotiation range in overhaul Landing Gear 737-800NG between PT. GMF Aero Asia and PT. Garuda Indonesia.
3. Identify risks and suggest mitigation scheme from the proposed scheme for both PT. Garuda Indonesia and PT. GMF Aero Asia.

1.4 Benefit of the Research

The benefit from this research is, PT. GMF Aero Asia and PT. Garuda Indonesia can implement the proposed business scheme in Landing Gear Overhaul Planning, which is fair scheme that consider profit for PT. GMF Aero Asia and cost for PT. Garuda Indonesia.

1.5 Research Scope

This sub chapter will explain about the boundaries and the assumption used in the research,

1.5.1 Assumptions

The assumptions used in this research are,

1. The Interest rate for dollar deposit assumed at 2% p.a.
2. Escalation rate is 4.5% p.a.

1.5.2 Boundaries

The boundaries used in the research are,

1. The business development between PT. GMF Aero Asia and PT. Garuda Indonesia is for overhaul landing gear B737-800 NG.
2. The maximum spare can be provided is three spares, according to the workshop capacity
3. Data for overhaul landing gear refers from Garuda is started in 2018 until 2021. Time span used for analyze the business development is 8 years.
4. There is no investment needed for the workers and facility, because GMF already has the capability. Investment only needed to purchase the Landing Gear spare.
5. According to figure 1.4, money flow examined in this research is only between Garuda Indonesia and GMF Aero Asia. Money flow to third party is determined by GMF Aero Asia policy.

1.6 Thesis Outline

Thesis outline used in this research as follows,

CHAPTER I PREFACE

This chapter contains the basic information regarding the research one by the writer. This chapter will explain about the research background, problem formulation, objective of the research, benefit of the search, research scope, and the systematic writing.

CHAPTER II LITERATURE REVIEW

This chapter contains the basic theory or reference from academic background that used as the reference to solve the problem in this research. Associated with

this research, the literature review will contain the maintenance schedule, feasibility parameter (NPV, IRR, etc), game theory – non zero sum game, and payment method.

CHAPTER III RESEARCH METHODOLOGY

This chapter will explain about the steps done during the research. By determining the methodology, the writer can do the research systematically.

CHAPTER IV BUSINESS SCHEME ANALYSIS

This chapter contains the data tabulation to analyze the business scheme of Landing Gear Overhaul that seen from each PT. GMF Aero Asia perspective and PT. Garuda Indonesia. From the result, we can get the value projection (NPV) for each scheme. Then, best scheme is chosen for each perspective. From the range negotiation, fair business scheme is proposed by considering each preferences and objective in the landing gear overhaul business.

CHAPTER V RISK IDENTIFICATION AND RISK TREATMENT

This chapter contains the risk identification and the treatment to mitigate the impact. The risk identification is separated using each perspective.

BAB VII CONCLUSION AND SUGGESTION

This chapter contains the conclusion from the research regarding the objectives of the research. Otherwise, the writer also gives suggestions for the company or the future research.

Chapter II
Literature Review

This chapter will explain the literature review or basic theory that used in this research. The concepts and theories provided in this chapter are Landing gear overhaul schedule, feasibility parameter, game theory, and payment scheme.

2.1 Landing Gear Overhaul for Boeing 737-800 NG

Landing gear in Boeing 737NG is divided into two parts, Main Landing Gear (MLG) and Nose Landing Gear (NLG). According to Federal Aviation Academy (FAA), the average life cycle for Landing Gear is 18,000 – 30,000 flight cycles. Specifically, the life cycle for NLG is 18,000 flights cycle and 30,000 flight cycles for MLG (AviTrader Publications Corp., 2011). MLG has longer life cycle because during the take-off and landing it will receive higher pressure. Thus, the profile of MLG is higher than NLG.

2.1.1 Maintenance Process

Based on the LDG maintenance schedule from Garuda and GMF engineering, the aircraft will brought to hangar in GMF when it is already enter the overhaul period. Based on (Aircraft Maintenance Technology (AMT), 2001), the process for overhaul the LDG as follow,

- Incoming inspection

  After the aircraft brought to the hangar, visual test is performed trough the LDG to check any possibilities of broken or missing parts. Check the amount of component in Landing Gear assemblies also done in this process. This process is very important to give information to the owner about the existing condition and the amount of LDG component before it is disassembly.

- LDG Disassembly

  After the incoming inspection, LDG will be disassembled from the aircraft and install the LDG spare. The duration needed for LDG disassembly and

spare installation is two days. This duration is the same whether NLG and MLG is separated or merged in one schedule.

- LDG Evaluation

  Generally, evaluation process follows the requirement from the manufacturer. The objective of this evaluation process is to inspect the gear to wear and to check any possibility of damage and corrosion. The requirement in the evaluation process is done until tolerance 0.0001 inch.

- LDG Assembly

  After done the overhaul process, the aircraft is sent back to hangar. Then, the proses of disassembly of the spare and assembly the landing gear back is done. As the same with previous activity, this process will spend two days.

2.1.2 Maintenance schedule

There are three scenarios proposed by GMF Aero Asia to overhaul the Garuda Indonesia's aircrafts. Those are Leg Scenario, Shipset Scenario and Staggering Scenario.

- **Leg Scenario**

In leg scenario, the schedule for maintenance the MLG and the NLG follows the life cycle for each landing gear. In the same aircraft, NLG will overhaul first before the MLG. Date to be grounded follows the box below its box. The red box represent the aircraft does need to be overhaul. The schedule for leg scenario is shown in Figure 2.1.

The advantages by apply the leg scenario is,

- The overhaul schedule follows the normal life cycle
- Because the overhaul follows the normal life cycle, there will be no un-effective cost due to premature period.

The disadvantages by apply the leg scenario is,

- For one aircraft, number of grounded time is more than the scenario when MLG and NLG are merged in one schedule.

- More grounded time impacted to higher loss in sales, this lead to disadvantaged for the airline.
- If we see the demand, number of overhaul is very high in 2019 and 2020 and low in 2018 and 2021. This will make PT. GMF Aero Asia hard to adjust the capacity to minimize the offload to the third party.

B737-800 LANDING GEAR OVERHAUL DUE DATE UP TO 2021

2013	2014	2015	2016	2017	2018	2019		2020		2021	
NIL	NIL	NIL	NIL	NIL	12	25		32		15	
	PK-GEQ NLG	PK-GEQ LH/RH		PK-GER NLG	PK-GMA NLG	PK-GFA NLG	PK-GFK NLG	PK-GMG LH/RH	PK-GMV NLG	PK-GFM LH/RH	PK-GFQ LH/RH
	1-May-14	20-May-15		1-Jun-17	20-Apr-18	1-Jan-19	29-Mar-19	5-Feb-20	26-Jul-20	13-Jan-21	14-Sep-21
					PK-GMD NLG	PK-GFD NLG	PK-GFL NLG	PK-GFQ NLG	PK-GEI NLG	PK-GEK LH/RH	PK-GFU NLG
					10-Jun-18	1-Jan-19	17-Apr-19	5-Feb-20	30-Jul-20	30-Jan-21	20-Sep-21
					PK-GMC NLG	PK-GMO NLG	PK-GEK NLG	PK-GMK LH/RH	PK-GMP LH/RH	PK-GFN LH/RH	PK-GFV NLG
					18-Jun-18	1-Jan-19	26-May-19	10-Feb-20	10-Aug-20	14-Apr-21	3-Oct-21
					PK-GME NLG	PK-GMP NLG	PK-GFM NLG	PK-GML LH/RH	PK-GMX NLG	PK-GEN NLG	PK-GFR LH/RH
					17-Jul-18	4-Jan-19	29-May-19	16-Feb-20	15-Aug-20	15-May-21	16-Oct-21
					PK-GER LH/RH	PK-GFF NLG	PK-GMA LH/RH	PK-GFR NLG	PK-GFF LH/RH	PK-GEO NLG	PK-GEP LH/RH
					23-Jul-18	5-Jan-19	29-Jun-19	6-Mar-20	16-Aug-20	23-May-21	30-Oct-21
					PK-GMK NLG	PK-GFC NLG	PK-GFN NLG	PK-GMH LH/RH	PK-GFE LH/RH	PK-GFO LH/RH	PK-GFW NLG
					3-Aug-18	11-Jan-19	6-Aug-19	21-Mar-20	19-Aug-20	14-Jun-21	22-Nov-21
					PK-GML NLG	PK-GFE NLG	PK-GFO NLG	PK-GMI LH/RH	PK-GEM NLG	PK-GFP LH/RH	PK-GMS LH/RH
					22-Aug-18	20-Jan-19	18-Oct-19	20-Apr-20	24-Aug-20	20-Jun-21	5-Dec-21
					PK-GMG NLG	PK-GFH NLG	PK-GFP NLG	PK-GMJ LH/RH	PK-GFH LH/RH	PK-GEL LH/RH	PK-GFS LH/RH
					3-Sep-18	28-Jan-19	24-Oct-19	20-Apr-20	7-Sep-20	28-Jun-21	8-Dec-21
					PK-GMH NLG	PK-GFG NLG	PK-GMC LH/RH	PK-GFS NLG	PK-GFG LH/RH	PK-GMY NLG	PK-GMZ NLG
					5-Sep-18	5-Feb-19	30-Oct-19	23-Apr-20	16-Sep-20	22-Aug-21	12-Dec-21
					PK-GMJ NLG	PK-GMQ NLG	PK-GEL NLG	PK-GEP NLG	PK-GMQ LH/RH	PK-GFX NLG	PK-GFT LH/RH
					25-Oct-18	19-Feb-19	23-Nov-19	27-Apr-20	20-Sep-20	23-Aug-21	15-Dec-21
					PK-GMM NLG	PK-GMI NLG	PK-GMD LH/RH	PK-GMS NLG	PK-GEH NLG		
					4-Nov-18	26-Feb-19	24-Nov-19	6-May-20	21-Sep-20		
					PK-GMF NLG	PK-GFI NLG	PK-GME LH/RH	PK-GFT NLG	PK-GMW NLG		
					16-Nov-18	28-Feb-19	17-Dec-19	6-May-20	24-Sep-20		
					PK-GMN NLG	PK-GFJ NLG	PK-GMF LH/RH	PK-GMM LH/RH	PK-GEG NLG		
					19-Nov-18	6-Mar-19	23-Dec-19	26-May-20	29-Sep-20		
						PK-GMR NLG		PK-GMN LH/RH	PK-GFI LH/RH		
						28-Mar-19		14-Jun-20	20-Oct-20		
								PK-GMU NLG	PK-GMR LH/RH		
								8-Jul-20	21-Oct-20		
								PK-GMO LH/RH	PK-GFJ LH/RH		
								8-Jul-20	26-Oct-20		
								PK-GFA LH/RH	PK-GFK LH/RH		
								13-Jul-20	16-Nov-20		
								PK-GFD LH/RH	PK-GEJ NLG		
								15-Jul-20	22-Nov-20		
								PK-GFC LH/RH	PK-GFL LH/RH		
								26-Jul-20	21-Dec-20		

Figure 2.1 Schedule in Leg Scenario (GMF Aero Asia, 2014)

- **Shipset Scenario**

If in the leg scenario, MLG and NLG overhaul in one aircraft is separated based on each life cycle, in shipset the schedule is merged in one schedule. Thus, the MLG overhaul is earlier than its schedule follows the downtime of NLG. The schedule of shipset scenario is shown in Figure 2.2

B737-800 LANDING GEAR OVERHAUL DUE DATE UP TO 2021

2013	2014	2015	2016	2017	2018	2019		2020		2021	
NIL	NIL	NIL	NIL	NIL	12	20		9		6	
	PK-GEQ NLG&MLG			PK-GER NLG&MLG	PK-GMA NLG&MLG	PK-GFA NLG&MLG	PK-GFK NLG&MLG	PK-GFQ NLG&MLG	PK-GMV NLG&MLG	PK-GEN NLG&MLG	PK-GFU NLG&MLG
	1-May-14			1-Jun-17	20-Apr-18	1-Jan-19	29-Mar-19	5-Feb-20	26-Jul-20	15-May-21	20-Sep-21
					PK-GMD NLG&MLG	PK-GFD NLG&MLG	PK-GFL NLG&MLG	PK-GFR NLG&MLG	PK-GEI NLG&MLG	PK-GEO NLG&MLG	PK-GFV NLG&MLG
					10-Jun-18	1-Jan-19	17-Apr-19	6-Mar-20	30-Jul-20	23-May-21	3-Oct-21
					PK-GMC NLG&MLG	PK-GMO NLG&MLG	PK-GEK NLG&MLG	PK-GFS NLG&MLG	PK-GMX NLG&MLG	PK-GMY NLG&MLG	PK-GFW NLG&MLG
					18-Jun-18	1-Jan-19	26-May-19	23-Apr-20	15-Aug-20	22-Aug-21	22-Nov-21
					PK-GME NLG&MLG	PK-GMP NLG&MLG	PK-GFM NLG&MLG	PK-GEP NLG&MLG	PK-GEM NLG&MLG	PK-GFX NLG&MLG	PK-GMZ NLG&MLG
					17-Jul-18	4-Jan-19	29-May-19	27-Apr-20	24-Aug-20	23-Aug-21	12-Dec-21
					PK-GMK NLG&MLG	PK-GFF NLG&MLG	PK-GFN NLG&MLG	PK-GMS NLG&MLG	PK-GEH NLG&MLG		
					3-Aug-18	5-Jan-19	6-Aug-19	6-May-20	21-Sep-20		
					PK-GML NLG&MLG	PK-GFC NLG&MLG	PK-GFO NLG&MLG	PK-GFT NLG&MLG	PK-GMW NLG&MLG		
					22-Aug-18	11-Jan-19	18-Oct-19	6-May-20	24-Sep-20		
					PK-GMG NLG&MLG	PK-GFE NLG&MLG	PK-GFP NLG&MLG	PK-GMU NLG	PK-GEG NLG&MLG		
					3-Sep-18	20-Jan-19	24-Oct-19	8-Jul-20	29-Sep-20		
					PK-GMH NLG&MLG	PK-GFH NLG&MLG	PK-GEL NLG&MLG		PK-GEJ NLG&MLG		
					5-Sep-18	28-Jan-19	23-Nov-19		22-Nov-20		
					PK-GMJ NLG&MLG	PK-GFG NLG&MLG					
					25-Oct-18	5-Feb-19					
					PK-GMM NLG&MLG	PK-GMQ NLG&MLG					
					4-Nov-18	19-Feb-19					
					PK-GMF NLG&MLG	PK-GMI NLG&MLG					
					16-Nov-18	26-Feb-19					
					PK-GMN NLG&MLG	PK-GFI NLG&MLG					
					19-Nov-18	28-Feb-19					
						PK-GFJ NLG&MLG					
						6-Mar-19					
						PK-GMR NLG&MLG					
						28-Mar-19					

Figure 2.2 Schedule in Shipset Scenario (GMF, 2014)

The advantages by applying the leg scenario is,

- By merging MLG and NLG in one schedule, the aircraft only need to be grounded for two times.

- If we see to the total demand, number even is less than leg scenario. This will make GMF easier to adjust the capacity to meet demand.

  The disadvantages by applying the leg scenario is,

- There will be un-effective cost due to shifting the MLG forward. The un-effective cost caused by MLG premature overhaul.

- **Staggering Scenario**

Staggering scenario is the optimization from the shipset scenario. There will be overhaul schedule that shifted forward to make the demand smoother. The objective of shifting the schedule forward is to make GMF easier to adjust the capacity to fulfill demand with minimizing off-load work.

Figure 2.3. Schedule in Staggering Scenario (GMF, 2014)

The advantage of staggering scenario is

- If we compare with the other scenario, demand in staggering is the smoothest demand. This is an advantage for GMF Aero Asia.

The disadvantage of staggering scenario is

- There is higher un-effective due to double shifted schedule. Premature period will bigger that affected to the cost carried by Garuda.

2.2 Feasibility analysis

To compare every scenario developed regarding the business scheme, there will be some approach to measure the value generated. Commonly, the used parameter is, Net Present Value, Internal Rate of Return, and Payback Period to be the parameter. Profit and Loss Analysis (PNL) also used to calculate income and outcome from each scenario.

2.2.1 Profit and Loss Analysis

Profit and Loss (PNL) is a statement measures rate of sales of a company in certain time-period. The function of PNL will sum up all revenue and subtracted with expenditure regarding revenue generated. The value shoes the progress financial of a company in certain period (Bond, 2005).

2.2.2 Net Present Value (NPV)

Net Present Value will convert all cash flow to value in present (P). The value will sum up which shows the net value from all cash flow in certain planning horizon (Pujawan, 2009). Generally, feasible business scheme has value of NPV ≥ 0. To compare with the other scenario, larger NPV value worth greater profit generated.

2.2.3 Internal Rate of Return (IRR)

Interest rate in equilibrium point between cash inflow and cash outflow called as Rate of Return (ROR). ROR is a rate condition where revenue result NPV value of investment equal to zero (Pujawan, 2009). One of method in ROR used to compare investment alternatives is Internal Rate of Return (IRR).

IRR is the expected rate of growth of a project to generate. Usually, when a project IRR is higher**,** it is more desirable to undertake the project scheme**.**

2.2.4 Payback Period

Payback period shows how long period needed to get the investment back with certain rate of return (Pujawan, 2009). To compare output from the scheme, smaller payback period value shows that the return period is faster. Payback period is usually used for business with high unpredictable-risk. To get the investment back from the business is prior.

2.3 Payment Scheme

In long-term contract between PT. PLN and IPP (Independent Power Producer), payment scheme is one of crucial decision for both parties. For PT. PLN, payment using annual flat fee is preferred to avoid any bubbled cost regarding electricity production cost from IPP. Nevertheless, IPP prefer on payment type, which cover the production cost annually.

Revenue for IPP by selling the electricity is based on four components (Alrahmani, 2013),

- A Component (Capital Cost Recovery)
- B Component (Fixed O&M)
- C Component (Energy payment)
- D Component (Variable Operating Component)

From those four components, IPP will calculate the selling cost. Selling price is determined from minimum cost that needed to produce electricity per kWh. According to four-cost component, component B, C and D is the risk component with high fluctuation.

B-component (O&M cost) is related with the cost to maintain the generator, which divided into two, variable and fixed cost. This cost will fluctuate according to the maintenance need, minor maintenance, major maintenance and the overhaul maintenance. C-component (Energy Payment) associated with the payment from PT. PLN for fuel consumption. In long-term contract, the fuel price never stands flat. Thus, the possibility of fluctuating is high. D-component

(Variable Operating Component) is payment from PT. PLN for the operation service and maintenance to keep the power plant performance. This price will adjust by the inflation rate, which possibly of high variability.

With fluctuation of total cost each year, IPP and PT. PLN need to agree on the payment scheme. PT. PLN will use the annual flat fee. Therefore, IPP need to calculate the annual fees that cover the annual total cost.

