

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

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Referring to maintenance schedule data from Garuda Indonesia, starting from 2017 until 2021 there is a need for overhaul 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 maintenance service demand from its parent company. Business agreement is developed between both parties by arranges on several parameters. Those are, maintenance schedule, number of landing gear spares need to be provided, and the ownership combination of the spares. 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 earn 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.

I. INTRODUCTION

REFERRING to maintenance data from Garuda Indonesia and GMF engineering, 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) and Nose Landing Gear (NLG). 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 [1].

As mentioned, life cycle between NLG and MLG is different. In the same aircraft, NLG will reach overhaul earlier than MLG. There are two options regarding overhaul schedule, separate MLG and NLG overhaul schedule or combine MLG and NLG to one schedule. Each option has advantage and disadvantage for both parties. Thus, Garuda and GMF has to agree on the maintenance 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. Thus, Garuda and GMF have to agree on the number of spare provided.

After determine the how much spares will be provided, Garuda and GMF has to agree on how is the ownership of the spares. There are two options, invest on the LDG spare or rent the spare from third party. **Figure 1** shows the rich picture for the overhaul LDG maintenance.

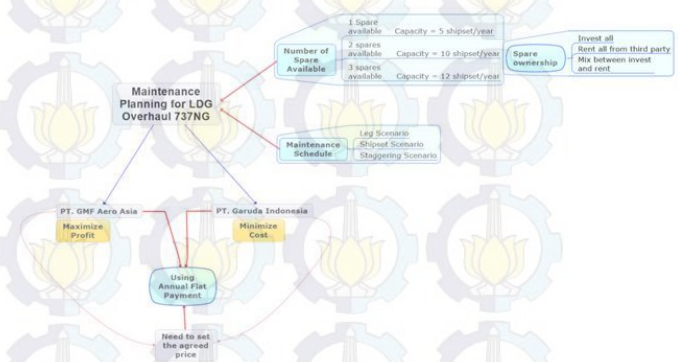


Figure 1. Rich Picture for Maintenance Planning Development for Landing Gear Overhaul between PT. Garuda Indonesia and PT. GMF Aero Asia

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.

II. BUSINESS SCHEME ANALYSIS

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.

After 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 providing two spares and three spares. The decision tree regarding ten schemes is shown in **figure 2**.

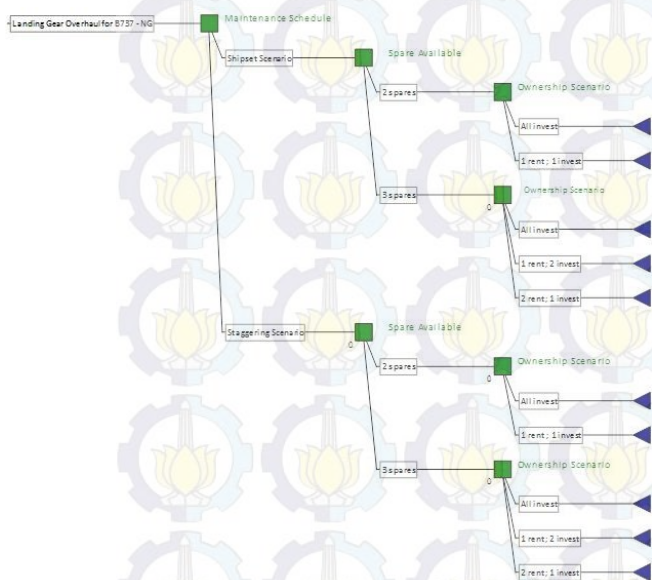


Figure 2. Decision Tree of the scheme after domination

III. PT. GMF AERO ASIA BUSINESS SCHEME ANALYSIS

Cash inflow and cash outflow has to be determined before performing Profit and Loss Analysis (PNL). **Table 4.1** shows the recapitulation of NPV output from ten schemes.

Table 1. NPV Recapitulation using GMF Aero Asia Perspective

Scheme	Maintenance Schedule	Number of spares	Ownership	NPV Value (\$ 1000)
1	Shipset	2	1 invest; 1 rent	\$ 1,384
2	Shipset	2	All invest	\$ 1,850
3	Shipset	3	All invest	\$ 1,406
4	Shipset	3	2 invest; 1 rent	\$ 2,027
5	Shipset	3	1 invest; 2 rent	\$ 1,536
6	Staggering	2	1 invest; 1 rent	\$ 1,682
7	Staggering	2	All invest	\$ 2,183
8	Staggering	3	All invest	\$ 1,851
9	Staggering	3	2 invest; 1 rent	\$ 2,361
10	Staggering	3	1 invest; 2 rent	\$ 1,860

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.

