JRSSEM 2026, Vol. 5, No. 12, July
E-ISSN: 2807 - 6311
P-ISSN: 2807 - 6494

Strategic and Financial Evaluation of New-Generation Jet Engine Maintenance Development: A Case Study on Investment Decision-Making for PT GG Aircraft Maintenance

Ari Wibowo*, Oktofa Yudha Sudrajad
Institut Teknologi Bandung, Indonesia
Email: 29124360@mahasiswa.itb.ac.id*

Keywords:
MRO industry; PT GG Aircraft Maintenance; engine maintenance capabilities; CFM56; LEAP engine.

Abstract

In the next decade, the Maintenance, Repair, and Overhaul (MRO) market is expected to undergo significant changes driven by evolving demand for aircraft and engine maintenance services. The currently dominant CFM56 engine family is gradually being replaced by the LEAP engine family, which represents a new generation of commercial aircraft engines. As one of the largest MRO providers in Southeast Asia, PT GG Aircraft Maintenance has established capabilities in CFM56 engine maintenance but faces a strategic challenge regarding whether to invest in developing LEAP engine maintenance capabilities, which requires an estimated capital expenditure of approximately USD 75 million. This investment decision is critical to ensuring the company's long-term sustainability, particularly in maintaining competitive aircraft engine maintenance service capabilities. This study examines strategic alternatives for the company, including the development of LEAP engine maintenance capabilities through internal investment and resources, as well as the evaluation of potential collaboration schemes with investors or strategic partners, such as joint operations (JO) or joint ventures (JV) with original equipment manufacturers (OEMs) or other MRO providers. This study aims to provide strategic recommendations supported by comprehensive financial evaluations, serving as a reference for strategic decision-making to strengthen the company's long-term competitiveness in the regional and global MRO industry.

INTRODUCTION

In the upcoming decade, the MRO market is expected to undergo significant shifts in aircraft and engine demand. The currently dominant CFM56 engine family is gradually being replaced by LEAP engines, representing the new generation of commercial aircraft engines, driven by continued global fleet expansion and rising demand for engine overhaul capacity (ResearchAndMarkets.com, 2025; Spherical Insights, 2024). However, GG Airlines, as the primary captive customer of GG Aircraft Maintenance, faces uncertainty regarding the timeline for replacing its existing CFM engines with LEAP engines. At present, GG Airlines operates only one B737 MAX aircraft equipped with two LEAP-1B engines. Although previous plans indicated an expansion of up to 50 B737 MAX aircraft (equivalent to 100 LEAP-1B engines), the implementation timeline remains uncertain. Meanwhile, CC Airlines, a sister company of GG Aircraft Maintenance and another captive customer, currently operates five A320neo aircraft powered by ten LEAP-1A engines. To date, there has been no clear indication regarding when CC Airlines will further expand its A320neo fleet with additional LEAP-1A-powered aircraft.

This uncertainty in the growth of the captive market represents a key challenge in securing sufficient and predictable revenue streams, which are essential to justify and sustain the feasibility of investing in LEAP engine maintenance capability development. GG Aircraft Maintenance is a leading MRO service provider in Southeast Asia and one of the largest in the Asia-Pacific region. As a subsidiary of GG Airlines, the national flag carrier, GG Aircraft Maintenance plays a strategic role in supporting GG Airlines' fleet operations while also serving various domestic and international airlines.

The company's origins date back more than seven decades, beginning as the Technical Division of GG Airlines. Over time, GG Aircraft Maintenance has developed its technical expertise, infrastructure, and global reputation, eventually becoming an independent entity.

GG Aircraft Maintenance operates one of the largest and most comprehensive MRO facilities in the region. Its services include airframe maintenance, engine repair and overhaul, component maintenance, line maintenance, and engineering services. The company also operates specialized workshops equipped with advanced technologies capable of supporting both routine maintenance activities and complex heavy maintenance inspections.