To determine the price, IPP will forecast the cost for all price components and sum it up. For illustration, assume that the cost-value follows the Table 2.1

Table 2.1 Total Cost for Electricity Production for each component

Year / Total Cost	2011 Jan-Jun	2011 Jul-Dec	2012 Jan-Jun	2012 Jul-Dec	2013 Jan-Jun	2013 Jul-Dec	2014 Jan-Jun	2014 Jul-Dec	2015 Jan-Jun	2015 Jul-Dec
A-component	136,776,114	136,776,114	136,776,114	136,776,114	136,776,114	136,776,114	136,776,114	136,776,114	136,776,114	136,776,114
B-component	283,524,225	283,686,520	283,852,548	284,022,402	284,196,177	284,373,973	284,555,888	284,742,027	284,932,496	285,127,403
C-component	-	-	-	-	-	-	-	-	-	-
D-component	90,000,000	92,385,000	94,833,203	97,346,282	99,925,959	102,573,997	105,292,208	108,082,451	110,946,636	113,886,722
Total Cost	**510,300,339**	**512,847,634**	**515,461,865**	**518,144,798**	**520,898,250**	**523,724,084**	**526,624,210**	**529,600,592**	**532,655,246**	**535,790,239**

Resource : (Kristianto, 2010)

The selling price to PT. PLN will based on the annual energy production (kWh) and the annual energy sold (kWh). The contract price will be updated once in four years, which refers to the prediction of highest selling price in four years. After calculate the value of annual production and the value of sold energy, the cost outlined using the following formula,

Component price (Rp/kWh) = Total component : annual energy production in each period
Total production = A-component + B-component + C-component + D-component
Selling price = (Total A-component + Total B-component + Total C-component + Total D-component) : annual selling energy (kWh) every period.

Table 2.2 Tariff Rp/kWh for one period

Year / Total Cost	2011 Jan-Jun	2011 Jul-Dec	2012 Jan-Jun	2012 Jul-Dec	2013 Jan-Jun	2013 Jul-Dec	2014 Jan-Jun	2014 Jul-Dec
A-component	1,143	1,136	1,143	1,136	1,143	1,136	1,136	1,136
B-component	2,368	2,357	2,371	2,360	2,374	2,362	2,366	2,366
C-component	-	-	-	-	-	-	-	-
D-component	752	767	792	809	835	852	898	898
Production Cost	4,263	4,260	4,306	4,305	4,352	4,350	4,400	4,400
Selling Cost	4,487	4,485	4,532	4,531	4,580	4,580	4,631	4,631
Profit margin	4,487	4,485	4,532	4,531	4,580	4,580	4,631	4,631
Selling price	8,974	8,970	9,064	9,062	9,160	9,160	9,262	9,262
Contract price	**9,262**	**9,262**	**9,262**	**9,262**	**9,262**	**9,262**	**9,262**	**9,262**

Resource : (Kristianto, 2010)

Contract price between PT.PLN and IPP is applied for each four years and the contract price is determined based on the highest selling price in each four years-period. The highest selling price from 2011 and 2014 is 9,262. This price becomes the contract price.

Chapter III
Research Methodology

This chapter will explain the all steps conducted in the research so that the research can run in systematic way. Mainly, the research is done in three steps, business scheme analysis in PT. GMF Aero Asia perspective, business scheme analysis in PT. Garuda Indonesia perspective, and negotiation range development for both parties.

The flowchart of methodology used is given as follows,

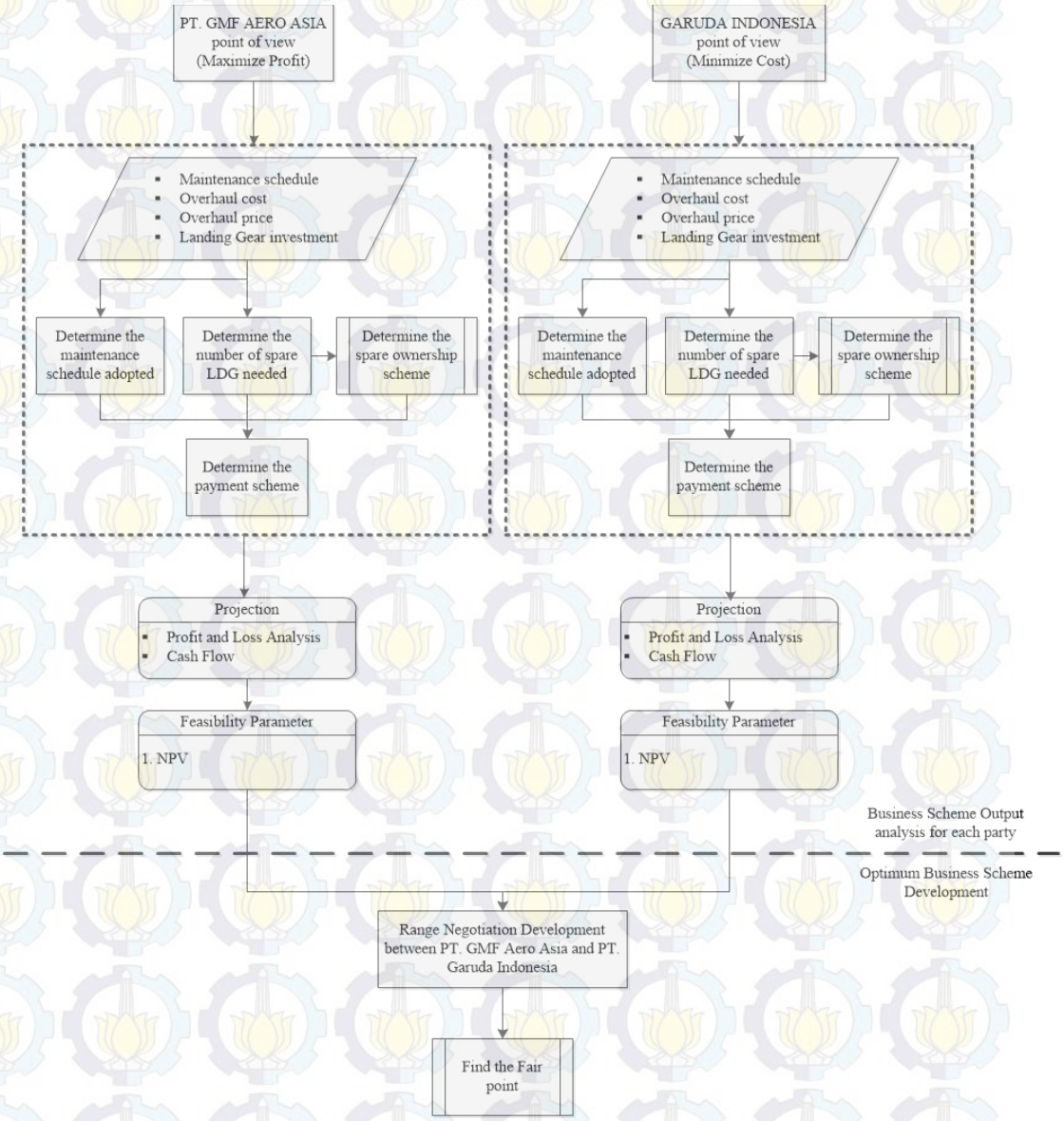


Figure 3.1The Research Methodology used in this research

As mentioned in previous chapter, there will some decision alternatives in business scheme development for maintenance planning Landing Gear Overhaul. There are maintenance schedule, landing gear spare and ownership, and payment agreement. PT. GMF Aero Asia and PT. Garuda Indonesia has different objective. GMF wants to maximize profit while Garuda wants to minimize cost. Thus, the researcher needs to separate the scheme analysis.

3.1 Business Scheme Output Analysis using PT. GMF Aero Asia Perspective

As shown in Figure 3.1, the first step is determine which maintenance schedule is adopted. There are three options, leg scenario, shipset scenario, and staggering scenario. Then decide the number of spare will be provided and how is the ownership of spare. After that both party need to agree on the payment scheme, whether paid on each even or paid using annual flat rate.

After made the decision tree, calculate the Profit and Loss (PNL) Analysis for each scheme. From the cash flow we can find the IRR, NPV, and payback period for each scenario. NPV value is used to compare the result. The best scheme is decision with highest NPV value due to profit objective.

3.2 Business Scheme Output Analysis using PT. Garuda Indonesia Perspective

As the same for Garuda Indonesia, the first step is determine which maintenance schedule is adopted. There are three options, leg scenario, shipset scenario, and staggering scenario. Then decide the number of spare will be provided and how is the ownership of spare. After that both party need to agree on the payment scheme, whether paid on each even or paid using annual flat rate.

After made the decision tree, develop the Profit and Loss (PNL) Analysis for each scheme. From the cash flow, we can find the IRR, NPV, and payback period for each scenario. NPV value is used to compare the result. The best scheme is decision with lowest NPV value due to cost objective.

3.3 Range Negotiation Development between PT. GMF Aero Asia and PT. Garuda Indonesia

After find the best business scheme for each one, in this step will be developed fair range negotiation for both parties in term of cost and profit. The NPV value calculated will be plotted in a graph. From the graph, we can find the equilibrium point or fair point where the value generated by GMF and value paid by Garuda is the fair.

3.4 Risk analysis and Risk Mitigation

After find, which scheme is the fair scheme between Garuda and GMF. Then the risk analysis is done to investigate what factor will interrupt the objective for each Garuda and GMF perspective. After find the critical parameter and its critical point, the mitigation scenario is developed to reduce the impact of changes parameter to the objectives for both parties.

Chapter IV
Business Scheme Analysis for PT. GMF Aero Asia Perspective

This chapter contains analysis of business scheme both using PT. GMF Aero Asia and PT. Garuda Indonesia perspective. Best option for Garuda Indonesia is scheme with the lowest cost and best option for GMF Aero Asia is scheme with highest profit. From the negotiation range that generated between cost (Garuda) and profit (GMF), fair business is determined.

4.1 Business Scheme Analysis

This sub chapter explains the business schemes that come from the combination of three factors, the maintenance schedule, number of spares, and the spare ownership.

4.1.1 Existing Business Scheme

There are three parameters need to be agreed between Garuda and GMF Aero Asia. First they have to agree on the maintenance schedule which consist of leg scenario, shipset scenario, and staggering scenario. Each scenario has advantage and disadvantages as mentioned in chapter two.

After determine the maintenance schedule, GMF and Garuda can find the number of aircraft (LDG) will be overhauled each year. Then, both can decide number how many spares need to be provided by GMF. There are three options in the spare availability, provides one, two or three spares. Each number of spare is related with the capacity that GMF can provided. Number of spare also related with amount of availability fee Garuda needs to pay.

Instead of deciding number of spare, GMF can Garuda need to find the right combination of the provided spare. GMF may invest to all spares, or find the right combination how many spares need to rent and invest. However, GMF cannot rent all the spares, because in 2014 Garuda already decided to invest to one spare.

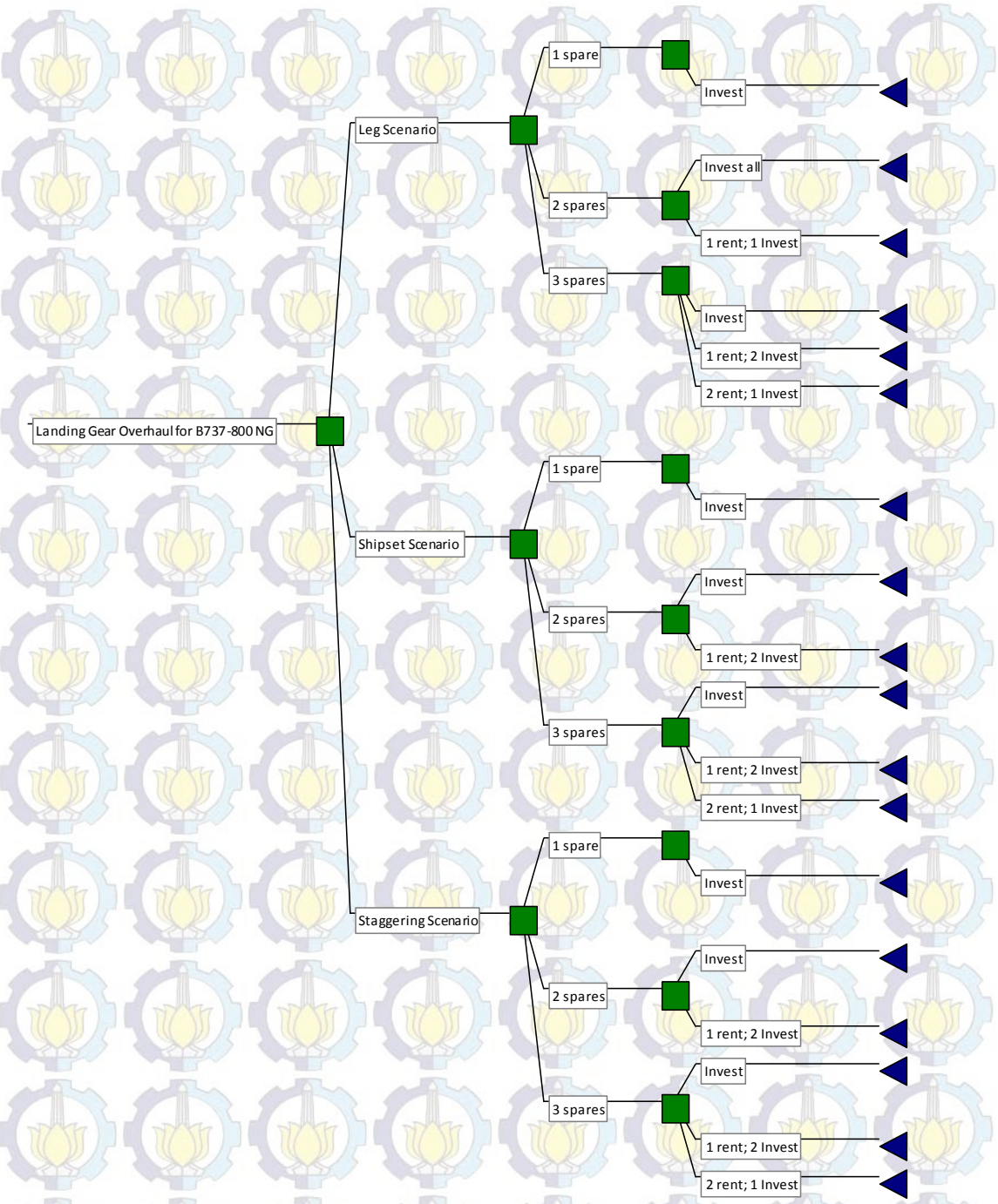


Figure 4.1 Decision Decision Tree of the scehme defore domination

From the combination of those factors, there are 18 schemes that available to choose. Figure 4.1 shows the decision three of the available scheme.

4.1.2 Business Scheme after Domination

There are 18 schemes developed from the combination of three decision alternatives, maintenance schedule, number of spares and the spare ownership. Therefore, domination exists in term of maintenance schedule and the number of available spare. In maintenance schedule, domination exists from shipset and staggering scenario over the leg scenario. This is because both for GMF Aero Asia and Garuda Indonesia will hard to manage their operational when adopting leg scenario in maintenance schedule.

For Garuda Indonesia, leg scenario leads to higher loss sales due to more grounded time needed. When the aircraft is grounded, they cannot fly and generate money from the ticket sales. In staggering and shipset scenario, each aircraft will have only one schedule to grounded the aircraft or in equal with four days. Compared with leg scenario, each aircraft will be scheduled two times for the grounded. It equals with eight days per aircraft. Longer the time needed for grounded, leads to higher loss for Garuda. Figure 4.2 shows the comparison of loss sales between three maintenance-schedule scenarios.

Hence, when GMF Aero Asia uses leg scenario, they will get hard to decide the number of spare LDG that need to be provided. One of the options is renting from third party. When GMF choose to rent from third party, it should for in one set of MLG and NLG. Otherwise, leg scenario will done overhaul separately.

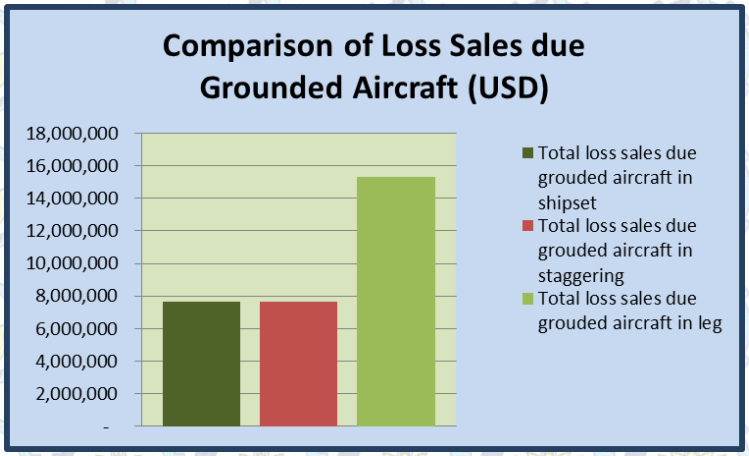


Figure 4.2 Comparison of Ineffective Value between Scenario

Domination also exists in the number of spare provided by GMF Aero Asia. When there is only one spare available, both GMF and Garuda will get disadvantages. One spare capacity equals with 5 LDG overhaul even per year. For GMF Aero Asia, capacity of five LDGs per year is too low. It leads to high opportunity lost due to off-load overhaul even to third party, since demand of overhaul per year is more than five. Table 4.1 shows the recap of number off-loaded overhaul to third party (for example using the shipset scenario).

Table 4.1 Capacity comparison between spares

Off-loaded Work in Shipset Scenario			
Year	**1 Spare**	**2 spares**	**3 spares**
2013	0	0	0
2014	0	0	0
2015	0	0	0
2016	0	0	0
2017	0	0	0
2018	7	2	0
2019	15	10	8
2020	4	0	0
2021	1	0	0

From Garuda perspective, when the number of overhaul that off-loaded to third party is high, Garuda needs to pay higher for each overhaul even. This is because the price of overhaul in third party is higher than offered by GMF Aero Asia. The price each overhaul in third party is USD 401,100 per overhaul even.

From those dominations, 10 schemes left which possible to be chosen for both Garuda and GMF. The left decision alternatives for maintenance schedule are shipset scenario and staggering scenario. Then the decision alternatives for number of spare are two spares and three spares with the same combination whether invest or rent from third party. Indeed, rent-all option is not available to choose, because in 2014 investment already done for one spare by Garuda Indonesia. The decision tree regarding ten schemes is shown in figure 4.3

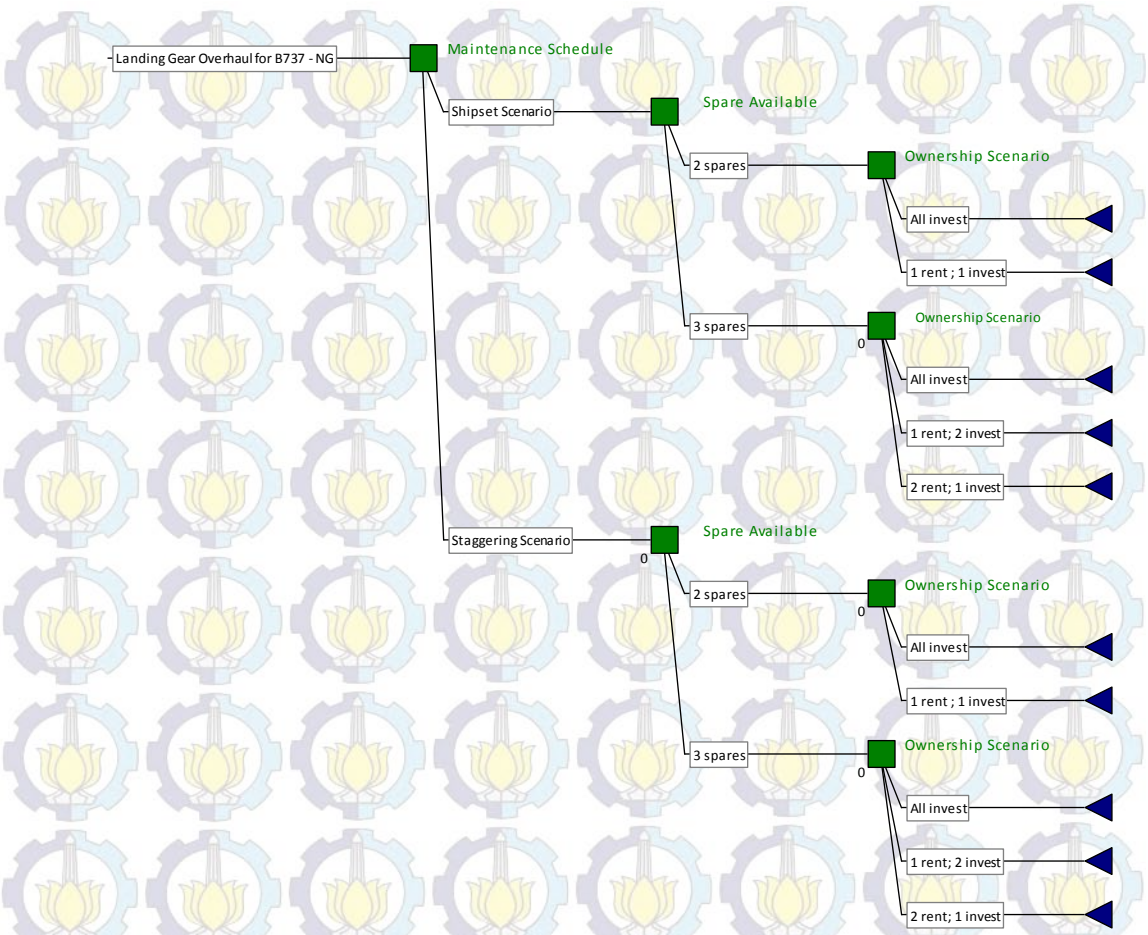


Figure 4.3. Decision Tree of the scehme after domination

Each scheme will be analyzed using Profit and Loss Analysis (PNL) to identify the income and outcome in the agreed time span regarding the business overhaul. From the PNL result, find the NPV value to be the feasibility parameter for current scheme.