IV. PT. GARUDA INDONESIA BUSINESS SCHEME ANALYSIS

Cash inflow and cash outflow has to be determined before performing Profit and Loss Analysis (PNL). By doing PNL analysis to all schemes, **table 4.2** shows the recapitulation of NPV output from ten schemes.

Table 2. NPV Recapitulation using Garuda Indonesia Perspective

Scheme	Maintenance Schedule	Number of spares	Ownership	NPV Value (\$ 1000)
1	Shipset	2	1 invest; 1 rent	(\$22,397)
2	Shipset	2	All invest	(\$22,568)
3	Shipset	3	All invest	(\$24,240)
4	Shipset	3	2 invest; 1 rent	(\$25,110)
5	Shipset	3	1 invest; 2 rent	(\$23,578)
6	Staggering	2	1 invest; 1 rent	(\$23,382)
7	Staggering	2	All invest	(\$23,595)
8	Staggering	3	All invest	(\$24,904)
9	Staggering	3	2 invest; 1 rent	(\$25,627)
10	Staggering	3	1 invest; 2 rent	(\$22,660)

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.

V. 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 4.3 shows the comparison each scheme between NPV cost for GIA and NPV profit for GMF.

Table 3. Comparison between NPV GIA and NPV GMF

Scheme GIA	NPV GIA	Scheme GMF	NPV GMF
1	\$ (22,397,874.87)	1	\$ 1,384,448.66
2	\$ (22,568,239.37)	2	\$ 1,850,089.22
3	\$ (24,240,264.65)	3	\$ 1,406,200.62
4	\$ (25,110,301.61)	4	\$ 2,027,900.66
5	\$ (23,578,077.85)	5	\$ 1,536,817.08
6	\$ (23,382,045.46)	6	\$ 1,682,567.37
7	\$ (23,595,943.96)	7	\$ 2,183,711.30
8	\$ (24,904,501.98)	8	\$ 1,851,030.06
9	\$ (25,627,499.36)	9	\$ 2,361,522.73
10	\$ (22,660,869.25)	10	\$ 1,860,378.80

Range Negotiation between PT. Garuda Indonesia and PT. GMF Aero Asia are shown in figure 4.54. Heuristic method is used to find the fair scheme.

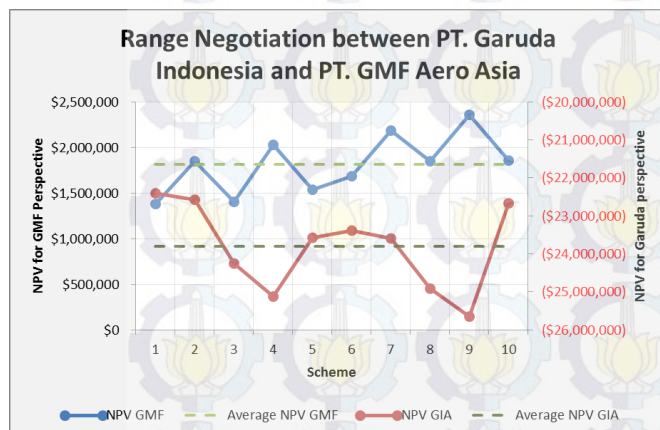


Figure 3. Range Negotiation between PT. Garuda Indonesia and PT. GMF Aero Asia

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. 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.

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.

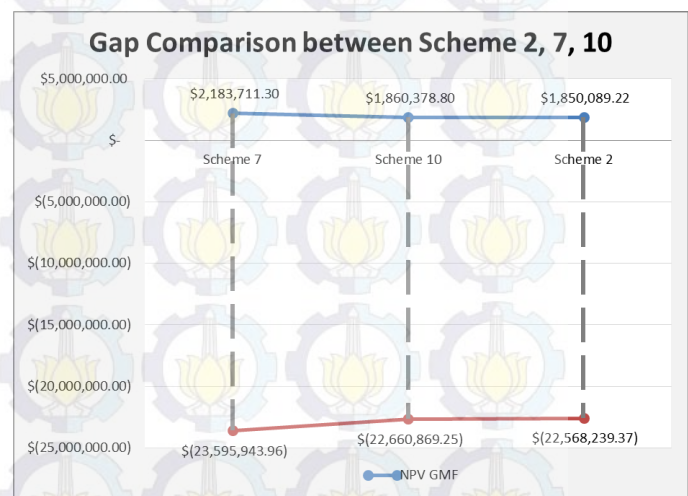


Figure 4.1 Gap between Schemes two, seven, and ten

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. Than scheme-two is chosen to be the proposed fair scheme.

VI. CONCLUSION AND SUGGESTION

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.

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