Currently, GG Aircraft Maintenance serves more than 150 customers, including national airlines, low-cost carriers, cargo operators, aircraft leasing companies, and military operators. The company's credibility is further strengthened by certifications from more than 25 global civil aviation authorities, including the Federal Aviation Administration (FAA) of the United States, the European Union Aviation Safety Agency (EASA), the Civil Aviation Safety Authority (CASA) of Australia, and Indonesia's Directorate General of Civil Aviation (DGCA). These certifications demonstrate GG Aircraft Maintenance's compliance with international aviation safety and quality standards.

As one of the largest MRO providers in the region, GG Aircraft Maintenance possesses comprehensive capabilities for CFM56 engine maintenance but faces a strategic decision regarding whether to invest in developing LEAP engine maintenance capabilities, which requires an estimated capital expenditure of approximately USD 75 million to establish a new engine testing facility. This decision is critical to ensuring the company's long-term sustainability, particularly in maintaining and expanding its aircraft engine maintenance portfolio.

The primary challenge is that the existing captive market for LEAP engines remains relatively limited, although it is projected to grow steadily over the next five years. The company is also considering alternative strategic options, such as establishing partnerships with external parties or divesting the engine maintenance facility. Notably, a previous attempt to establish a joint venture several years ago was unsuccessful because the valuation offered for GG Aircraft Maintenance was significantly below the company's expectations. This situation highlights the importance of reassessing the company's valuation within the current market environment, consistent with prior findings that joint ventures frequently fail when partners' expectations on contribution value and commitment are not well aligned (Goyal & Dubey, 2025).

The novelty of this research lies in its integrated methodological approach, combining three analytical perspectives: (1) capital budgeting analysis using Net Present Value (NPV), Internal Rate of Return (IRR), and payback period calculations, supported by scenario and sensitivity analyses to evaluate financial feasibility (Sureka et al., 2021; Sinaga et al., 2023);

(2) enterprise valuation using the Discounted Cash Flow (DCF) method (Jonek-Kowalska, 2018) to determine the value of existing engine maintenance facilities for potential partnership contributions; and (3) strategic partnership assessment through comparative financial modeling of standalone investment and joint venture structures (Arora et al., 2023). This integrated approach has not previously been applied to LEAP engine capability development decisions within the Indonesian MRO industry context. Furthermore, this research incorporates qualitative insights from senior management interviews to complement quantitative financial analysis, providing a more comprehensive decision-support framework.

Research Questions and Research Objectives:

This study addresses the following research questions: (1) What is the financial feasibility of investing in LEAP engine maintenance capabilities at GG Aircraft Maintenance, considering market potential, capital requirements, financing alternatives, and projected financial returns? (2) How do strategic collaboration models, such as joint operations (JO) or joint ventures (JV) with engine manufacturers or other MRO providers, influence the feasibility and competitiveness of developing LEAP engine maintenance capabilities? The research objectives are to evaluate the financial feasibility of LEAP engine maintenance capability development and assess alternative strategic collaboration models that may enhance the company's competitiveness and long-term sustainability.

The scope of this study focuses on comparing the financial projections of strategic alternatives, specifically between developing LEAP engine maintenance capabilities through internal investment and pursuing a partnership model. Under the partnership scenario, this study also evaluates the valuation of the existing engine maintenance facility to determine the appropriate contribution required from a potential partner to establish an equitable ownership structure (e.g., a 50:50 partnership). Revenue projections are based on historical market performance and market share trends, supplemented by sensitivity analyses to assess potential variations and uncertainties.