4.2 PT. GMF Aero Asia Business Scheme Analysis

This subchapter analyzes what is the cash inflow and the cash outflow in business overhaul LDG Boeing 737-800 NG for each scenario using GMF Aero Asia perspective. After determine the inflow and outflow, the Profit and Loss Analysis is done to get the NPV value for each scheme. Then the best scheme is chosen using the GMF Aero Asia perspective.

4.2.1 Cash Inflow and Cash Outflow

Cash inflow represents the revenue generated by GMF when performing landing gear overhaul. The cash inflows are,

- Revenue from maintenance

  Based on data from GMF Aero Asia, the price for one even of landing gear overhaul is USD 396,000 per shipset. Per shipset refers to overhaul of Main Landing Gear (MLG) and Nose Landing Gear (NLG) in one schedule. This price is base price in 2014 and the price will increase using escalation price is 4.5% per year. The recap of the maintenance price is shown in table 4.2

Table 4.2 Maintennace Price

Year	Maintenance Price (USD)
2014	396,000
2015	413,820
2016	432,442
2017	451,902
2018	472,237
2019	493,488
2020	515,695
2021	538,901

  Multiply number of overhaul even with the following price generates the revenue from maintenance fee in current year. When there is no overhaul even in current year, there will be no revenue generated from the maintenance fee.

- Revenue from availability fee

  Availability fee is cost paid by Garuda for the availability of Landing Gear spare that is used during the overhaul process. When the number of spare that available is higher, Garuda will pay higher fee. The concept of availability fee is using flat fee based on the investment to buy the landing gear. The amount of availability fee is got by dividing the total investment

for one spare with the payment duration in the time span. The recap of availability fee for each spare investment is shown in table 4.3

Table 4.3 Availability Fee price for each number of spare available

Year	Availability Fee for One Spare Investment (USD)	Availability Fee for Two Spares Investment (USD)	Availability Fee for Three Spares Investment (USD)
2014	487,241	487,241	487,241
2015	487,241	1,049,245	1,049,245
2016	487,241	1,049,245	1,049,245
2017	487,241	1,049,245	1,308,630
2018	487,241	1,049,245	1,308,630
2019	487,241	1,049,245	1,308,630
2020	487,241	1,049,245	1,308,630
2021	487,241	1,049,245	1,308,630

- Revenue from other service

  When GMF is performing landing gear overhaul, the revenue does not only come from the overhaul process. GMF also got revenue from the other service outside the maintenance process. Those revenue are parking fee, handling fee, disassembly fee, etc. According to historical data, the revenue from other service is USD 50,000 per year.

- LDG salvage value

  Landing gear has certain age before need to be overhaul, which is 21,000 cycles. Using the assumption that one landing gear spends 5.5 cycles per day, landing gear will get an overhaul in day 3,818 or year-10. That period is used as the economic life of landing gear. Therefore, the times span used in this business analysis is eight years. In the years-8, there will be salvage value of LDG because the time span is smaller than the economic life. The amount of salvage value is got by subtracting the amount of investment with the depreciation each year.

- LDG rent payment from Garuda Indonesia

  The maximum capacity of LDG workshop is 12 LDGs per year and the overhaul spends 2.4 months. There are three lines available in the workshop. Thus, the maximum spare that possible to be provided is three spares. As mentioned in previous, there is option to choose whether the procurement of spare will through the investment or rent. If GMF decided to rent the spare from the third party, they need to pay USD 52,500 per month per shipset. This fee comes from payment of Garuda with no profit charged by GMF.

Cash outflow represents the cost spend by GMF when performing landing gear overhaul. The cash outflow are,

- LDG Procurement

  Investment needed to procure the spare for the landing gear. Garuda will rent the spare during the overhaul process so the aircraft still can fly to generate sales. The base price for landing gear is USD 2,800,000 each. By using escalation rate 4.5% p.a., table 4.4 shoes the price recap,

Table 4.4 Landing Gear Price

Year	LDG price (USD)
2014	2,800,000
2015	2,926,000
2016	3,057,670
2017	3,195,265
2018	3,339,052
2019	3,489,309
2020	3,646,328
2021	3,810,413

- Cost of Poor Quality (COPQ)

  During the overhaul process, there will be error works, which comes from material or done by the workers. Therefore, GMF Aero Asia needs to pay this error as a cost. The cost is called is Cost of Poor Quality. According to historical data, COPQ rate equals 0.03% from the revenue generated each year.

- Man-hour cost

  Man-hour cost is related with the cost paid by GMF to pay workers during the overhaul process. For one overhaul, the workforce needed equals with 572 hours. To pay the worker, labor rate used at USD 30 per hour. As the same with previous calculation, the labor rate increase every year follows the escalation rate 4.5% p.a. Table 4.5 shows the recap of labor cost each year.

Table 4.5 Labor Cost each year

Year	Manhour	Labor Rate	Labor Cost
2014	572	30	17,160
2015	572	31	17,932
2016	572	33	18,739
2017	572	34	19,582
2018	572	36	20,464
2019	572	37	21,384
2020	572	39	22,347
2021	572	41	23,352

- Material Cost

  During the overhaul process, GMF will purchase material as needed. In total, material procurement will spend USD 269,000, which is base price in 2014. As the same with previous calculation, the labor rate increase every year follows the escalation rate 4.5% p.a. Table 4.6 shows the recap of material cost each year.

Table 4.6 Material Price

Year	Material Cost (USD)
2014	269,000
2015	281,105
2016	293,755
2017	306,974
2018	320,788
2019	335,223
2020	350,308
2021	366,072

- LDG rent payment from Garuda

  The payment for renting LDG spare from third party is the same as the cash inflow from Garuda to pay the LDG rent payment from third party.

- General and Administration Cost

  General and administration cost that spend by GMF is related with water, electricity, office equipment, etc. According to historical data, the percentage of G&A cost equals with 5.1% from the revenue generated each year.

- Insurance Cost

  Assume that insurance cost is equal with 2% from the revenue generated each year.

4.2.2 Profit and Loss Analysis

After define the entity in cash inflow and cash outflow, Profit and Loss Analysis (PNL) is done for each scheme. Inflow and outflow calculation is done in PNL to find Gross Profit and Free Cash Flow. In this subchapter, scheme one is done to show the calculation example. Scheme one uses shipset scenario, available spare is two spares with combination of one investment and one rent. Then, subchapter 4.2.4 shows the recap of NPV result for each scheme.

In scheme one, there are five entities as the cash inflow for GMF Aero Asia. The first revenue comes from the maintenance fee. Maintenance fee depends with the schedule, number of spare and when the overhaul is done. After define how much overhaul even will done by GMF Aero Asia, multiply number of even with maintenance price will become the revenue for maintenance.

The next revenue comes from availability fee. Availability fee depends on the number of spare provided by GMF Aero Asia. In this scheme the number of spare provided is two spares. Thus, the availability fee generated each year is USD 487,241. The next revenue comes from the other service fee, USD 50,000.

Fourth revenue comes from salvage value of landing gear spare. As in scheme one, GMF does not invest any spare, there is no salvage value generated by GMF Aero Asia. The last income in scheme one comes from the LDG Rent Payment from Garuda to pay the rented LDG spare from third party. GMF will only rent spare from third party when the one spare that provided by Garuda cannot fulfill the demand. One spare capacity equals with five LDGs per year. Table 4.7 shows the recap of inflow calculation in scheme one.

Table 4.7. Cash inflow in scheme one for GMF Aero Asia perspective

	Demand Overhaul from Garuda							
	2014	2015	2016	2017	2018	2019	2020	2021
	0	0	0	1	12	20	9	8
	Number of Landing Gear Overhauled							
	2014	2015	2016	2017	2018	2019	2020	2021
	0	0	0	1	10	10	9	8
Inflow	2014	2015	2016	2017	2018	2019	2020	2021
Revenue Ovehaul Maintenance (USD)	-	-	-	451,902	4,722,374	4,934,880	4,641,255	4,311,210
Revenue Availability Fee (USD)	487,241	487,241	487,241	487,241	487,241	487,241	487,241	487,241
Revenue from Other Service (USD)	-	-	-	50,000	50,000	50,000	50,000	50,000
Salvage Value (USD)	-	-	-	-	-	-	-	-
LDG rent Payment from Garuda (USD)	-	-	-	-	630,000	630,000	504,000	378,000
Total Cash Inflows	**487,241**	**487,241**	**487,241**	**989,143**	**5,889,615**	**6,102,122**	**5,682,496**	**5,226,452**

After calculate the cash inflow from the business landing gear overhaul in scheme one, the next step is we need to calculate the expenditure for the cash outflow. There are seven entities as expenditure in cash outflow when GMF Aero Asia perform overhaul.

The first expenditure is money that invested to procure landing gear spare. In scheme one, there is one landing gear purchased in 2014 for USD 2,800,000. The next expenditure is Cost of Poor Quality (COPQ) which anticipate error works during the process overhaul. According to historical data, COPQ equals with 0.03%.

The next expenditure is to pay workers and buy materials. To calculate man-hour cost, multiply number of even with number workforce. Then multiply the result with the labor rate to get the man-hour cost each year. Then to find the material costs, multiply material cost each year with the number of even overhaul.

Table 4.8. Cash outflow in scheme one for GMF Aero Asia perspective

	Demand Overhaul from Garuda							
	2014	2015	2016	2017	2018	2019	2020	2021
	0	0	0	1	12	20	9	8
	LDG Purchased							
	2014	2015	2016	2017	2018	2019	2020	2021
	1	0	0	0	0	0	0	0
	Number of Landing Gear Overhauled							
	2014	2015	2016	2017	2018	2019	2020	2021
	0	0	0	1	10	10	9	8
Outflow	2014	2015	2016	2017	2018	2019	2020	2021
LDG Procurement (USD)	(2,800,000)	-	-	-	-	-	-	-
Cost Of Poor Quality (0.03% from revenue)	-	-	-	(297)	(1,767)	(1,831)	(1,705)	(1,568)
Manhours cost (USD)	-	-	-	(19,582)	(204,636)	(213,845)	(201,121)	(186,819)
Material Cost (USD)	-	-	-	(306,974)	(3,207,875)	(3,352,229)	(3,152,772)	(2,928,575)
LDG rent Payment for Garuda (USD)	-	-	-	-	(630,000)	(630,000)	(504,000)	(378,000)
General & Administration cost	-	-	-	(50,446)	(300,370)	(311,208)	(289,807)	(266,549)
Insurance Cost	-	-	-	(19,783)	(117,792)	(122,042)	(113,650)	(104,529)
Total Cash Outflows	**(2,800,000)**	-	-	**(397,082)**	**(4,462,441)**	**(4,631,156)**	**(4,263,055)**	**(3,866,040)**

The next expenditure related with the payment of Garuda Indonesia spare rent from third party. The amount of payment is the same with what is received in cash inflow in 'LDG Rent Payment from Garuda'. The last expenditure is related with general and admiration cost (G&A cost) and insurance cost. The percentage of G&A cost is 5.1% from the revenue generated each year and the percentage of insurance cost is 2% from revenue. Table 4.8 shows the recap of outflow calculation in scheme one.

4.2.3 Net Profit and NPV Value

After define the cash inflow and cash outflow, gross profit is calculated by subtracting total cash inflow with total cash outflow. In 2014, value of gross profit will be negative as there is amount of inflow generated is smaller compared with money that invested for one LDG. Then, gross profit is subtracted with LDG depreciation value to get the Earnings before Interest and Tax (EBIT).

The investment to purchase landing gear is using GMF capital, thus there is no outflow to pay interest and principal payment. To get the net profit, subtract EBIT with tax 25%. Then to get NPV value, we need to find free cash flow by adding net profit with depreciation. Adding depreciation again to net profit is because in actual cash flow there is no expenditure for depreciation. Table 4.9 shows gross profit calculation and the Net Cash Flow.

Table 4.9 Gross Profit in Scheme one using GMF Aero Asia Perspective

	Number of Landing Gear Overhauled							
	2014	2015	2016	2017	2018	2019	2020	2021
	0	0	0	1	10	10	9	8
Gross Profit	**(2,312,759)**	**487,241**	**487,241**	**592,061**	**1,427,174**	**1,470,966**	**1,419,442**	**1,360,412**
Depreciation	-	-	-	-	-	-	-	-
EBIT	**(2,312,759)**	**487,241**	**487,241**	**592,061**	**1,427,174**	**1,470,966**	**1,419,442**	**1,360,412**
Interest Expense	-	-	-	-	-	-	-	-
EBT	(2,312,759)	487,241	487,241	592,061	1,427,174	1,470,966	1,419,442	1,360,412
TAX (25%)	-	(121,810)	(121,810)	(148,015)	(356,794)	(367,742)	(354,860)	(340,103)
Earning After Tax (Net Profit)	**(2,312,759)**	**365,431**	**365,431**	**444,046**	**1,070,381**	**1,103,225**	**1,064,581**	**1,020,309**
Depreciation	-	-	-	-	-	-	-	-
Principal Payment	-	-	-	-	-	-	-	-
Net Cash Flows	**(2,312,759)**	**365,431**	**365,431**	**444,046**	**1,070,381**	**1,103,225**	**1,064,581**	**1,020,309**

From the calculation of net cash flow in eight-years' time span, we can get the NPV value in scheme one equals with USD 1,688,154.

4.2.4 Result Recapitulation and Best Scheme Analysis

The calculation in previous section is only for scheme one. By doing the same calculation step to the other schemes, table 4.10 shows the recapitulation of NPV output from ten schemes.

Table 4.10 NPV Recapitulation using GMF Aero Asia Perspective

Scheme	Maintenance Schedule	Number of spares	Ownership	NPV Value
1	Shipset	2	1 invest; 1 rent	$ 1,384,449
2	Shipset	2	All invest	$ 1,850,688
3	Shipset	3	All invest	$ 1,406,201
4	Shipset	3	2 invest; 1 rent	$ 2,027,901
5	Shipset	3	1 invest; 2 rent	$ 1,536,817
6	Staggering	2	1 invest; 1 rent	$ 1,682,567
7	Staggering	2	All invest	$ 2,183,711
8	Staggering	3	All invest	$ 1,851,030
9	Staggering	3	2 invest; 1 rent	$ 2,361,523
10	Staggering	3	1 invest; 2 rent	$ 1,860,379

For GMF Aero Asia, the best scheme is scheme with highest NPV value. Scheme nine is scheme with highest NPV value that equals to USD 2,361,523. This scheme used staggering scenario as the schedule and use three spares capacity by using combination of two investments and one rent. Table 4.11 shows the information of scheme nine.

Table 4.11 Scheme nine Information

Scheme 9	
Maintenance Schedule	Staggering Schedule
Number of Spare	3 spares
Ownership	2 invest
	1 rent
NPV Value	$ 2,361,523

Staggering scenario is the best option for GMF because GMF's revenue from this schedule is higher compared with shipset scenario. This is because in staggering scenario, GMF done more even overhaul rather than shipset scenario. In shipset scenario, GMF done 42 aircrafts with total revenue from maintenance fee is USD 20,993,072. In the other hand, when GMF uses staggering scenario, it will increase the capacity follows the load of the workshop each year. GMF will done 48 aircrafts with total revenue USD 23,704,482 or USD 2,711,410 higher.

Furthermore, by using three spares will increase the maximum capacity to 12 LDGs. The combination of two investments and one rent is the optimum option for GMF. Using this combination, GMF still gets high revenue from availability fee (two spares), but they do not have to do high investment through three spares. This combination shows that the revenue from three spares investment (availability fee) is not equivalent with the investment for three spares. The expenditure is too high compared the revenue.

4.3 PT. Garuda Indonesia Business Scheme Analysis

This subchapter analyzes what is the what is going to be the cash inflow and cash outflow in business overhaul LDG Boeing 737-800 NG for each scenario using Garuda Indonesia perspective. After determine the inflow and outflow, the Profit and Loss Analysis is done to get the NPV value for each scheme. Then the best scheme is chosen using the Garuda Indonesia perspective.

4.3.1 Cash Inflow and Cash Outflow

Cash inflow represents the revenue generated by GMF when performing landing gear overhaul. The cash inflow are,

- LDG spare Salvage Value

  Landing gear that purchased in 2014 is going to be owned by Garuda Indonesia even the investment in 2014 comes from GMF Aero Asia. Thus, in 2021 Garuda will have salvage value from the Landing Gear. To get salvage value, subtract the investment to buy the LDG with the depreciation each year.

Cash outflow represents the cost spend by GMF when performing landing gear overhaul. The cash outflow are,

- Maintenance Fee Payment

  Maintenance fee payment is expenditure that paid to GMF Aero Asia regarding maintenance activities to the landing gear. The price charged for one even overhaul is USD 396,000 with escalation rate 4.5% p.a.

  The payment from Garuda does not follow the per-even payment system. Garuda prefers to used flat fee annual payment. To determine how much annual fee that need to be paid, first we have to determine the actual cost that happen each year follows the capacity provided. Table 4.12 shows the even overhaul and the actual fee charged each year.

Table 4.12 Maintenance Fee Price charged by GMF Aero Asia

Year	Overhaul Even	Maintenance Fee
2014	0	-
2015	0	-
2016	0	-
2017	7	3,163,312
2018	10	4,722,374
2019	10	4,934,880
2020	9	4,641,255
2021	8	4,311,210

As mentioned, Garuda will use annual flat payment system; find the present value for each maintenance fee use i=4% by assuming the deposit in dollar currency. Then, the annual fee that needs to be paid is shown in table 4.13

Table 4.13 Annual Fee payment

Total Maintenance Fee	20,021,884
Annual Fee	2,973,807

As known, there is difference system preferred by Garuda and GMF. Garuda wants annual flat fee payment but GMF prefers to use per even payment. To accommodate this difference objective, new system by involving Fund Manager (FM) as third party is proposed.

Garuda and GMF will find and choose third party as the Financial Manager (FM) that has responsible to manager the money flow between Garuda and GMF. Garuda uses annual flat payment will give the fee to FM, not goes to GMF. FM will manage the money so it will grow following the interest rate 4%. FM has responsible to make sure that the money paid from Garuda can cover the maintenance fee that need to be paid each year to GMF. Therefore, GMF will only take money by corresponding the number of overhaul will be done each year.

- Availability Fee Payment

  Availability shows the expenditure paid by Garuda for the number of spares that available through the investment done by GMF. To get the cost for availability, divide the total of investment with the period in business analysis time-span. Table 4.14 shows the amount of availability each year.

Table 4.14 Availability Fee charge

Year	Availability Fee for One Spare Investment (USD)	Availability Fee for Two Spares Investment (USD)	Availability Fee for Three Spares Investment (USD)
2014	487,241	487,241	487,241
2015	487,241	1,049,245	1,049,245
2016	487,241	1,049,245	1,049,245
2017	487,241	1,049,245	1,308,630
2018	487,241	1,049,245	1,308,630
2019	487,241	1,049,245	1,308,630
2020	487,241	1,049,245	1,308,630
2021	487,241	1,049,245	1,308,630

- LDG rent fee payment

  If the spare capacity contains any renting from third party, Garuda will pay the rented spare by using rate of USD 52,500 per month. To find the fee, we have to find the difference with workshop capacity with number of demand. Then multiply the result with USD 52,500 multiplied 2.4

- Offload-work maintenance payment

  Beside maintenance fee that paid to GMF, there will be maintenance fee that paid to third party to every even cannot that done by GMF due to capacity limitation. If the demand is larger than the workshop capacity, the rest of aircrafts need to be send and overhaul in third party. The fee charged to Garuda is USD 401,000 per even overhaul.

4.3.2 Profit and Loss Analysis

After define the entity in cash inflow and cash outflow, Profit and Loss Analysis (PNL) is done for each scheme. Inflow and outflow calculation is done in PNL to find Gross Profit and Free Cash Flow. In this subchapter, scheme one is done to show the calculation example. Scheme one uses shipset scenario, available spare is two spares with combination of one investment and one rent. Then, subchapter 4.2.4 shows the recap of NPV result for each scheme.

As mentioned, Garuda will have one cash inflow through the landing gear salvage value. Salvage value will comes in 2021 for USD 1,036,000. Table 4.15 shows the calculation for the cash inflow for Garuda Indonesia using scheme one.

Table 4.15 Cash Inflow Calculation in scheme one using Garuda Perspective

	Number of Landing Gear Overhauled							
	2014	2015	2016	2017	2018	2019	2020	2021
	0	0	0	1	10	10	9	8
Inflow	2014	2015	2016	2017	2018	2019	2020	2021
Salvage Value	0	0	0	0	0	0	0	1,036,000
Total Cash Inflows	-	-	-	-	-	-	-	**1,036,000**

After calculate the cash inflow using scheme one, the next step is we need to calculate the expenditure for the cash outflow. There are four expenditures in cash outflow when Garuda Indonesia perform overhaul.

The first expenditure is maintenance fee payment paid to GMF Aero Asia. Garuda will use annual flat payment to pay the maintenance even from 2014 until 2021. According to the total actual cost then find the PV-value for each cost, from the total PV-value find the NPV-value using i=8%. Thus, in scheme one, Garuda needs to pay USD 2,531,066 as the annual fee.

The second expenditure is payment for aircrafts that cannot done the overhaul process in GMF Aero Asia. To find the spend, subtract the total demand each year with the maximum capacity offered by GMF. Then multiply the result with USD 401,100 to get the fee payment to third party.

Table 4.16 Cash Outflow Calculation in scheme one using Garuda Perspective

	Demand Overhaul							
	2014	2015	2016	2017	2018	2019	2020	2021
	0	0	0	1	12	20	9	8
	Number of Landing Gear Overhauled by GMF							
	2014	2015	2016	2017	2018	2019	2020	2021
	0	0	0	0	0	0	0	0
Outflow	2014	2015	2016	2017	2018	2019	2020	2021
Maintenance Fee Payment to GMF	(2,531,066)	(2,531,066)	(2,531,066)	(2,531,066)	(2,531,066)	(2,531,066)	(2,531,066)	(2,531,066)
Maintenance Fee Payment to Third Party	-	-	-	-	(802,200)	(4,011,000)	-	-
Availability Fee Payment	(487,241)	(487,241)	(487,241)	(487,241)	(487,241)	(487,241)	(487,241)	(487,241)
Spare Rent Fee Payment	-	-	-	-	(630,000)	(630,000)	(504,000)	(378,000)
Total Cash Outflows	**(3,018,308)**	**(3,018,308)**	**(3,018,308)**	**(3,018,308)**	**(4,450,508)**	**(7,659,308)**	**(3,522,308)**	**(3,396,308)**

Instead of maintenance payment, Garuda needs to pay the availability of the spare that provided by GMF. In scheme one, the capacity provided is two LDGs using combination of one invest and one rent. The expenditure each year can refers to table 4.16. This outflow only covers the one investment for the landing gear. Garuda still needs to pay for the LDG spare that rent from third party. The cost of renting LDG spare is USD 52,500 per month, but Garuda will only rent the spare when the utilization of the invested spare already 100%. The capacity of one LDG is 5 LDGs per year.

4.3.3 Net Profit and NPV Value

After define the cash inflow and cash outflow, gross profit is calculated by subtracting total cash inflow with total cash outflow. For all years, the value will be negative as the position of Garuda Indonesia as customer will expend money for overhaul the LDG to their aircrafts.

We can directly calculate NPV value from the gross profit, because there is no payment regarding with debt.

Table 4.17 Gross Profit Calculation in Scheme one using Garuda Perspective

	Demand Overhaul							
	2014	2015	2016	2017	2018	2019	2020	2021
	0	0	0	1	12	20	9	8
	Number of Landing Gear Overhauled by GMF							
	2014	2015	2016	2017	2018	2019	2020	2021
	0	0	0	0	0	0	0	0
Gross Profit	**(3,018,308)**	**(3,018,308)**	**(3,018,308)**	**(3,018,308)**	**(4,450,508)**	**(7,659,308)**	**(3,522,308)**	**(2,360,308)**
Depreciation	-	(252,000)	(252,000)	(252,000)	(252,000)	(252,000)	(252,000)	(252,000)
EBIT	**(3,018,308)**	**(3,270,308)**	**(3,270,308)**	**(3,270,308)**	**(4,702,508)**	**(7,911,308)**	**(3,774,308)**	**(2,612,308)**
Interest Expense	-	-	-	-	-	-	-	-
EBT	-	-	-	-	-	-	-	-
TAX (25%)	-	-	-	-	-	-	-	-
Earning After Tax (Net Profit)	**(3,018,308)**	**(3,270,308)**	**(3,270,308)**	**(3,270,308)**	**(4,702,508)**	**(7,911,308)**	**(3,774,308)**	**(2,612,308)**
Depreciation	-	252,000	252,000	252,000	252,000	252,000	252,000	252,000
Principal Payment	-	-	-	-	-	-	-	-
Net Cash Flows	**(3,018,308)**	**(3,018,308)**	**(3,018,308)**	**(3,018,308)**	**(4,450,508)**	**(7,659,308)**	**(3,522,308)**	**(2,360,308)**

Table 4.17 shows gross profit calculation and the Net Cash Flow in perspective of Garuda Indonesia.. From the calculation of net cash flow in eight-year' time span. We can get the NPV value in scheme one equals with (USD 22,397,875).

4.3.4 Result Recapitulation and Best Scheme Analysis

The calculation in previous section is only for scheme one. By doing the same calculation step to the other schemes, table 4.18 shows the recapitulation of NPV output from ten schemes.

Table 4.18 NPV Recapitulation from Garuda Perspective

Scheme	Maintenance Schedule	Number of spares	Ownership	NPV Value
1	Shipset	2	1 invest; 1 rent	($22,397,875)
2	Shipset	2	All invest	($22,568,239)
3	Shipset	3	All invest	($24,240,265)

Scheme	Maintenance Schedule	Number of spares	Ownership	NPV Value
4	Shipset	3	2 invest; 1 rent	($25,110,302)
5	Shipset	3	1 invest; 2 rent	($23,578,078)
6	Staggering	2	1 invest; 1 rent	($23,382,045)
7	Staggering	2	All invest	($23,595,944)
8	Staggering	3	All invest	($24,904,502)
9	Staggering	3	2 invest; 1 rent	($25,627,499)
10	Staggering	3	1 invest; 2 rent	($22,660,869)

For Garuda Indonesia, the best scheme is scheme with highest NPV value. Scheme one is scheme with highest NPV value in term of cost that equals to USD 22,397,875. This scheme used staggering scenario as the schedule and use three spares capacity by using combination of two investments and one rent. Table 4.19 shows the information of scheme nine.

Table 4.19 Scheme Nine Information

Scheme 1	
Maintenance Schedule	Shipset Schedule
Number of Spare	2 spares
Ownership	1 invest
	1 rent
NPV Value	$ (22,397,875)

Shipset scenario is the best option for Garuda because Garuda's cost tp pay the maintenance activity is lower compared with staggering scenario. This is because in staggering scenario, GMF done more even overhaul rather than shipset scenario. In shipset scenario, Garuda aircrafts that done overhaul in GMF is 38 aircrafts that equals to (USD 20,248,531) and 12 aircrafts will be done by using third party service or equals with (USD 4,813,200). Thus, the total cost for overhaul this 50 aircrafts is (USD 25,061,731).

In the other hand, when Garuda uses staggering scenario, it will increase the cost that paid in total for maintenance activity. The total cost is (USD 26,197,056) or (USD 1,135,325) higher than shipset total fee.

This scheme is using two spares as the capacities by using combination of one invest and one rent. Garuda chooses this option, because the total costs to rent LDG is lowest if compared with the other spare capacity option. Garuda's costs to rent LDG from GMF, called availability, equals with (USD 3,897,931). Then, the cost that needs to pay to rent LDG from third party is (USD 2,142,000). This combination of cost is the lowest expenditure for Garuda if compared with other scheme.

4.4 Fair Business Scheme

After decide which scheme gives best benefit for each PT. GMF Aero Asia and PT. Garuda Indonesia, can be seen that both party choose different scenario to adopt. GMF Aero Asia prefers to adopt scheme nine, which gives highest profit. In scheme nine, staggering scenario is used, and three spares capacity is used by using combination of two investments and one rent from third party. This scheme gives profit to GMF Aero Asia USD 2,361,522 in net present value.

Contrary with Garuda preferences to choose lowest cost, the chosen scheme is scheme one. In scheme one, shipset scenario is used and two spares capacity is used by invest to all spares. This scheme costs Garuda (USD 22,397,874) in net present value. Table 4.20 shows the comparison each scheme between NPV cost for GIA and NPV profit for GMF.

Table 4.20 Comparison between NPV GIA and NPV GMF

No	Scheme GIA	NPV GIA	Scheme GMF	NPV GMF
1	1	$ (22,397,874.87)	1	$ 1,384,448.66
3	2	$ (22,568,239.37)	2	$ 1,850,089.22
4	3	$ (24,240,264.65)	3	$ 1,406,200.62
5	4	$ (25,110,301.61)	4	$ 2,027,900.66
6	5	$ (23,578,077.85)	5	$ 1,536,817.08
2	6	$ (23,382,045.46)	6	$ 1,682,567.37
9	7	$ (23,595,943.96)	7	$ 2,183,711.30
8	8	$ (24,904,501.98)	8	$ 1,851,030.06
10	9	$ (25,627,499.36)	9	$ 2,361,522.73
7	10	$ (22,660,869.25)	10	$ 1,860,378.80

If we see the pattern between cost and revenue for each schemes, normally when Garuda spend high cost, GMF will got higher profit. Otherwise, when

Garuda decide to reduce the expenditure regarding overhaul the LDG, GMF profit will decrease. Regarding current condition, business scheme that fair for both perspective is proposed. The objective of fair business scheme proposal is to give advantage for both Garuda Indonesia and GMF Aero Asia. Fair business scheme gives advantage for GMF Aero Asia in terms of the effort to maximize profit. Otherwise, Garuda Indonesia does not have to spend a lot of money to pay GMF Aero Asia.

The proposed scheme will consider constraint that Garuda is not willing to spend at high cost and GMF's objective to get high profit. Figure 4.5 shows the negotiation range from the plotted NPV output of each scheme from Garuda Indonesia and GMF Aero Asia.

Heuristic method is used to find the fair scheme as shown in figure 4.5. The reason using heuristic method is because the value inputted to the interaction matrix between GMF and Garuda cannot fill all columns. Even game theory approach can be used to determine the fair point, heuristic method is enough to determine the fair point. In the interaction matrix, the filled column is in the diagonal side. This condition describes that the scheme chosen between GMF and Garuda has to be the same. GMF and Garuda cannot run the overhaul business if the scheme is not agreed.

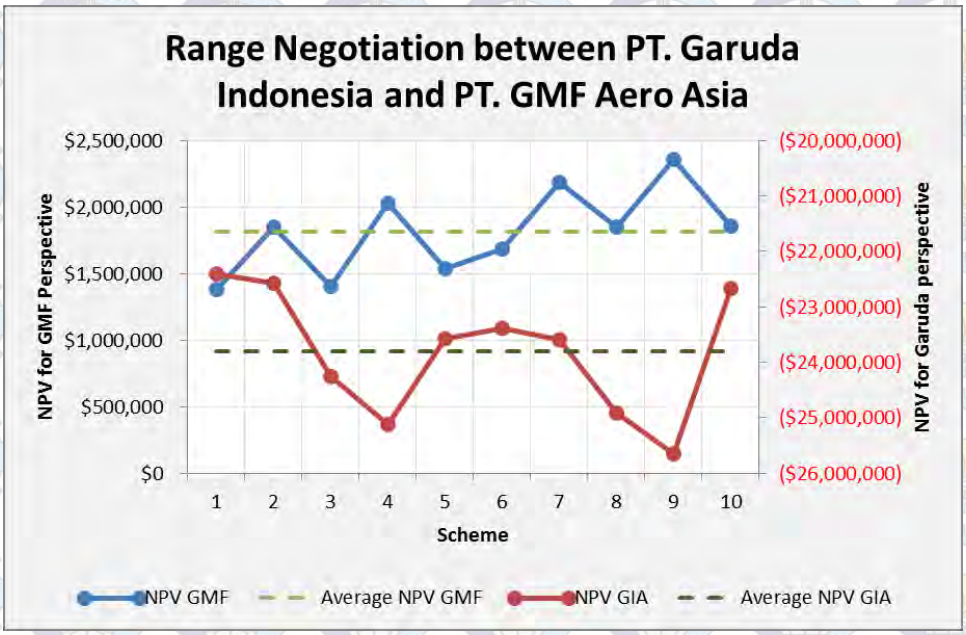


Figure 4.4 Range Negotiation between PT. Garuda Indonesia and PT. GMF Aero Asia

There are two steps used to find the fair scheme from the negotiation range. The first step finds which schemes that both parties will accept. Thus, an acceptance boundary is made by calculating the average NPV output from all schemes. Table 4.21 shows the average NPV outcome for GIA and GMF.

Table 4.21 The average NPV for GIA and GMF

Average NPV for GIA	$ (21,013,426.20)
Average NPV for GMF	$ 1,814,466.65

The acceptance area for GMF is for schemes that above the GMF average value, USD 1,814,466. Any schemes has output lower than the threshold, GMF will not accept the scheme. Whereas, acceptance area for Garuda is for schemes that has NPV value not greater than (USD 21,013,426). Thus, Garuda only accept schemes that have NPV cost lower that the threshold. From the acceptance area, schemes that accepted for each perspective are shown in table 4.22

Table 4.22 The accepted scheme for GMF and Garuda

Scenario	NPV Value for GMF	Scenario	NPV Value Garuda
2	$ 1,850,089	1	$ (22,397,874.87)
4	$ 2,027,901	2	$ (22,568,239.37)
7	$ 2,183,711	5	$ (23,578,077.85)
8	$ 1,851,030	6	$ (23,382,045.46)
9	$ 2,361,523	7	$ (23,595,943.96)
10	$ 1,860,379	10	$ (22,660,869.25)

From table 4.22, schemes that accepted by both Garuda and GMF are scheme two, scheme seven, and scheme ten. From those available schemes, the next step is to choose which scheme is the best-fair scheme for both perspectives. The approach used to find the scheme is by calculating gap. Gap is the value difference between cost by Garuda and profit by GMF. To find gap value, subtract NPV GMF with NPV GIA.

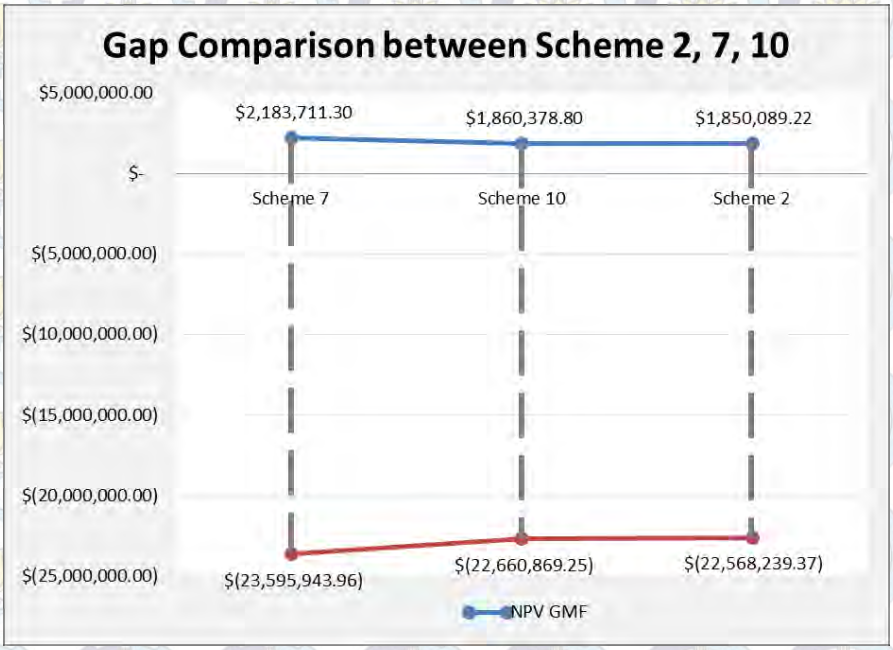


Figure 4.5 Gap between Scheme two, seven, and ten

Table 4.23 Gap value comparison between Scheme two, seven, and ten

Scheme	NPV Value
Scheme 7	$ 25,779,655.26
Scheme 10	$ 24,521,248.05
Scheme 2	$ 24,418,328.59

To find which scheme is the most fair for both parties, choose scheme with lowest gap value. Gap value express how big is the total costs spent by GIA and total profit received by GMF. When the gap is small, it tends that the GIA does not expend cost too high and GMF does not receive profit too high. Otherwise, big gap define either GIA and GMF spend and receive big costs and profit. Garuda as the parent company will not agree to choose scheme with big gap because they will burden by the high cost expenditure.