RESEARCH METHOD

Research Design

This research adopted a mixed-methods case study approach (Bell & Warren, 2023) to examine GG Aircraft Maintenance's investment decision, particularly regarding the development of new engine (LEAP) maintenance capabilities. The study integrated quantitative and qualitative approaches to obtain comprehensive findings aligned with the research objectives and questions. The research design framework is presented below:

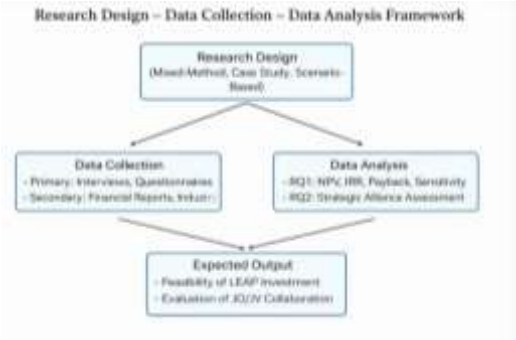


Figure 1 Research Design Framework for LEAP Engine Maintenance Capability Development Decision-Making

The research began with business issue identification, focusing on the strategic challenge faced by GG Aircraft Maintenance due to the transition in market demand from legacy-generation engines (CFM56) to new-generation engines (LEAP) over the upcoming decade. This situation created a strategic dilemma for the company regarding whether to invest in LEAP engine maintenance capability development, divest the existing engine maintenance facility, exit the engine maintenance business, or refocus resources on its core business of airframe maintenance.

To support the research, a comprehensive literature review was conducted. The first stream of literature focused on corporate finance and investment feasibility assessment (Kengatharan, 2016; de Souza Michelon et al., 2020). The second stream examined enterprise valuation (Khanafi et al., 2024), which was required to reassess the value of GG Aircraft Maintenance's engine maintenance facility and determine an appropriate valuation threshold if the company decided to exit the engine maintenance business. The final stream explored strategic alliances (Arora et al., 2024), which were relevant if the company pursued LEAP engine capability development through Joint Operations (JO) or Joint Ventures (JV) to improve the project's financial viability.

Data collection involved a combination of secondary and primary sources. Secondary data consisted of GG Aircraft Maintenance's financial reports, internal company documents, industry data, and relevant academic publications, while primary data were collected through interviews with key stakeholders. Secondary data were used as the basis for developing financial models, whereas primary data provided strategic insights that could not be fully captured through quantitative analysis. Data analysis was conducted by integrating financial modeling with strategic analysis to provide a comprehensive assessment. Financial and strategic comparisons were presented as references for developing recommendations regarding the investment decision. This research integrated three key analytical areas—investment feasibility assessment, enterprise valuation, and strategic alliance evaluation—into a unified decision-making framework.

Data Collection Method

The data for this research will be collected through both primary and secondary sources. To illustrate the alignment between research questions, data sources, and collection method, a data collection matrix is presented as follows:

Table 1 Research Question, Required Data, Source, and Data Collection Method

Research Question	Required Data	Source	Data Collection Method
RQ1 – Financial feasibility of LEAP investment	Investment cost, projected revenues, financing options, demand forecast	GG Aircraft Maintenance reports, Industry reports, Experts, Customers	Secondary (financial reports, market studies), Interviews
RQ2 – Influence of JO/JV models	Alliance structures, governance, success/failure factors, partnership risks	GG Aircraft Maintenance, Senior Management, Journals, Case studies	Interviews, Benchmarking, Literature review

To address the first research question, which is assessing financial feasibility of new generation (LEAP) engines investment, the accurate investment cost, demand forecast, projected revenues, and financing option to be examined. This data can be gathered through the following sources:

1. **Company Documents**
   Data can be gathered through GG Aircraft Maintenance's audited financial reports and internal reports. This data will provide critical information such as historical revenue from engine services, capital structure, cash flow, existing debt, and past valuation attempts
2. **Industry Reports and Market Study**
   Industry reports can be accessed through Oliver Wyman's Global Fleet & MRO Forecast, IATA publications, Aviation Fleet Analyzer, etc. This provides regional fleet growth, MRO demand by engine type (CFM56 vs. LEAP), competitive positioning of global MRO players.

The main approach relies on secondary data. However, certain interviews with experts and customers will also be conducted to obtain complementary insights and enhance the completeness of the analysis.