Figure 4.5 and table 4.23, shows the recapitulation from gap calculation for scheme two, seven, and ten. It can be seen that scenario seven has the highest gap value and scenario two has the lowest gap value, USD 24,418,328. Thus, according with the approach used, scheme two becomes the recommendation to be used for both Garuda Indonesia and GMF Aero Asia.

Scheme two for Garuda Indonesia classified as scheme with the lowest cost expenditure number two after scheme one. From the lowest cost, Garuda Indonesia needs to pay (USD 170,364) more. Otherwise, for GMF Aero Asia scheme two categorized as high profit, ranked number 5. If compared with scheme that has lowest profit, in scheme two GMF will receive USD 491,239 higher.

In conclusion, scheme two that considered as fair scheme because Garuda Indonesia as the parent company does not have expend high cost for the overhaul process. Nevertheless, GMF Aero Asia still receives profit that considered as high and above the average value.

Chapter V
Risk Identification and Risk Treatment

After define which scheme is fair for both parties, this chapter identifies the possible risk that will change the output from the chosen scheme. From the risk identification, risk treatment is analyzed to mitigate the risk and predict the impact. The risk analysis and its treatment is separated for each perspective.

5.1 GMF Aero Asia Business Context

From the proposed scheme, it is expected that GMF Aero Asia will get profit equals to USD 1,850,089. As the service provider, GMF has set a minimum profit that can be expected to gain. GMF set an objective that the minimum profit GMF must gain is USD 1,300,000. The minimum profit of USD 1,300,000 is derived from the lowest output within ten schemes, scheme one, that equals to USD 1,384,449. When there are any parameter changes and it gives impact to make the profit decrease below USD 1,300,000, GMF Aero Asia will consider it as risk. Instead of profit objective, GMF also concern to maximize the utilization of line capacity and the spare. Utilization is influenced by the demand from Garuda.

5.1.1 Risk Identification and Risk Treatment

From GMF business context, it can be concluded that GMF concerns on how to prevent profit reduction and workshop low utilization. From the general landing gear overhaul business context, there are six parameters that predicted will affect the profit earned by GMF. There are,

- Overhaul price

  Overhaul price is the highest sensitive parameter for the overhaul business. Overhaul price will give direct impact to the profit generated each year. This is different with the availability fee, which is determined from the LDG investment.

In contract, the overhaul price agreed in USD 396,000 per even overhaul. This price only cover 28% profit margin from the total cost. When the price decrease, it will reduce the profit earned per even overhaul. As the expenditure is the same but the payment is lower. To test the sensitivity of overhaul price, test the price against the objective to get minimum NPV USD 1,300,000 and to get NPV equal to 0. From the critical point, we can develop the mitigation action if there is any changes regarding overhaul price.

Table 5.1 Critical point for overhaul price

NPV Profit	$ 1,300,000	$ -
Overhaul Price (USD)	$ 368,010	$ 304,802

When there is any re-negotiation or Garuda Indonesia as parent company asks to change the overhaul price, GMF can prepare three mitigation actions. First GMF can offer the overhaul price at USD 401,100. This price is the same price as the competitor price. When GMF apply this rate, the NPV value will increase to USD 2,114,624.

The next mitigation is offering price at the current price, USD 396,000. If Garuda accept this price, NPV value will be USD 1,850,089. The last mitigation is offering price at rate USD 368,010 per even. This price is the lowest price that GMF can accept, because rate below USD 368,010 resulted on NPV below USD 1,300,000.

- Number of overhaul aircraft or demand

Demand will give impact to the profit because GMF will get revenue from maintenance fee depend on the number of overhaul. When there is cancellation by Garuda from the number of aircraft agreed on contract, it will decrease the revenue. To test the critical point, find the number of overhaul that will change the NPV to USD 1,300,000. The result shows if the demand decreases to 35 LDGs or Garuda decide to cancel 15 aircrafts; it will change NPV to USD 1,300,000. Nevertheless, we cannot test NPV

equal to 0, because even there is no overhaul GMF still earns revenue from availability fee.

To avoid NPV reduction, there are three mitigations can be done by GMF to avoid profit decreasing. First, when GMF has not order material, GMF can charge Garuda equals with labor rate + cancellation fee (10% overhaul price) per even cancellation. In this scheme, Garuda does not have the responsibility to pay the material but need to pay the worker. This will make the NPV equals to USD 1,566,808.

The other condition is when material already received by GMF. GMF can charge Garuda equals with labor rate + material cost + cancellation fee (10% overhaul price) per even cancellation. In this scheme, Garuda has to pay the labor rate and the material as it is already received by GMF. This action will make NPV to USD 1,764,160.

The last mitigation is Garuda has to determine the penalty need to be paid to all cancellation (15 aircrafts). First, simulate if the demand is only 35 aircrafts, and compare when the total demand in 50. The NPV difference shows USD 615,000. Then, GMF can charge Garuda for USD 500,000 for total cancelation. This will make NPV profit to USD 1,833,509

- Material Cost

  Material cost spends 90% from the total cost and it is sensitive to change the profit earned as the mark up only 28% from the total cost. To test the critical point of material cost, find the price that will change NPV to USD 1,300,000 and NPV 0. The result shows that when the material cost increases to USD 294,994, NPV cost will reduce to USD 1,300,000. When the material cost increase to USD 353,695, the NPV will turn to 0.

  To mitigate the risk, three schemes can be used to reduce the possibility for profit reduction. The scheme is offered to the suppler of material. The first scheme, try to negotiate the base price at current price USD 269,000. When the supplier reject the rate, GMF can offer higher rate at USD 269,000 + 5%. This rate is the middle rate between current price and the

price that will change NPV to USD 1,300,000. If the price is accepted, it is projected the NPV will become USD 1,577,819.

If the supplier rejects the rate, GMF can offer USD 269,000 + 10%. This is the rate when the NPV will equal with USD 1,300,000.

- Escalation rate

  The determination of escalation rate also sensitive for GMF as the service provide. When rate agrees is below the existing rate, GMF get advantages from the price difference. Otherwise, when the real rate is above the agreement, GMF will suffer, as the price expected is higher. First, test the rate to make the NPV equal to 1,300,000 and NPV equal to 0. The result shows that when the actual rate is 6.12% but the agreement is at rate 4.5%, this will decrease to USD 1,300,000. Otherwise, when the actual rate is 9.44%, it will change NPV to 0.

  To mitigate the profit reduction, three mitigations proposed. First, offer the same escalation rate as the same 4.5%. According to the U.S inflation distribution, the probability of inflation rate less or equal with 4.5% is 89%. This is quite safe for GMF to use the current rate.

  If GMF consider that 4.5% is too high, GMF can offer 3.5% as the escalation rate. If GMF use this, the probability that the actual rate above 3.5% is quite high. There is probability that 20.59% rate is above 3.5%.

  The last recommendation if Garuda still consider that 3.5% is too high, GMF can ask to us floating escalation rate follows the annual inflation of U.S.

- G&A cost

  G&A cost is related with the cash outflow to pay electricity, water, etc. The critical point of G&A cost that reduce profit to USD 1,300,000 is at 9.93% from total revenue. When the G&A% increase to 20.82%, this will change the NPV value to 0. Thus, GMF has to make sure that all activities during overhaul are done effectively to reduce the cost.

- Labor Rate

  10% from the total cost in aircraft maintenance comes from labor rate. Thus, it is very important for GMF to set a good base labor rate to maximize profit generated. In the existing condition, GMF set labor price at rate USD 30 per hour. If there is any negotiation from the workers to change the labor rate, there are there schemes to mitigate the profit risk.

  The first scheme is keep offering labor rate at USD 30 per hour. If the worker asked for higher rate, GMF can offer at rate USD 39. This rate is based on study from ARG/US aircraft, USD 39 per hour is the standard rate for airframe mechanical.

  The last scheme is GMF offer USD 75 per hour. This critical point makes the NPV equal to USD 1,300,000. Nevertheless, this rate is too high if used. Based on rate that used in Europe, for engine and power plant mechanical, they are paid at rate USD 53-67. Thus, USD 75 is not accepted and not suggested to offer.

  Table 5.2 shows the recap of risk identification and the mitigation scheme. The table also gives the prediction on the proposed mitigation scheme.

Table 5.2 Risk Identification, Risk mitigation and its impact for Garuda Indonesia

Risks Identification and the Mitigation action on scheme 2 - using GMF Aero Asia Perspective					
Objective :	1. Minimum Profit generated by GMF Aero Asia is USD 1,300,000				
	2. Maximize the Utilization of workshop and LDG Spare				
Risk ID	**Risk Identification**	**Context**	**Mitigation**		**Impact**
GMF 1	Overhaul Price (USD)	In contract, overhaul price rate is USD 396,000. Garuda as the parent company negotiate to change the price because it is considered too high.	1	Offer Garuda to use overhaul base price as the same with the competitor's **price USD 401,000**	NPV value from profit generated increase to USD 2,114,624
			2	Offer Garuda to use overhaul base price as the same with current price (28% profit	NPV value from profit generated is the same as expected, USD 1,875,688

Risks Identification and the Mitigation action on scheme 2 - using GMF Aero Asia Perspective					
Objective :	1. Minimum Profit generated by GMF Aero Asia is USD 1,300,000				
	2. Maximize the Utilization of workshop and LDG Spare				
Risk ID	**Risk Identification**	**Context**	**Mitigation**		**Impact**
				margin from total cost) **USD 396,000**	
			3	Use **USD 368,010** as overhaul base price - against objective #1	NPV from profit will drop from USD 1,875,688 to USD 1,300,000 (minimum profit expected)
GMF 2	Overhaul Even or Demand	In contract, there are 50 aircrafts agreed will be overhauled. Garuda decide to cancel 15 schedules of overhaul	1	When materials are not delivered yet -- penalty cost charged is **labor cost + cancellation fee 10% overhaul cost** per even cancellation	NPV from profit equals to USD 1,566,808
			2	When materials already received -- penalty cost charged is **labor cost + material cost + cancellation fee 10% overhaul costs** per even cancellation	NPV from profit equals to USD 1,764,160
			3	Charge Garuda Indonesia **USD 500,000** for total 15 cancellation -- Against objective #1 and #2	NPV value from profit equals to USD 1,833,509
GMF 3	G&A Cost	Current rate, G&A rate is 5.1%. There is possibility that the real expenditure exceed 5.1%	1	**Control expenditure** regarding G&A cost, do not exceed 9.93% from total revenue - against objective #1	Reduce G&A cost will increase the gross profit.

Risks Identification and the Mitigation action on scheme 2 - using GMF Aero Asia Perspective					
Objective :	1. Minimum Profit generated by GMF Aero Asia is USD 1,300,000				
	2. Maximize the Utilization of workshop and LDG Spare				
Risk ID	**Risk Identification**	**Context**	**Mitigation**		**Impact**
GMF 4	Escalation Rate	The current agreement is using 4.5% as the rate. There is possibility that the existing rate is higher or lower than the agreed rate.	1	Use the rate at **4.5%** (contract)	The probability of inflation rate in below 4.5% is 89%. When the real inflation rate increase to 6.12%, the NPV from profit decrease to USD 1,300,000
			2	Use the rate at **3.5%** p.a	The probability of inflation rate above 3.5% is high, 20.59%.
			3	**Floating** escalation rate follows the inflation in United States	Escalation rate follows U.S inflation rate per year.
GMF 5	Increasing Labor Rate	Current labor rate is USD 30 per hour,. There is possibility that the workers ask to renegotiate the labor rate.	1	Offer man-hour cost in base rate **USD 30** (contract)	NPV value from profit generated is the same as expected, USD 1,875,688
			2	Offer man-hour cost in base rate **USD 39** (ARG/US aircraft rate for airframe mechanical)	NPV value from profit generated is the same as expected, USD 1,761,678
			3	Offer man-hour cost in base rate **USD 75** -- against objective #1	This rate is too high if compared with rate that used in Europe for engine and power plant mechanical USD 53-67 per hour. Using rate USD 75 per hour will reduce NPV to USD 1,300,000
GMF 6	Material Cost	There is possibility that the material cost is higher than the forecast at rate USD	1	Make contract with supplier, agreed upon current base material price **USD 269,000**	NPV value from profit is the same as expected, USD 1,875,688

Risks Identification and the Mitigation action on scheme 2 - using GMF Aero Asia Perspective					
Objective :	1. Minimum Profit generated by GMF Aero Asia is USD 1,300,000				
	2. Maximize the Utilization of workshop and LDG Spare				
Risk ID	**Risk Identification**	**Context**	**Mitigation**		**Impact**
		269,000	2	Make contract with the supplier, agreed new the material price --> **USD 269,000 +5%**	Using base material rate USD 294,994 will reduce NPV to USD 1,577,819
			3	Make contract with the supplier, agreed new the material price --> **USD 269,000 +10%** -- Against objective #1	Using base material rate USD 294,994 will reduce NPV to USD 1,300,000

One-way analysis is done to determine whether there are any significant differences of the proposed scheme. To test the scheme sensitivity, there are several parameters used. There are escalation rate, labor rate, number of overhaul even (demand), overhaul price, G&A Cost and material cost. From the base value from each parameter, the deviation of ±20% is tested to scheme two. Then, tornado diagram is developed to see the scheme sensitivity from each parameter. Figure 5.1 shows the tornado diagram using GMF Aero Asia perspective using scheme two.

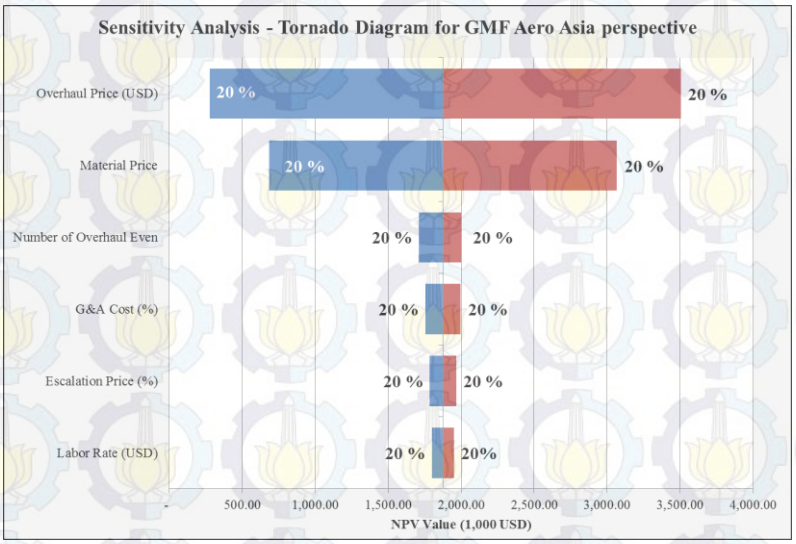


Figure 5.1 Tornado Diagram for GMF Aero Asia perspective

From the tornado diagram, it can be seen that scheme two is sensitive with changes from overhaul price and material price as the two highest. From tornado rank it also describes rank of the risk rate. As tornado diagram shows how big is the deviation from the base NPV by changing the ±20% of the parameter.

5.2 Risk Analysis and Risk Management for Garuda Indonesia

From the proposed scheme, it is expected that Garuda Indonesia will spend cost equals to ($22,568,239). As the customer, Garuda Indonesia has set maximum cost that can be expected (USD 26,000,000). The maximum cost of (USD 26,000,000) is derived from the highest cost within ten schemes, scheme nine that equals to (USD 25,627,499). When there is any parameter changes and it gives impact to make the cost increase more than (USD 25,627,499), Garuda Indonesia will consider it as risk. Instead of cost objective, Garuda Indonesia also concern to maximize the number of aircraft that overhauled by Garuda. The number of overhauled LDG depends on the capacity of GMF Aero Asia.

5.2.1 Risk Identification and Risk Treatment

From Garuda Indonesia business context, it can be concluded that Garuda concerns on how to prevent cost increment and maximize GMF service

utilization. From the general landing gear overhaul business context, there are six parameters that predicted will affect the cost spend by Garuda. There are,

- Overhaul Price

  For Garuda Indonesia, overhaul fee is the biggest expenditure compared with other fee. Around 70% of the expenditure comes from overhaul payment. If the price increases, the total expenditure of Garuda also increase. To test the sensitivity of the overhaul price, find the critical factor of the overhaul price that against the maximum cost accepted. It finds that the overhaul price can be accepted is at rate USD 489,431.

  To avoid the risk of cost increment, there are three mitigation plans that proposed. First offer GMF price at current price USD 396,000. If GMF asked for higher price, Garuda can offer price USD 401,100 per even overhaul. This price is the same as the competitor price. The impact of using this price is (USD 22,755,563).

  The last option is offering price at USD 489,431. This is the price when Garuda will spend total cost (USD 26,000,000).

- Overhaul demand

  When the number of overhaul increase, the total cost to cover the overhaul activities also increase. From the critical point analysis, total cost will increase to (USD 26,000,000) is when the overhaul increase to 62 aircrafts. There are two scenario to mitigate the negative impact.

  In this scenario, shipset schedule is used. The first mitigation change the maintenance schedule to staggering scenario with the same spare available. When GMF accept the mitigation, the total cost for Garuda will decrease to (USD 23,986,711). In the other hand compared with scheme number 2, GMF profit also higher in scheme number seven.

  Nevertheless, if GMF refuse to use staggering scenario, the last choice is keep using the current scheme with impact to higher total cost.

- Escalation rate

  Escalation rate gives impact to the price rate need to be paid. When GMF is using high escalation rate, the price increment from year to year is also high. This will give disadvantage for Garuda. In the other hand, GMF do not want to set low rate because the probability that the existing rate higher than the base rate is very high. After calculate the critical point, it resulted that the escalation rate at 8.52% will make NPV equals to USD 1,300,000.

  To mitigate the risk, there are three scenario proposed. The first scenario is using rate at 3%. This rate is the average US inflation rate. If the proposed scheme is accepted, NPV for Garuda equals to (USD 21,431,892). Nevertheless, if GMF reject the 3% rate, Garuda can proposed the current rate at 4.5%. However if GMF still refuse the rate, Garuda can proposed floating escalation rate follows the U.S inflation rate.

  Table 5.2 shows the recap of risk identification and the mitigation scheme. The table also gives the prediction on the proposed mitigation scheme.

Table 5.3 Risk Identification, Risk mitigation and its impact for Garuda Indonesia

Risks Identification and the Mitigation action on scheme 2 - using Garuda Indonesia Perspective					
Objective :	1. Maximum Cost spend by Garuda Indonesia is (USD 26,000,000)				
	2. Maximize number of aircrafts that done overhaul in GMF Aero Asia				
Risk ID	**Risk Identification**	**Context**	**Mitigation**		**Impact**
GIA1	Overhaul Price Negotiation (USD)	GMF Aero Asia as the service provider want to renegotiate the overhaul price.	1	Use overhaul base price at **USD 396,000** per even overhaul as the same in contract	NPV value from cost spend by Garuda is the same as expected, (USD 22,568,239)
			2	Use overhaul base price at **USD 401,100** per even overhaul, same price with the competitor price	NPV value from cost spend by Garuda will increase to (USD 22,755,563)

Risks Identification and the Mitigation action on scheme 2 - using Garuda Indonesia Perspective					
Objective :	1. Maximum Cost spend by Garuda Indonesia is (USD 26,000,000)				
	2. Maximize number of aircrafts that done overhaul in GMF Aero Asia				
Risk ID	**Risk Identification**	**Context**	**Mitigation**		**Impact**
			3	Use **USD 489,431** as overhaul base price - maximum rate allowed which against objective #1	NPV value from cost increased to (USD 26,000,000) -- (maximum cost accepted)
GIA2	Overhaul demand increase to 62 aircrafts	In the existing contract, there are 50 aircraft will be overhauled. There is unexpected 12 more aircraft needs to overhauled.	1	Ask to change maintenance schedule to **staggering Scenario** with the same spare available	NPV value from cost decrease to (USD 23,986,711)
			2	Use **current scheme** -- against objective #1 and #2	NPV value from cost increased to (USD 26,000,000) -- (maximum cost accepted)
GIA3	Escalation Rate	GMF Aero Asia as the service provider want to renegotiate the overhaul rate.	1	Use the rate at **3%**	NPV value from cost decrease to (USD 21,431,892)
			2	Use the rate at **4.5%** (contract)	NPV value from cost spend by Garuda is the same as expected, (USD 22,568,239)
			3	**Floating** escalation rate follows the inflation in United States	Escalation rate follows U.S inflation rate per year.