The second investment examines the influence of strategic alliances through Joint Operation (JO) or Joint Venture (JV) models to the financial viability of new generation (LEAP) engine investment. This requires information on alliance structures, governance, success/failure factors, and partnership risks. The principal data sources will include academic journals, case studies of comparable partnership schemes within the industry, and Senior Management insights. The primary method of data collection will be literature review and interview with GG Aircraft Maintenance Senior Management, while benchmarking exercises or interviews with engine manufacturers and potential partners may also be pursued to enrich the findings.

Data Analysis Method

This study applies a two-tier data analysis method which directly corresponds to the research questions. The first tier evaluates the financial feasibility of developing LEAP engine capability, while the second tier examines strategic considerations on the collaboration structure.

1. **Capital Budgeting Analysis (Research Question 1)**

To address the first research question, this study uses capital budgeting approach to assess the whether the LEAP engine capability development investment creates value for GG Aircraft Maintenance (Sureka et al., 2021). The primary metrics to be measured are the NPV and IRR (Sokolov, 2024; Wang, 2025). The analysis steps are defined as follows:

a. Cash Flow Projection
   Project annual operating cash flow based on the assumed data such as estimated shop visit volume, price per shop visit, operating cost (labour, materials, and overhead cost), and capital expenditure.
b. Determination of Discount Rate
   Calculate appropriate discount rate using GG Aircraft Maintenance's WACC, representing GG Aircraft Maintenance's financial structure. The WACC is calculated based on the average cost of debt stipulated in the annual report and cost of equity using CAPM approach.
c. NPV and IRR Calculation
   NPV to be used as the primary decision criterion to evaluate the value creation, while IRR to be used as complementary. However, both metrics must be applied.
d. Scenario and Sensitivity Analysis

Three scenarios will be applied, consistent with common practice in capital budgeting risk assessment (Darmansyah et al., 2025; Purnamasari & Adriza, 2024), as follows:

1) Pessimistic scenario
   This scenario assumes the lowest projected demand, provided by GG Airlines Group only based on the existing fleet plan.
2) Moderate Scenario
   Moderate scenario assumes the most likely assumptions with moderate projected demand in which 25% of the total demand is generated by third-party customers.
3) Optimistic Scenario
   This scenario assumes the highest achievable market with an assumption that GG Airlines will contribute 50% of the total demand, while the rest demand is targeted from the third-party customers.

By integrating scenario simulations (pessimistic, moderate, optimistic), this research captures demand volatility and financial risk exposure. The ultimate output of the first tier is to determine in what conditions the LEAP engines investment is financially viable for GG Aircraft Maintenance.

2. Strategic Partnership Models (Research Question 2)

After the first-tier data analysis method is accomplished, the certain conditions to make the investment is financially viable is determined. The challenge is to ensure whether GG Aircraft Maintenance may achieve such conditions using stand-alone investment structure, given constraints related to capital availability, technology access, market scale, and execution risk. Therefore, the second-tier analysis evaluates whether a joint venture (JV) structure provides a more feasible and sustainable strategic alternative, in line with evidence that joint ventures can reduce risk exposure relative to standalone investment (Goyal & Dubey, 2025). In this second-tier data analysis method, the study will combine between comparative feasibility study and qualitative study. The strategic partnership option in this study is limited for joint venture (JV) as it represents the most relevant form of equity-based alliance for high-capital, technology-intensive investments such as LEAP engine capability development. This analysis is conducted through the following steps:

a. Definition of Collaboration Structures

The investment structure is defined as follows:

1. a stand-alone investment fully funded and operated by GG Aircraft Maintenance, and
2. a joint venture investment involving GG Aircraft Maintenance and a strategic partner, with shared capital, risks, and operational responsibilities.

b. Existing GG Aircraft Maintenance Engine Shop Valuation

To operate the LEAP engine capability, the existing engine shop building and equipment must be retained. Consequently, the existing facility to be included as part of GG Aircraft Maintenance contribution to the JV entity other than the captive market. Existing engine shop valuation is required to calculate the contribution. The valuation will be performed using the DCF valuation method (Khanafi et al., 2024).