One-way analysis is done to determine whether there are any significant differences of the proposed scheme. To test the scheme sensitivity, there are several parameters used. There are overhaul price, number of LDG overhaul, and escalation price. From the base value from each parameter, the deviation of ±20%

is tested to scheme two. Then, tornado diagram is developed to see the scheme sensitivity from each parameter. Figure 5.2 shows the tornado diagram using Garuda Indonesia perspective using scheme two.

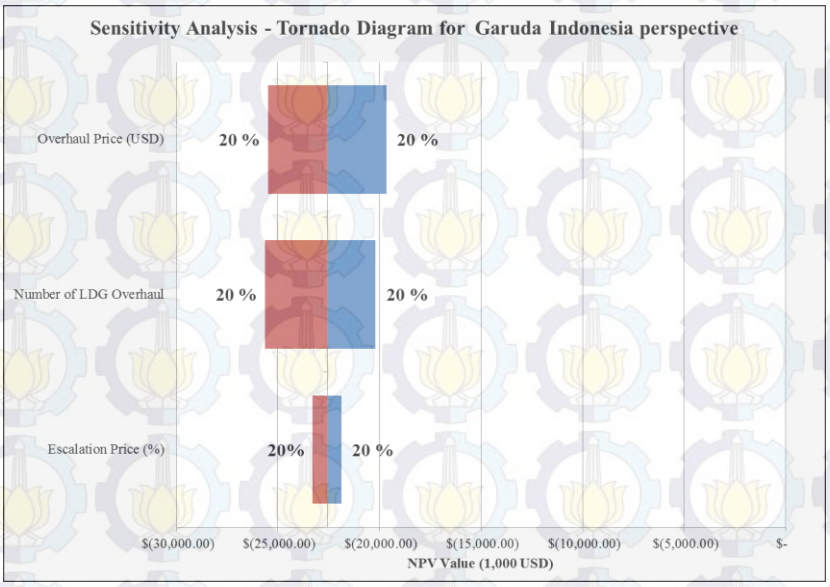


Figure 5.2 Tornado Diagram for Garuda Indonesia

From the tornado diagram, it can be seen that scheme two is sensitive with changes from overhaul price and number of landing gear overhaul. From tornado rank it also describes rank of the risk rate. As tornado diagram shows how big is the deviation from the base NPV by changing the ±20% of the parameter.

Chapter VI
Conclusion and Suggestion

This chapter included conclusions obtained from the analysis and interpretation which done in previous chapter. This chapter also provided recommendation for further research.

6.1 Conclusion

After conducting this research, there are several conclusions to present. Those are,

1. From ten business schemes analyzed, the best scheme for GMF Aero Asia to adopt is scheme nine. Scheme nine is chosen because it generates highest profit compared with other output. Scheme nine uses staggering maintenance as the schedule, and the number spare provided is three spares with combination of two investments and one rent. The NPV projected in scheme nine is USD 2,361,523.

   Otherwise, the best scheme for Garuda Indonesia to adopt is scheme one. This scheme generates the lowest cost for Garuda Indonesia with NPV equals to ($22,397,875). Scheme one uses shipset maintenance as the schedule, and the number spare provided is two spares with combination of one investments and one rent
2. The fair business scheme is chosen to satisfy both PT. Garuda Indonesia and PT. GMF Aero Asia objectives. From the range negotiation between Garuda and GMF, scheme two is chosen to be the fair scheme. The selection of scheme two is through two processes. The first process is scheme filter according to each party acceptance area. The threshold for the acceptance area is the average value from the total output for each GMF and Garuda. The next process is choosing which scheme will be the most fair for both perspectives using gap identification. Gap value is calculated between cost and profit for scheme that already accepted in acceptance area. Then, scheme with lowest gap value is chosen. Since the lower the gap value, it represent both GMF does not earn very high profit and Garuda does not have to spend very high cost.

3. In Garuda Indonesia perspective, the objective is to minimize cost and set the maximum accepted NPV is (USD 26,000,000). After tested, the sensitive factors that possibly change the expected output from scheme two are number of landing gear even (aircraft), escalation rate, and the overhaul price charged from GMF Aero Asia. To minimize the impact, mitigation scheme is developed by considering the critical point that against the objective of maximum cost (USD 26,000,000)

   For GMF Aero Asia perspective, the objective is to maximize profit and set the minimum accepted NPV is USD 1,300,000. The sensitive factors that possibly change the expected output from scheme two are overhaul price, material price, labor rate, G&A cost, escalation rate, and number of overhaul demand. To minimize the impact, mitigation scenario is developed by considering the critical point for each parameter against the objective of minimum profit USD 1,300,000.

6.2 Suggestion

There are several suggestions for future research,

1. In this research, the risk management is not done respectively follows the standard. Thus, it is suggested that in next research the risk management can be prepared in complete procedure.
2. For GMF Aero Asia and Garuda Indonesia, it is better for further business scheme development is considering the fairness output for both objectives. Hence, both parties still can satisfy their objectives by not giving loss for the other party.

Bibliography

Aircraft Maintenance Technology (AMT). (2001, November 1). *Landing Gear Overhaul*. Retrieved October 9, 2014, from Aviation Pros: http://www.aviationpros.com/article/10387913/landing-gear-overhaul-a-behind-the-scenes-look-at-some-of-the-steps-involved-in-this-inspection

Alrahmani, S. (2013, July). ANALISIS PENERAPAN INTERPRETASI STANDAR AKUNTANSI KEUANGAN (ISAK) 16 TENTANG PERJANJIAN KONSESI JASA PADA INDUSTRI KETENAGALISTRIKAN (STUDI KASUS PT XYZ). Depok, Jakarta, Jakarta.

AviTrader Publications Corp. (2011, September). An Inside Look at Landing Gear Overhaul. Richmond, BC, Canada.

Bond, E. (2005). *Businesss Builder 3 : How to Prepare a Profit and Loss (Income) Statement.* Zions Business Resource Center.

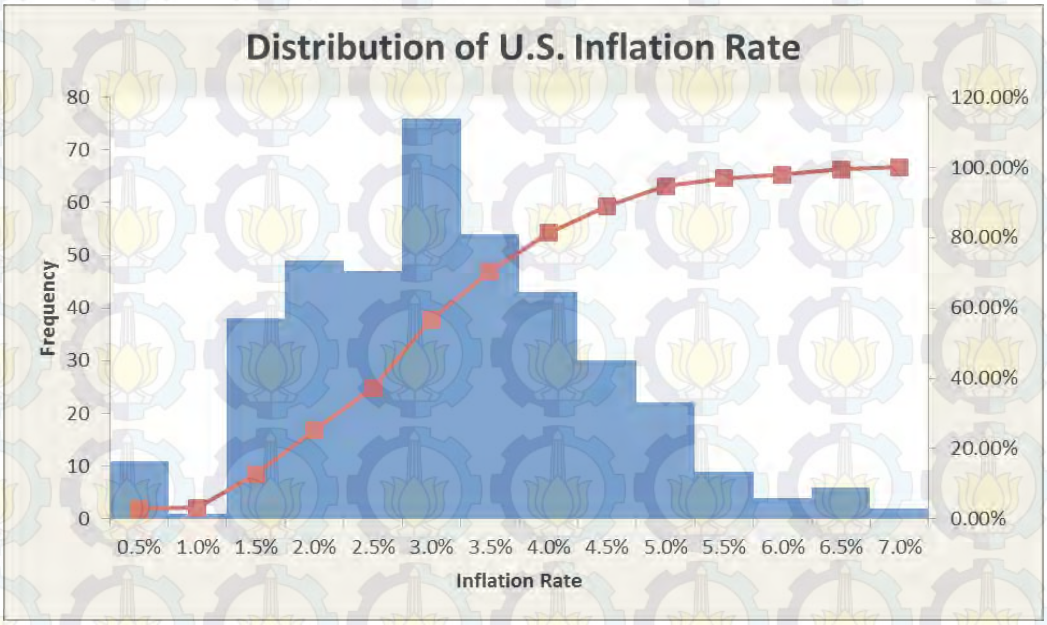
Federal Aviation Administration. (2008). *Aircraft Handbooks & Manuals.* Retrieved October 4, 2014, from Federal Aviation Administration: http://www.faa.gov/regulations_policies/handbooks_manuals/aircraft/

Kristianto, A. N. (2010). *Studi Kelayakan Investasi Pembangkit Listrik Tenaga Surya (PLTS) di Pulau Biaro dengan Menggunakan Metode Real Option.* Depok, Jakarta: Universitas Indonesia.

Pujawan, I. N. (2009). *Ekonomi Teknik.* Surabaya: Guna Widya.

Turocy, T., & Von Stengel, B. (2001). *Game Theory*. London: London School of Economics.

Appendix A


Distribution of U.S. Inflation Rate
Frequency
80
70
60
50
40
30
20
10
0
120.00%
100.00%
80.00%
60.00%
40.00%
20.00%
0.00%
0.5% 1.0% 1.5% 2.0% 2.5% 3.0% 3.5% 4.0% 4.5% 5.0% 5.5% 6.0% 6.5% 7.0%
Inflation Rate

Appendix B

In this appendix will be shown the calculation for each scheme in GMF Perspective

- Scheme two – GMF Aero Asia

Inflow	2014	2015	2016	2017	2018	2019	2020	2021
Ovehaul Maintenance Cost (USD)	-	-	-	451,902	4,722,374	4,934,880	4,641,255	4,311,210
Availability Fee (USD)	487,241	1,049,245	1,049,245	1,049,245	1,049,245	1,049,245	1,049,245	1,049,245
Revenue from Other Service (USD)	-	-	-		50,000	50,000	50,000	50,000
Salvage Value (USD)	-	-	-	-	-	-	-	1,345,960.00
Total Cash Inflows	**487,241**	**1,049,245**	**1,049,245**	**1,501,147**	**5,821,619**	**6,034,126**	**5,740,500**	**6,756,415**

Outflow	2014	2015	2016	2017	2018	2019	2020	2021
CAPEX	(2,800,000)	(2,926,000)	-	-	-	-	-	-
Cost Of Poor Quality (0.03% from revenue)			-	(450)	(1,746)	(1,810)	(1,722)	(2,027)
Manhours cost (USD)	-	-	-	(19,582)	(204,636)	(213,845)	(201,121)	(186,819)
Maintenance cost per event (USD)	-	-	-	(306,973.69)	(3,207,875.04)	(3,352,229.41)	(3,152,771.76)	(2,928,574.66)
General & Administration cost	-	-	-	(76,558.50)	(296,902.56)	(307,740.41)	(292,765.51)	(344,577.19)
Insurance Cost	-	-	-	(30,022.94)	(116,432.38)	(120,682.51)	(114,810.01)	(135,128.31)
Total Cash Outflows	**(2,800,000)**	**(2,926,000)**	**-**	**(433,588)**	**(3,827,593)**	**(3,996,307)**	**(3,763,190)**	**(3,597,126)**

Gross Profit	**(2,312,759)**	**(1,876,755)**	**1,049,245**	**1,067,559**	**1,994,026**	**2,037,818**	**1,977,310**	**3,159,289**
Depreciation	0	(263,340)	(263,340)	(263,340)	(263,340)	(263,340)	(263,340)	(263,340)
EBIT	**(2,312,759)**	**(2,140,095)**	**785,905**	**804,219**	**1,730,686**	**1,774,478**	**1,713,970**	**2,895,949**
Interest Expense	-	-	-	-	-	-	-	-
EBT	(2,312,759)	(2,140,095)	785,905	804,219	1,730,686	1,774,478	1,713,970	2,895,949
TAX (25%)	-	-	(196,476.29)	(201,054.77)	(432,671.55)	(443,619.56)	(428,492.44)	(723,987.32)
Earning After Tax (Net Profit)	**(2,312,759)**	**(2,140,095)**	**589,429**	**603,164**	**1,298,015**	**1,330,859**	**1,285,477**	**2,171,962**
Depreciation	-	263,340	263,340	263,340	263,340	263,340	263,340	263,340
Principal Payment	-	-	-	-	-	-	-	-
Net Cash Flows	**(2,312,759)**	**(1,876,755)**	**852,769**	**866,504**	**1,561,355**	**1,594,199**	**1,548,817**	**2,435,302**
NPV	**$1,850,089**							

- Scheme three – GMF Aero Asia

Inflow	2014	2015	2016	2017	2018	2019	2020	2021
Overhaul Maintenance Cost (USD)	-	-	-	451,902	5,666,848	5,921,857	4,641,255	4,311,210
Availability Fee (USD)	487,241	1,049,245	1,049,245	1,308,630	1,308,630	1,308,630	1,308,630	1,308,630
Revenue from Other Service (USD)	-	-	-		50,000	50,000	50,000	50,000
Salvage Value (USD)	-	-	-	-	-	-	-	3,390,929.70
Total Cash Inflows	**487,241**	**1,049,245**	**1,049,245**	**1,760,532**	**7,025,479**	**7,280,487**	**5,999,885**	**9,060,770**

Outflow	2014	2015	2016	2017	2018	2019	2020	2021
LDG Procurement (USD)	(2,800,000)	(2,926,000)	-	(3,195,265)	-	-	-	-
Cost Of Poor Quality (0.03% from revenue)	-	-	-	(528)	(2,108)	(2,184)	(1,800)	(2,718)
Manhours cost (USD)	-	-	-	(19,582)	(245,563)	(256,614)	(201,121)	(186,819)
Maintenance cost per event (USD)	-	-	-	(306,973.69)	(3,849,450.04)	(4,022,675.29)	(3,152,771.76)	(2,928,574.66)
General & Administration cost	-	-	-	(89,787.14)	(358,299.41)	(371,304.83)	(305,994.15)	(462,099.28)
Insurance Cost	-	-	-	(35,210.64)	(140,509.57)	(145,609.74)	(119,997.71)	(181,215.41)
Total Cash Outflows	**(2,800,000)**	**(2,926,000)**	-	**(3,647,347)**	**(4,595,930)**	**(4,798,388)**	**(3,781,685)**	**(3,761,427)**

Gross Profit	(2,312,759)	(1,876,755)	1,049,245	(1,886,815)	2,429,549	2,482,099	2,218,201	5,299,344
Depreciation	0	(263,340)	(263,340)	(550,914)	(550,914)	(550,914)	(550,914)	(550,914)
EBIT	(2,312,759)	(2,140,095)	785,905	(2,437,729)	1,878,635	1,931,185	1,667,287	4,748,430
Interest Expense	-	-	-	-	-	-	-	-
EBT	(2,312,759)	(2,140,095)	785,905	(2,437,729)	1,878,635	1,931,185	1,667,287	4,748,430
TAX (25%)	-	-	(196,476.29)	-	(469,658.68)	(482,796.30)	(416,821.72)	(1,187,107.43)
Earning After Tax (Net Profit)	(2,312,759)	(2,140,095)	589,429	(2,437,729)	1,408,976	1,448,389	1,250,465	3,561,322
Depreciation	-	263,340	263,340	550,914	550,914	550,914	550,914	550,914
Principal Payment	-	-	-	-	-	-	-	-
Net Cash Flows	(2,312,759)	(1,876,755)	852,769	(1,886,815)	1,959,890	1,999,303	1,801,379	4,112,236

NPV	$1,406,201

- Scheme four – GMF Aero Asia

Inflow	2014	2015	2016	2017	2018	2019	2020	2021
Ovehaul Maintenance Cost (USD)	-	-	-	451,902	5,666,848	5,921,857	4,641,255	4,311,210
Availability Fee (USD)	487,241	1,049,245	1,049,245	1,049,245	1,049,245	1,049,245	1,049,245	1,049,245
Revenue from Other Service (USD)	-	-	-		50,000	50,000	50,000	50,000
Salvage Value (USD)	-	-	-	-	-	-	-	1,345,960.00
LDG rent Payment from Garuda	-	-	-	-	252,000.00	252,000.00	-	-
Total Cash Inflows	**487,241**	**1,049,245**	**1,049,245**	**1,501,147**	**7,018,094**	**7,273,102**	**5,740,500**	**6,756,415**

Outflow	2014	2015	2016	2017	2018	2019	2020	2021
LDG Procurement (USD)	(2,800,000)	(2,926,000)	-	-	-	-	-	-
Cost Of Poor Quality (0.03% from revenue)	-	-	-	(450)	(2,105)	(2,182)	(1,722)	(2,027)
Manhours cost (USD)	-	-	-	(19,582)	(245,563)	(256,614)	(201,121)	(186,819)
Maintenance cost per event (USD)	-	-	-	(306,973.69)	(3,849,450.04)	(4,022,675.29)	(3,152,771.76)	(2,928,574.66)
Loan Payment	-	-	-	-	(252,000)	(252,000)	-	-
General & Administration cost	-	-	-	(76,558.50)	(357,922)	(370,928)	(292,765.51)	(344,577.19)
Insurance Cost	-	-	-	(30,022.94)	(140,361.87)	(145,462.03)	(114,810.01)	(135,128.31)
Total Cash Outflows	**(2,800,000)**	**(2,926,000)**	-	**(433,588)**	**(4,847,404)**	**(5,049,861)**	**(3,763,190)**	**(3,597,126)**

Gross Profit	(2,312,759)	(1,876,755)	1,049,245	1,067,559	2,170,690	2,223,241	1,977,310	3,159,289
Depreciation	0	(263,340)	(263,340)	(263,340)	(263,340)	(263,340)	(263,340)	(263,340)
EBIT	(2,312,759)	(2,140,095)	785,905	804,219	1,907,350	1,959,901	1,713,970	2,895,949
Interest Expense	-	-	-	-	-	-	-	-
EBT	(2,312,759)	(2,140,095)	785,905	804,219	1,907,350	1,959,901	1,713,970	2,895,949
TAX (25%)	-	-	(196,476.29)	(201,054.77)	(476,837.51)	(489,975.13)	(428,492.44)	(723,987.32)
Earning After Tax (Net Profit)	(2,312,759)	(2,140,095)	589,429	603,164	1,430,513	1,469,925	1,285,477	2,171,962
Depreciation	-	263,340	263,340	263,340	263,340	263,340	263,340	263,340
Principal Payment	-	-	-	-	-	-	-	-
Net Cash Flows	(2,312,759)	(1,876,755)	852,769	866,504	1,693,853	1,733,265	1,548,817	2,435,302

NPV	**$2,027,901**

Scheme 5 – GMF Aero Asia

Inflow	2014	2015	2016	2017	2018	2019	2020	2021
Ovehaul Maintenance Cost (USD)	-	-	-	451,902	5,666,848	5,921,857	4,641,255	4,311,210
Availability Fee (USD)	487,241	487,241	487,241	487,241	487,241	487,241	487,241	487,241
Revenue from Other Service (USD)	-	-	-	-	50,000	50,000	50,000	50,000
Salvage Value (USD)	-	-	-	-	-	-	-	-
Loan Payment from Garuda	-	-	-	-	882,000.00	882,000.00	504,000.00	378,000.00
Total Cash Inflows	**487,241**	**487,241**	**487,241**	**939,143**	**7,086,090**	**7,341,098**	**5,682,496**	**5,226,452**

Outflow	2014	2015	2016	2017	2018	2019	2020	2021
LDG Procurement (USD)	(2,800,000)	-	-		-	-	-	-
Cost Of Poor Quality (0.03% from revenue)	-	-	-	-	(2,126)	(2,202)	(1,705)	(1,568)
Manhours cost (USD)	-	-	-	(19,582)	(245,563)	(256,614)	(201,121)	(186,819)
Maintenance cost per event (USD)	-	-	-	(306,973.69)	(3,849,450.04)	(4,022,675.29)	(3,152,771.76)	(2,928,574.66)
Loan Payment	-	-	-	-	(882,000.00)	(882,000.00)	(504,000.00)	(378,000.00)
General & Administration cost	-	-	-	(47,896.30)	(361,390.58)	(374,395.99)	(289,807.32)	(266,549.03)
Insurance Cost	-	-	-	(18,782.86)	(141,721.79)	(146,821.96)	(113,649.93)	(104,529.03)
Total Cash Outflows	**(2,800,000)**	-	-	**(393,235)**	**(5,482,252)**	**(5,684,709)**	**(4,263,055)**	**(3,866,040)**

Gross Profit	(2,312,759)	487,241	487,241	545,908	1,603,838	1,656,389	1,419,442	1,360,412
Depreciation	-	-	-	-	-	-	-	-
EBIT	(2,312,759)	487,241	487,241	545,908	1,603,838	1,656,389	1,419,442	1,360,412
Interest Expense	-	-	-	-	-	-	-	-
EBT	(2,312,759)	487,241	487,241	545,908	1,603,838	1,656,389	1,419,442	1,360,412
TAX (25%)	-	(121,810.33)	(121,810.33)	(136,476.96)	(400,959.51)	(414,097.13)	(354,860.40)	(340,102.96)
Earning After Tax (Net Profit)	(2,312,759)	365,431	365,431	409,431	1,202,879	1,242,291	1,064,581	1,020,309
Depreciation	-	-	-	-	-	-	-	-
Principal Payment	-	-	-	-	-	-	-	-
Net Cash Flows	(2,312,759)	365,431	365,431	409,431	1,202,879	1,242,291	1,064,581	1,020,309

NPV	**$1,536,817**

Scheme six – GMF Aero Asia

Inflow	2014	2015	2016	2017	2018	2019	2020	2021
Revenue Ovehaul Maintenance Cost (USD)	-	-	-	3,163,312	4,722,374	4,934,880	4,641,255	4,311,210
Revenue Availability Fee (USD)	487,241	487,241	487,241	487,241	487,241	487,241	487,241	487,241
Revenue from Other Service (USD)	-	-	-	50,000	50,000	50,000	50,000	50,000
Salvage Value (USD)	-	-	-	-	-	-	-	-
Garuda payment for rent LDG	-	-	-	252,000.00	630,000.00	630,000.00	504,000.00	378,000.00
Total Cash Inflows	**487,241**	**487,241**	**487,241**	**3,952,554**	**5,889,615**	**6,102,122**	**5,682,496**	**5,226,452**

Outflow	2014	2015	2016	2017	2018	2019	2020	2021
LDG Procurement (USD)	(2,800,000)	-	-	-	-	-	-	-
Cost Of Poor Quality (0.03% from revenue)	-	-	-	(1,186)	(1,767)	(1,831)	(1,705)	(1,568)
Manhours cost (USD)	-	-	-	(137,077)	(204,636)	(213,845)	(201,121)	(186,819)
Material Cost (USD)	-	-	-	(2,148,815.81)	(3,207,875.04)	(3,352,229.41)	(3,152,771.76)	(2,928,574.66)
LDG Rent Payment	-	-	-	(252,000.00)	(630,000.00)	(630,000.00)	(504,000.00)	(378,000.00)
General & Administration cost	-	-	-	(201,580.25)	(300,370.36)	(311,208.21)	(289,807.32)	(266,549.03)
Insurance Cost	-	-	-	(79,051.08)	(117,792.30)	(122,042.44)	(113,649.93)	(104,529.03)
Total Cash Outflows	**(2,800,000)**	-	-	**(2,819,710)**	**(4,462,441)**	**(4,631,156)**	**(4,263,055)**	**(3,866,040)**

Gross Profit	**(2,312,759)**	**487,241**	**487,241**	**1,132,844**	**1,427,174**	**1,470,966**	**1,419,442**	**1,360,412**
Depreciation	-	-	-	-	-	-	-	-
EBIT	**(2,312,759)**	**487,241**	**487,241**	**1,132,844**	**1,427,174**	**1,470,966**	**1,419,442**	**1,360,412**
Interest Expense	-	-	-	-	-	-	-	-
EBT	(2,312,759)	487,241	487,241	1,132,844	1,427,174	1,470,966	1,419,442	1,360,412
TAX (25%)	-	(121,810.33)	(121,810.33)	(283,211.01)	(356,793.55)	(367,741.57)	(354,860.40)	(340,102.96)
Earning After Tax (Net Profit)	**(2,312,759)**	**365,431**	**365,431**	**849,633**	**1,070,381**	**1,103,225**	**1,064,581**	**1,020,309**
Depreciation	-	-	-	-	-	-	-	-
Principal Payment	-	-	-	-	-	-	-	-
Net Cash Flows	**(2,312,759)**	**365,431**	**365,431**	**849,633**	**1,070,381**	**1,103,225**	**1,064,581**	**1,020,309**

NPV	**$1,682,567**

Scenario seven – GMF Aero Asia

Inflow	2014	2015	2016	2017	2018	2019	2020	2021
Revenue Ovehaul Maintenance Cost (USD)	-	-	-	3,163,312	4,722,374	4,934,880	4,641,255	4,311,210
Revenue Availability Fee (USD)	487,241	1,049,245	1,049,245	1,049,245	1,049,245	1,049,245	1,049,245	1,049,245
Revenue from Other Service (USD)	-	-	-	50,000	50,000	50,000	50,000	50,000
Salvage Value (USD)	-	-	-	-	-	-	-	1,345,960
Total Cash Inflows	**487,241**	**1,049,245**	**1,049,245**	**4,262,558**	**5,821,619**	**6,034,126**	**5,740,500**	**6,756,415**

Outflow	2014	2015	2016	2017	2018	2019	2020	2021
LDG Procurement (USD)	(2,800,000)	(2,926,000)	-	-	-	-	-	-
Cost Of Poor Quality (0.03% from revenue)	-	-	-	(1,279)	(1,746)	(1,810)	(1,722)	(2,027)
Manhours cost (USD)	-	-	-	(137,077)	(204,636)	(213,845)	(201,121)	(186,819)
Material Cost (USD)	-	-	-	(2,148,815.81)	(3,207,875.04)	(3,352,229.41)	(3,152,771.76)	(2,928,574.66)
General & Administration cost	-	-	-	(217,390.44)	(296,902.56)	(307,740.41)	(292,765.51)	(344,577.19)
Insurance Cost	-	-	-	(85,251.15)	(116,432.38)	(120,682.51)	(114,810.01)	(135,128.31)
Total Cash Outflows	**(2,800,000)**	**(2,926,000)**	-	**(2,589,813)**	**(3,827,593)**	**(3,996,307)**	**(3,763,190)**	**(3,597,126)**

Gross Profit	(2,312,759)	(1,876,755)	1,049,245	1,672,745	1,994,026	2,037,818	1,977,310	3,159,289
Depreciation	0	(263,340)	(263,340)	(263,340)	(263,340)	(263,340)	(263,340)	(263,340)
EBIT	(2,312,759)	(2,140,095)	785,905	1,409,405	1,730,686	1,774,478	1,713,970	2,895,949
Interest Expense	-	-	-	-	-	-	-	-
EBT	(2,312,759)	(2,140,095)	785,905	1,409,405	1,730,686	1,774,478	1,713,970	2,895,949
TAX (25%)	-	-	(196,476.29)	(352,351.16)	(432,671.55)	(443,619.56)	(428,492.44)	(723,987.32)
Earning After Tax (Net Profit)	(2,312,759)	(2,140,095)	589,429	1,057,053	1,298,015	1,330,859	1,285,477	2,171,962
Depreciation	-	263,340	263,340	263,340	263,340	263,340	263,340	263,340
Principal Payment	-	-	-	-	-	-	-	-
Net Cash Flows	(2,312,759)	(1,876,755)	852,769	1,320,393	1,561,355	1,594,199	1,548,817	2,435,302

NPV	$2,183,711

Scenario eight – GMF Aero Asia

Inflow	2014	2015	2016	2017	2018	2019	2020	2021
Revenue Ovehaul Maintenance Cost (USD)	-	-	-	3,163,312	5,666,848	5,921,857	4,641,255	4,311,210
Revenue Availability Fee (USD)	487,241	1,049,245	1,049,245	1,308,630	1,308,630	1,308,630	1,308,630	1,308,630
Revenue from Other Service (USD)	-	-	-	50,000	50,000	50,000	50,000	50,000
Salvage Value (USD)	-	-	-	-	-	-	-	3,390,929.70
Total Cash Inflows	**487,241**	**1,049,245**	**1,049,245**	**4,521,943**	**7,025,479**	**7,280,487**	**5,999,885**	**9,060,770**

Outflow	2014	2015	2016	2017	2018	2019	2020	2021
LDG Procurement (USD)	(2,800,000)	(2,926,000)	-	(3,195,265)	-	-	-	-
Cost Of Poor Quality (0.03% from revenue)	-	-	-	(1,357)	(2,108)	(2,184)	(1,800)	(2,718)
Manhours cost (USD)	-	-	-	(137,077)	(245,563)	(256,614)	(201,121)	(186,819)
Material Cost (USD)	-	-	-	(2,148,815.81)	(3,849,450.04)	(4,022,675.29)	(3,152,771.76)	(2,928,574.66)
General & Administration cost	-	-	-	(230,619.08)	(358,299.41)	(371,304.83)	(305,994.15)	(462,099.28)
Insurance Cost	-	-	-	(90,438.86)	(140,509.57)	(145,609.74)	(119,997.71)	(181,215.41)
Total Cash Outflows	**(2,800,000)**	**(2,926,000)**	-	**(5,803,572)**	**(4,595,930)**	**(4,798,388)**	**(3,781,685)**	**(3,761,427)**

Gross Profit	**(2,312,759)**	**(1,876,755)**	**1,049,245**	**(1,281,630)**	**2,429,549**	**2,482,099**	**2,218,201**	**5,299,344**
Depreciation	0	(263,340)	(263,340)	(550,914)	(550,914)	(550,914)	(550,914)	(550,914)
EBIT	(2,312,759)	(2,140,095)	785,905	(1,832,543)	1,878,635	1,931,185	1,667,287	4,748,430
Interest Expense	-	-	-	-	-	-	-	-
EBT	(2,312,759)	(2,140,095)	785,905	(1,832,543)	1,878,635	1,931,185	1,667,287	4,748,430
TAX (25%)	-	-	(196,476.29)	-	(469,658.68)	(482,796.30)	(416,821.72)	(1,187,107.43)
Earning After Tax (Net Profit)	**(2,312,759)**	**(2,140,095)**	**589,429**	**(1,832,543)**	**1,408,976**	**1,448,389**	**1,250,465**	**3,561,322**
Depreciation	-	263,340	263,340	550,914	550,914	550,914	550,914	550,914
Principal Payment	-	-	-	-	-	-	-	-
Net Cash Flows	**(2,312,759)**	**(1,876,755)**	**852,769**	**(1,281,630)**	**1,959,890**	**1,999,303**	**1,801,379**	**4,112,236**

NPV	**$1,851,030**

Scheme nine – GMF Perspective

Inflow	2014	2015	2016	2017	2018	2019	2020	2021
Revenue Ovehaul Maintenance Cost (USD)	-	-	-	3,163,312	5,666,848	5,921,857	4,641,255	4,311,210
Revenue Availability Fee (USD)	487,241	1,049,245	1,049,245	1,049,245	1,049,245	1,049,245	1,049,245	1,049,245
Revenue from Other Service (USD)	-	-	-	50,000	50,000	50,000	50,000	50,000
Salvage Value (USD)	-	-	-	-	-	-	-	1,345,960.00
Loan Payment from Garuda	-	-	-	-	252,000.00	252,000.00	-	-
Total Cash Inflows	**487,241**	**1,049,245**	**1,049,245**	**4,262,558**	**7,018,094**	**7,273,102**	**5,740,500**	**6,756,415**

Outflow	2014	2015	2016	2017	2018	2019	2020	2021
LDG Procurement (USD)	(2,800,000)	(2,926,000)	-	-	-	-	-	-
Cost Of Poor Quality (0.03% from revenue)	-	-	-	(1,279)	(2,105)	(2,182)	(1,722)	(2,027)
Manhours cost (USD)	-	-	-	(137,077)	(245,563)	(256,614)	(201,121)	(186,819)
Material Cost (USD)	-	-	-	(2,148,815.81)	(3,849,450.04)	(4,022,675.29)	(3,152,771.76)	(2,928,574.66)
Loan Payment	-	-	-	-	(252,000.00)	(252,000.00)	-	-
General & Administration cost	-	-	-	(217,390.44)	(357,922.77)	(370,928.19)	(292,765.51)	(344,577.19)
Insurance Cost	-	-	-	(85,251.15)	(140,361.87)	(145,462.03)	(114,810.01)	(135,128.31)
Total Cash Outflows	**(2,800,000)**	**(2,926,000)**	-	**(2,589,813)**	**(4,847,404)**	**(5,049,861)**	**(3,763,190)**	**(3,597,126)**

Gross Profit	**(2,312,759)**	**(1,876,755)**	**1,049,245**	**1,672,745**	**2,170,690**	**2,223,241**	**1,977,310**	**3,159,289**
Depreciation	0	(263,340)	(263,340)	(263,340)	(263,340)	(263,340)	(263,340)	(263,340)
EBIT	(2,312,759)	(2,140,095)	785,905	1,409,405	1,907,350	1,959,901	1,713,970	2,895,949
Interest Expense	-	-	-	-	-	-	-	-
EBT	(2,312,759)	(2,140,095)	785,905	1,409,405	1,907,350	1,959,901	1,713,970	2,895,949
TAX (25%)	-	-	(196,476.29)	(352,351.16)	(476,837.51)	(489,975.13)	(428,492.44)	(723,987.32)
Earning After Tax (Net Profit)	**(2,312,759)**	**(2,140,095)**	**589,429**	**1,057,053**	**1,430,513**	**1,469,925**	**1,285,477**	**2,171,962**
Depreciation	-	263,340	263,340	263,340	263,340	263,340	263,340	263,340
Principal Payment	-	-	-	-	-	-	-	-
Net Cash Flows	**(2,312,759)**	**(1,876,755)**	**852,769**	**1,320,393**	**1,693,853**	**1,733,265**	**1,548,817**	**2,435,302**

NPV	**$2,361,523**

Scenario ten – GMF Aero Asia

Inflow	2014	2015	2016	2017	2018	2019	2020	2021
Revenue Overhaul Maintenance Cost (USD)	-	-	-	3,163,312	5,666,848	5,921,857	4,641,255	4,311,210
Revenue Availability Fee (USD)	487,241	487,241	487,241	487,241	487,241	487,241	487,241	487,241
Revenue from Other Service (USD)	-	-	-	50,000	50,000	50,000	50,000	50,000
Salvage Value (USD)	-	-	-	-	-	-	-	-
Loan Payment from Garuda	-	-	-	252,000.00	882,000.00	882,000.00	504,000.00	378,000.00
Total Cash Inflows	**487,241**	**487,241**	**487,241**	**3,952,554**	**7,086,090**	**7,341,098**	**5,682,496**	**5,226,452**

Outflow	2014	2015	2016	2017	2018	2019	2020	2021
LDG Procurement (USD)	(2,800,000)	-	-	-	-	-	-	-
Cost Of Poor Quality (0.03% from revenue)	-	-	-	(1,186)	(2,126)	(2,202)	(1,705)	(1,568)
Manhours cost (USD)	-	-	-	(137,077)	(245,563)	(256,614)	(201,121)	(186,819)
Material Cost (USD)	-	-	-	(2,148,815.81)	(3,849,450.04)	(4,022,675.29)	(3,152,771.76)	(2,928,574.66)
Loan Payment	-	-	-	(252,000.00)	(882,000.00)	(882,000.00)	(504,000.00)	(378,000.00)
General & Administration cost	-	-	-	(201,580.25)	(361,390.58)	(374,395.99)	(289,807.32)	(266,549.03)
Insurance Cost	-	-	-	(79,051.08)	(141,721.79)	(146,821.96)	(113,649.93)	(104,529.03)
Total Cash Outflows	**(2,800,000)**	-	-	**(2,819,710)**	**(5,482,252)**	**(5,684,709)**	**(4,263,055)**	**(3,866,040)**

Gross Profit	**(2,312,759)**	**487,241**	**487,241**	**1,132,844**	**1,603,838**	**1,656,389**	**1,419,442**	**1,360,412**
Depreciation	-	-	-	-	-	-	-	-
EBIT	(2,312,759)	487,241	487,241	1,132,844	1,603,838	1,656,389	1,419,442	1,360,412
Interest Expense	-	-	-	-	-	-	-	-
EBT	(2,312,759)	487,241	487,241	1,132,844	1,603,838	1,656,389	1,419,442	1,360,412
TAX (25%)	-	(121,810.33)	(121,810.33)	(283,211.01)	(400,959.51)	(414,097.13)	(354,860.40)	(340,102.96)
Earning After Tax (Net Profit)	**(2,312,759)**	**365,431**	**365,431**	**849,633**	**1,202,879**	**1,242,291**	**1,064,581**	**1,020,309**
Depreciation	-	-	-	-	-	-	-	-
Principal Payment	-	-	-	-	-	-	-	-
Net Cash Flows	**(2,312,759)**	**365,431**	**365,431**	**849,633**	**1,202,879**	**1,242,291**	**1,064,581**	**1,020,309**

NPV	**$1,860,379**

Appendix C

Scenario 2 – Garuda Indonesia

Inflow	2014	2015	2016	2017	2018	2019	2020	2021
Salvage Value	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1,036,000
Total Cash Inflows	-	-	-	-	-	-	**-**	**1,036,000**

Outflow	2014	2015	2016	2017	2018	2019	2020	2021
Maintenance Fee	(2,531,066)	(2,531,066)	(2,531,066)	(2,531,066)	(2,531,066)	(2,531,066)	(2,531,066)	(2,531,066)
Maintenance Fee third party	-	-	-	-	(802,200)	(4,011,000)	-	-
Availability Fee	(487,241.33)	(1,049,245.18)	(1,049,245.18)	(1,049,245.18)	(1,049,245.18)	(1,049,245.18)	(1,049,245.18)	(1,049,245.18)
Total Cash Outflows	**(3,018,308)**	**(3,580,312)**	**(3,580,312)**	**(3,580,312)**	**(4,382,512)**	**(7,591,312)**	**(3,580,312)**	**(3,580,312)**