c. Comparative Feasibility Study

This step compares financial modelling of stand-alone investment structure and joint venture (JV) investment structure. For the JV structure, the project value is adjusted based on GG Aircraft Maintenance's ownership share to ensure comparability with the stand-

alone case. This step evaluates whether risk-sharing and capital dilution under a JV structure improve GG Aircraft Maintenance's risk–return profile and reduce financial exposure. The JV financial modelling will be based on 3 scenarios as follows:

1) **Pessimistic Scenario**
   This scenario assumes the optimistic scenario of stand-alone investment (GG Airlines Group will contribute 50% of the total demand, while the rest demand is targeted from the third-party customers) as a baseline and the minimum requirement of the potential partner market contribution.
2) **Moderate Scenario**
   The scenario assumes that the potential partner will contribute 67% of total market. This scenario might be fulfilled by any potential partner which is an airlines/lessor with approximately 120 aircraft powered by LEAP engines. Other engine MRO with annual spill demand about 20 engines overhaul event may also be potential partner to be explored.
3) **Optimistic Scenario**
   The most progressive scenario assumes that the 75% of demand will be provided by the potential partner. The scenario is applicable for the potential partner who has over 200 aircraft powered by LEAP engines.

d. Qualitative Content Analysis

In addition to financial assessment, a qualitative analysis through interview using systematic coding to be conducted. Following established qualitative content analysis practice (Bell & Warren, 2023), this will identify recurring themes related to governance mechanisms, decision-making authority, risk-sharing arrangements, and performance outcomes. This step provides insight into non-financial factors that influence the effectiveness and sustainability of JV arrangements.

This hybrid approach reduces subjectivity, ensuring alliance assessment is not only theoretical but also practically comparable to financial alternatives (stand-alone/alliance).

RESULTS AND DISCUSSIONS

This chapter presents the financial projections of LEAP engine capability development as well as strategic preferences from the Senior Management. The financial projection compares between stand-alone investment and partnership scheme.

Capital Budgeting Analysis

This analysis is performed to answer the first research question regarding the financial feasibility of stand-alone investment (Hayward et al., 2017; Bhatnagar et al., 2025) under 3 scenarios based on the projected demand as described as follows:

a. Pessimistic scenario

This scenario assumes that the demand is generated solely from GG Airlines Group based on the existing fleet plan, consisting of 10 A320 Neo aircraft with 20 LEAP-1A engines and 50 B737Max aircraft with 100 LEAP-1B engines. It will generate approximately 4 annual events in the first 10 years and approximately 18 annual events starting from the 11^{th} year.

b. Moderate Scenario

Moderate scenario assumes 75% of the total demand is generated by GG Airlines Group, while 25% percent demand is projected from the third-party customers. This scenario assumes that the annual demand will be approximately 6 engines in the first 10 years and approximately 24 annual events starting from the 11th year.

c. Optimistic Scenario

This scenario assumes that GG Airlines Group will contribute 50% of the total demand, while the rest demand is targeted from the third-party customers. This scenario assumes that the annual demand will be approximately 8 engines in the first 10 years and approximately 34 annual events starting from the 11th year.

The assumptions and calculations are explained in the following details:

1. Revenue Projection

The revenue is projected based on the projected demand multiplied by assumed pricing. The first year of projection will start in 2027, while the assumed pricing refers to the 2026 estimated pricing, which is approximately USD 11.000.000 per overhaul event with 3% annual escalation.

Figure 2 LEAP Engine Overhaul Event and Revenue Projection under Stand-Alone Investment Scenarios

2. Cost Projection

The projected cost consists of the direct costs and overhead/operating expenses. The direct costs are defined as material costs sub-contracted costs, and fixed direct labor cost. The operating expenses are the overhead costs, which consist of staff expenses, utility costs, marketing-administration costs, annual license fee for LEAP engine capability support, and concession fee charged by In Journey.