Gross Profit	**(3,018,308)**	**(3,580,312)**	**(3,580,312)**	**(3,580,312)**	**(4,382,512)**	**(7,591,312)**	**(3,580,312)**	**(2,544,312)**
Depreciation	-	(252,000)	(252,000)	(252,000)	(252,000)	(252,000)	(252,000)	(252,000)
EBIT	**(3,018,308)**	**(3,832,312)**	**(3,832,312)**	**(3,832,312)**	**(4,634,512)**	**(7,843,312)**	**(3,832,312)**	**(2,796,312)**
Interest Expense								
EBT								
TAX (25%)								
Earning After Tax (Net Profit)	**(3,018,308)**	**(3,832,312)**	**(3,832,312)**	**(3,832,312)**	**(4,634,512)**	**(7,843,312)**	**(3,832,312)**	**(2,796,312)**
Depreciation	-	252,000	252,000	252,000	252,000	252,000	252,000	252,000
Principal Payment								
Net Cash Flows	**(3,018,308)**	**(3,580,312)**	**(3,580,312)**	**(3,580,312)**	**(4,382,512)**	**(7,591,312)**	**(3,580,312)**	**(2,544,312)**

NPV	**($22,568,239)**

Scenario 3 – Garuda Indonesia

Inflow	2014	2015	2016	2017	2018	2019	2020	2021
Salvage Value	0	0	0	0	0	0	0	1,036,000
Total Cash Inflows	-	-	-	-	-	-	-	**1,036,000**

Outflow	2014	2015	2016	2017	2018	2019	2020	2021
Maintenance Fee	(2,861,934)	(2,861,934)	(2,861,934)	(2,861,934)	(2,861,934)	(2,861,934)	(2,861,934)	(2,861,934)
Maintenance Fee third party	-	-	-	-	-	(3,208,800)	-	-
Availability Fee	(487,241.33)	(1,049,245.18)	(1,049,245.18)	(1,308,630.29)	(1,308,630.29)	(1,308,630.29)	(1,308,630.29)	(1,308,630.29)
Total Cash Outflows	**(3,349,176)**	**(3,911,180)**	**(3,911,180)**	**(4,170,565)**	**(4,170,565)**	**(7,379,365)**	**(4,170,565)**	**(4,170,565)**

Gross Profit	**(3,349,176)**	**(3,911,180)**	**(3,911,180)**	**(4,170,565)**	**(4,170,565)**	**(7,379,365)**	**(4,170,565)**	**(3,134,565)**
Depreciation	-	(252,000)	(252,000)	(252,000)	(252,000)	(252,000)	(252,000)	(252,000)
EBIT	**(3,349,176)**	**(4,163,180)**	**(4,163,180)**	**(4,422,565)**	**(4,422,565)**	**(7,631,365)**	**(4,422,565)**	**(3,386,565)**
Interest Expense								
EBT								
TAX (25%)								
Earning After Tax (Net Profit)	**(3,349,176)**	**(4,163,180)**	**(4,163,180)**	**(4,422,565)**	**(4,422,565)**	**(7,631,365)**	**(4,422,565)**	**(3,386,565)**
Depreciation	-	252,000	252,000	252,000	252,000	252,000	252,000	252,000
Principal Payment								
Net Cash Flows	**(3,349,176)**	**(3,911,180)**	**(3,911,180)**	**(4,170,565)**	**(4,170,565)**	**(7,379,365)**	**(4,170,565)**	**(3,134,565)**

NPV	**($24,240,265)**

Scenario four – Garuda Indonesia

Inflow	2014	2015	2016	2017	2018	2019	2020	2021
Salvage Value	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1,036,000
Total Cash Inflows	-	-	-	-	-	-	-	**1,036,000**

Outflow	2014	2015	2016	2017	2018	2019	2020	2021
Maintenance Fee	(2,861,934)	(2,861,934)	(2,861,934)	(2,861,934)	(2,861,934)	(2,861,934)	(2,861,934)	(2,861,934)
Maintenance Fee third party	-	-	-	-	-	(3,208,800)	-	-
Availability Fee	(487,241.33)	(1,049,245.18)	(1,049,245.18)	(1,049,245.18)	(1,049,245.18)	(1,049,245.18)	(1,049,245.18)	(1,049,245.18)
Spare Rent Fee	-	-	-	-	(252,000.00)	(252,000.00)	(252,000.00)	-
Total Cash Outflows	**(3,349,176)**	**(3,911,180)**	**(3,911,180)**	**(3,911,180)**	**(4,163,180)**	**(7,371,980)**	**(4,163,180)**	**(3,911,180)**

Gross Profit	**(3,349,176)**	**(3,911,180)**	**(3,911,180)**	**(3,911,180)**	**(4,163,180)**	**(7,371,980)**	**(4,163,180)**	**(2,875,180)**
Depreciation	-	(252,000)	(252,000)	(252,000)	(252,000)	(252,000)	(252,000)	(252,000)
EBIT	**(3,349,176)**	**(4,163,180)**	**(4,163,180)**	**(4,163,180)**	**(4,415,180)**	**(7,623,980)**	**(4,415,180)**	**(3,127,180)**
Interest Expense								
EBT								
TAX (25%)								
Earning After Tax (Net Profit)	**(3,349,176)**	**(4,163,180)**	**(4,163,180)**	**(4,163,180)**	**(4,415,180)**	**(7,623,980)**	**(4,415,180)**	**(3,127,180)**
Depreciation		252,000	252,000	252,000	252,000	252,000	252,000	252,000
Principal Payment								
Net Cash Flows	**(3,349,176)**	**(3,911,180)**	**(3,911,180)**	**(3,911,180)**	**(4,163,180)**	**(7,371,980)**	**(4,163,180)**	**(2,875,180)**

NPV	**($25,110,302)**

Scenario five – Garuda Indonesia

Inflow	2014	2015	2016	2017	2018	2019	2020	2021
Salvage Value	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1,036,000
Total Cash Inflows	-	-	-	-	-	-	-	**1,036,000**

Outflow	2014	2015	2016	2017	2018	2019	2020	2021
Maintenance Fee	(2,861,934)	(2,861,934)	(2,861,934)	(2,861,934)	(2,861,934)	(2,861,934)	(2,861,934)	(2,861,934)
Maintenance Fee third party	-	-	-	-	-	(3,208,800)	-	-
Availability Fee	(487,241.33)	(487,241.33)	(487,241.33)	(487,241.33)	(487,241.33)	(487,241.33)	(487,241.33)	(487,241.33)
Spare Rent Fee	-	-	-	-	(882,000.00)	(882,000.00)	(504,000.00)	(378,000.00)
Total Cash Outflows	**(3,349,176)**	**(3,349,176)**	**(3,349,176)**	**(3,349,176)**	**(4,231,176)**	**(7,439,976)**	**(3,853,176)**	**(3,727,176)**

Gross Profit	**(3,349,176)**	**(3,349,176)**	**(3,349,176)**	**(3,349,176)**	**(4,231,176)**	**(7,439,976)**	**(3,853,176)**	**(2,691,176)**
Depreciation	-	(252,000)	(252,000)	(252,000)	(252,000)	(252,000)	(252,000)	(252,000)
EBIT	**(3,349,176)**	**(3,601,176)**	**(3,601,176)**	**(3,601,176)**	**(4,483,176)**	**(7,691,976)**	**(4,105,176)**	**(2,943,176)**
Interest Expense								
EBT								
TAX (25%)								
Earning After Tax (Net Profit)	**(3,349,176)**	**(3,601,176)**	**(3,601,176)**	**(3,601,176)**	**(4,483,176)**	**(7,691,976)**	**(4,105,176)**	**(2,943,176)**
Depreciation		252,000	252,000	252,000	252,000	252,000	252,000	252,000
Principal Payment								
Net Cash Flows	**(3,349,176)**	**(3,349,176)**	**(3,349,176)**	**(3,349,176)**	**(4,231,176)**	**(7,439,976)**	**(3,853,176)**	**(2,691,176)**

NPV	**($23,578,078)**

Scenario six – Garuda Indonesia

Inflow	2014	2015	2016	2017	2018	2019	2020	2021
Salvage Value	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1,036,000
Total Cash Inflows	-	-	-	-	-	-	**-**	**1,036,000**

Outflow	2014	2015	2016	2017	2018	2019	2020	2021
Availability Fee	(487,241)	(487,241)	(487,241)	(487,241)	(487,241)	(487,241)	(487,241)	(487,241)
Maintenance Fee	(2,973,807.03)	(2,973,807.03)	(2,973,807.03)	(2,973,807.03)	(2,973,807.03)	(2,973,807.03)	(2,973,807.03)	(2,973,807.03)
Maintenance Fee third party	-	-	-	-	(802,200)	(1,604,400)	-	-
Spare Rent Fee	-	-	-	(126,000.00)	(630,000.00)	(630,000.00)	(504,000.00)	(126,000.00)
Total Cash Outflows	**(3,461,048)**	**(3,461,048)**	**(3,461,048)**	**(3,587,048)**	**(4,893,248)**	**(5,695,448)**	**(3,965,048)**	**(3,587,048)**

Gross Profit	**(3,461,048)**	**(3,461,048)**	**(3,461,048)**	**(3,587,048)**	**(4,893,248)**	**(5,695,448)**	**(3,965,048)**	**(2,551,048)**
Depreciation	-	(252,000)	(252,000)	(252,000)	(252,000)	(252,000)	(252,000)	(252,000)
EBIT	**(3,461,048)**	**(3,713,048)**	**(3,713,048)**	**(3,839,048)**	**(5,145,248)**	**(5,947,448)**	**(4,217,048)**	**(2,803,048)**
Interest Expense								
EBT								
TAX (25%)								
Earning After Tax (Net Profit)	**(3,461,048)**	**(3,713,048)**	**(3,713,048)**	**(3,839,048)**	**(5,145,248)**	**(5,947,448)**	**(4,217,048)**	**(2,803,048)**
Depreciation		252,000	252,000	252,000	252,000	252,000	252,000	252,000
Principal Payment								
Net Cash Flows	**(3,461,048)**	**(3,461,048)**	**(3,461,048)**	**(3,587,048)**	**(4,893,248)**	**(5,695,448)**	**(3,965,048)**	**(2,551,048)**

NPV	**($23,382,045)**

Scenario seven – Garuda Indonesia

Inflow	2014	2015	2016	2017	2018	2019	2020	2021
Salvage Value	0	0	0	0	0	0	0	1,036,000
Total Cash Inflows	-	-	-	-	-	-	-	**1,036,000**

Outflow	2014	2015	2016	2017	2018	2019	2020	2021
Maintenance Fee	(2,973,807)	(2,973,807)	(2,973,807)	(2,973,807)	(2,973,807)	(2,973,807)	(2,973,807)	(2,973,807)
Maintenance Fee third party	-	-	-	-	(802,200)	(1,604,400)	-	-
Availability Fee	(487,241)	(1,049,245)	(1,049,245)	(1,049,245)	(1,049,245)	(1,049,245)	(1,049,245)	(1,049,245)
Total Cash Outflows	**(3,461,048)**	**(4,023,052)**	**(4,023,052)**	**(4,023,052)**	**(4,825,252)**	**(5,627,452)**	**(4,023,052)**	**(4,023,052)**

Gross Profit	**(3,461,048)**	**(4,023,052)**	**(4,023,052)**	**(4,023,052)**	**(4,825,252)**	**(5,627,452)**	**(4,023,052)**	**(2,987,052)**
Depreciation	-	(252,000)	(252,000)	(252,000)	(252,000)	(252,000)	(252,000)	(252,000)
EBIT	**(3,461,048)**	**(4,275,052)**	**(4,275,052)**	**(4,275,052)**	**(5,077,252)**	**(5,879,452)**	**(4,275,052)**	**(3,239,052)**
Interest Expense								
EBT								
TAX (25%)								
Earning After Tax (Net Profit)	**(3,461,048)**	**(4,275,052)**	**(4,275,052)**	**(4,275,052)**	**(5,077,252)**	**(5,879,452)**	**(4,275,052)**	**(3,239,052)**
Depreciation	-	252,000	252,000	252,000	252,000	252,000	252,000	252,000
Principal Payment								
Net Cash Flows	**(3,461,048)**	**(4,023,052)**	**(4,023,052)**	**(4,023,052)**	**(4,825,252)**	**(5,627,452)**	**(4,023,052)**	**(2,987,052)**

NPV	**($23,595,944)**

Scenario eight – Garuda Indonesia

Inflow	2014	2015	2016	2017	2018	2019	2020	2021
Salvage Value	0	0	0	0	0	0	0	1,036,000
Total Cash Inflows	-	-	-	-	-	-	-	**1,036,000**

Outflow	2014	2015	2016	2017	2018	2019	2020	2021
Maintenance Fee	(3,241,426)	(3,241,426)	(3,241,426)	(3,241,426)	(3,241,426)	(3,241,426)	(3,241,426)	(3,241,426)
Maintenance Fee third party	-	-	-	-	-	(802,200)	-	-
Availability Fee	(487,241)	(1,049,245)	(1,049,245)	(1,308,630)	(1,308,630)	(1,308,630)	(1,308,630)	(1,308,630)
Total Cash Outflows	**(3,728,668)**	**(4,290,672)**	**(4,290,672)**	**(4,550,057)**	**(4,550,057)**	**(5,352,257)**	**(4,550,057)**	**(4,550,057)**

Gross Profit	**(3,728,668)**	**(4,290,672)**	**(4,290,672)**	**(4,550,057)**	**(4,550,057)**	**(5,352,257)**	**(4,550,057)**	**(3,514,057)**
Depreciation	-	(252,000)	(252,000)	(252,000)	(252,000)	(252,000)	(252,000)	(252,000)
EBIT	**(3,728,668)**	**(4,542,672)**	**(4,542,672)**	**(4,802,057)**	**(4,802,057)**	**(5,604,257)**	**(4,802,057)**	**(3,766,057)**
Interest Expense								
EBT								
TAX (25%)								
Earning After Tax (Net Profit)	**(3,728,668)**	**(4,542,672)**	**(4,542,672)**	**(4,802,057)**	**(4,802,057)**	**(5,604,257)**	**(4,802,057)**	**(3,766,057)**
Depreciation	-	252,000	252,000	252,000	252,000	252,000	252,000	252,000
Principal Payment								
Net Cash Flows	**(3,728,668)**	**(4,290,672)**	**(4,290,672)**	**(4,550,057)**	**(4,550,057)**	**(5,352,257)**	**(4,550,057)**	**(3,514,057)**

NPV	**($24,904,502)**

Scenario nine – Garuda Indonesia

Inflow	2014	2015	2016	2017	2018	2019	2020	2021
Salvage Value	0	0	0	0	0	0	0	1,036,000
Total Cash Inflows	-	-	-	-	-	-	-	**1,036,000**

Outflow	2014	2015	2016	2017	2018	2019	2020	2021
Availability Fee	(487,241)	(1,049,245)	(1,049,245)	(1,049,245)	(1,049,245)	(1,049,245)	(1,049,245)	(1,049,245)
Maintenance Fee	(3,241,426)	(3,241,426)	(3,241,426)	(3,241,426)	(3,241,426)	(3,241,426)	(3,241,426)	(3,241,426)
Maintenance Fee third party	-	-	-	-	-	(802,200)	-	-
Spare Rent Fee	-	-	-	-	(252,000.00)	(252,000.00)	-	-
Total Cash Outflows	**(3,728,668)**	**(4,290,672)**	**(4,290,672)**	**(4,290,672)**	**(4,542,672)**	**(5,344,872)**	**(4,290,672)**	**(4,290,672)**

Gross Profit	**(3,728,668)**	**(4,290,672)**	**(4,290,672)**	**(4,290,672)**	**(4,542,672)**	**(5,344,872)**	**(4,290,672)**	**(3,254,672)**
Depreciation	-	(252,000)	(252,000)	(252,000)	(252,000)	(252,000)	(252,000)	(252,000)
EBIT	**(3,728,668)**	**(4,542,672)**	**(4,542,672)**	**(4,542,672)**	**(4,794,672)**	**(5,596,872)**	**(4,542,672)**	**(3,506,672)**
Interest Expense								
EBT								
TAX (25%)								
Earning After Tax (Net Profit)	**(3,728,668)**	**(4,542,672)**	**(4,542,672)**	**(4,542,672)**	**(4,794,672)**	**(5,596,872)**	**(4,542,672)**	**(3,506,672)**
Depreciation		252,000	252,000	252,000	252,000	252,000	252,000	252,000
Principal Payment								
Net Cash Flows	**(3,728,668)**	**(4,290,672)**	**(4,290,672)**	**(4,290,672)**	**(4,542,672)**	**(5,344,872)**	**(4,290,672)**	**(3,254,672)**

Scenario ten – Garuda Indonesia

Inflow	2014	2015	2016	2017	2018	2019	2020	2021
Salvage Value	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1,036,000
Total Cash Inflows	-	-	-	-	-	-	-	**1,036,000**

Outflow	2014	2015	2016	2017	2018	2019	2020	2021
Availability Fee	(487,241)	(487,241)	(487,241)	(487,241)	(487,241)	(487,241)	(487,241)	(487,241)
Mantenance Fee	(2,973,807)	(2,973,807)	(2,973,807)	(2,973,807)	(2,973,807)	(2,973,807)	(2,973,807)	(2,973,807)
Maintenance Fee third party	-	-	-	-	-	(802,200)	-	-
Spare Rent Fee	-	-	-	(126,000.00)	(882,000.00)	(882,000.00)	(504,000.00)	(126,000.00)
Total Cash Outflows	**(3,461,048)**	**(3,461,048)**	**(3,461,048)**	**(3,587,048)**	**(4,343,048)**	**(5,145,248)**	**(3,965,048)**	**(3,587,048)**

Gross Profit	**(3,461,048)**	**(3,461,048)**	**(3,461,048)**	**(3,587,048)**	**(4,343,048)**	**(5,145,248)**	**(3,965,048)**	**(2,551,048)**
Depreciation	-	(252,000)	(252,000)	(252,000)	(252,000)	(252,000)	(252,000)	(252,000)
EBIT	**(3,461,048)**	**(3,713,048)**	**(3,713,048)**	**(3,839,048)**	**(4,595,048)**	**(5,397,248)**	**(4,217,048)**	**(2,803,048)**
Interest Expense								
EBT								
TAX (25%)								
Earning After Tax (Net Profit)	**(3,461,048)**	**(3,713,048)**	**(3,713,048)**	**(3,839,048)**	**(4,595,048)**	**(5,397,248)**	**(4,217,048)**	**(2,803,048)**
Depreciation		252,000	252,000	252,000	252,000	252,000	252,000	252,000
Principal Payment								
Net Cash Flows	**(3,461,048)**	**(3,461,048)**	**(3,461,048)**	**(3,587,048)**	**(4,343,048)**	**(5,145,248)**	**(3,965,048)**	**(2,551,048)**

NPV	**($22,660,869)**

Writer Biography

Troy Agung Wibowo was born is Surabaya, September 15th 1993. He has been finished his study in SDN Baratajaya (1999-2005), SMP Negeri 12 Surabaya (2005-2008), and SMA Negeri 6 Surabaya (2008-2011). In 2011, the writer is accepted in Industrial Engineering Department, Institut Teknologi Sepuluh Nopember.

During his study, the writer joined exchange study program between TI-ITS and FKP-UTeM in Melaka, Malaysia. During exchange program, the writer received Anugerah Sijil Dekan due to high result. The writer also actively join international program. He is selected as Indonesian ambassador in Global Youth Conference 2012 in Malaysia. He is also selected as participant in 2nd NIDA Summer Camp in Bangkok Thailand. In 2013, the writer is selected to join AYPVC Seminar in Brunei Darussalam.

In his third year, the writer is selected to be the assistant of Logistics and Supply Chain Management Laboratory. He can be reached through email at troyagung@centerscm.org