The amount of each cost is determined based on 2026 data with assumed annual escalation as follows:

Table 2 Cost Structure and Annual Escalation Assumptions for LEAP Engine Capability Development

Description	2026 Amount (USD)	Annual Escalation
Direct Cost		
Material Cost	65% of package price	NA
Sub-contracted	19% of package price	NA
Fixed Direct Labor	3,920,000	5%
Operating Expenses		
Staff Expenses	2,380,000	5%
Utility	1,500,000	3%
Marketing & Administration	1,080,000	3%
License Fee	10,000,000	3%
Concession	1.25% of package price	NA

LEAP engine overhaul will only contribute the fixed labor costs and overhead costs approximately 50% for the first 10 years, since the engine shop will still operate CFM engine overhaul until 2036 before the capability is shut down.

3. Investment

The major investment for the LEAP engine capability development will be on the new engine facility building, LEAP engine special tools, and LEAP engine personnel training and certifications. The existing building and machining/equipment will be still utilized either for CFM engines or LEAP engines. Below is the comparison between the facility details:

Existing Engine Maintenance Facility (Part 1):

Figure 3 Existing Engine Maintenance Facility Layout (Part 1) Supporting LEAP Engine Capability Development

Existing Engine Maintenance Facility (Part 2):

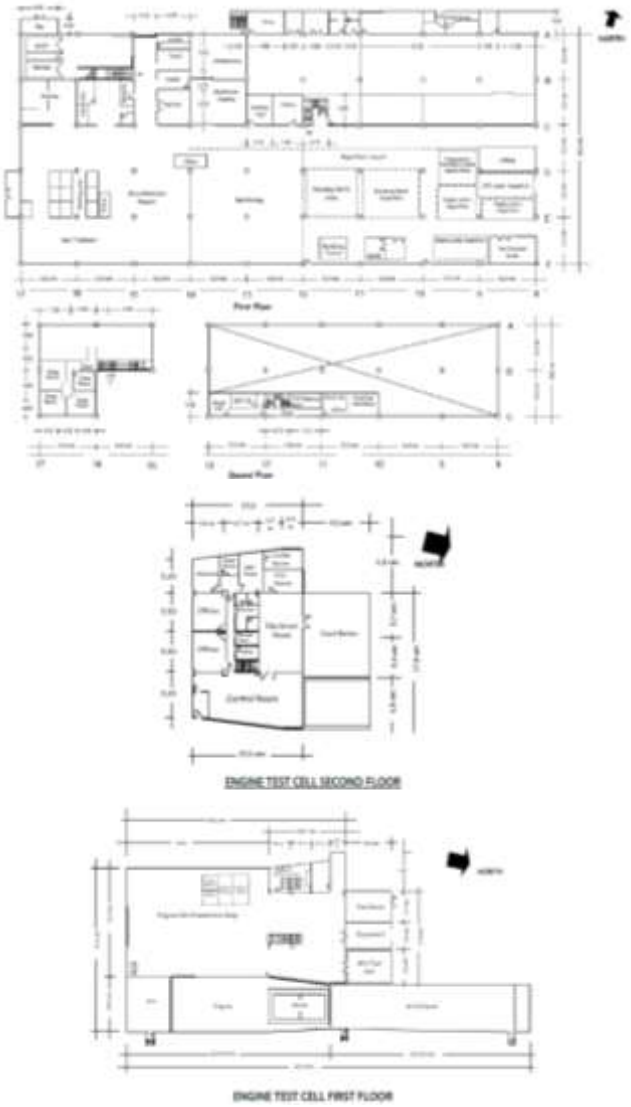


Figure 4 Existing Engine Maintenance Facility Layout (Part 2) Supporting LEAP Engine Capability Development

The existing facilities, as illustrated in the pictures above, are to be maintained and utilized to support the development of the new LEAP engine capability, while the engine test facility would only continue to be maintained if the existing CFM engine capability is retained.

A new engine testing facility is required to develop LEAP engine capability due to significant differences in the specification and testing requirements between the LEAP engines and CFM engines currently supported by the existing engine testing facilities.

New Engine Testing Facility Illustration

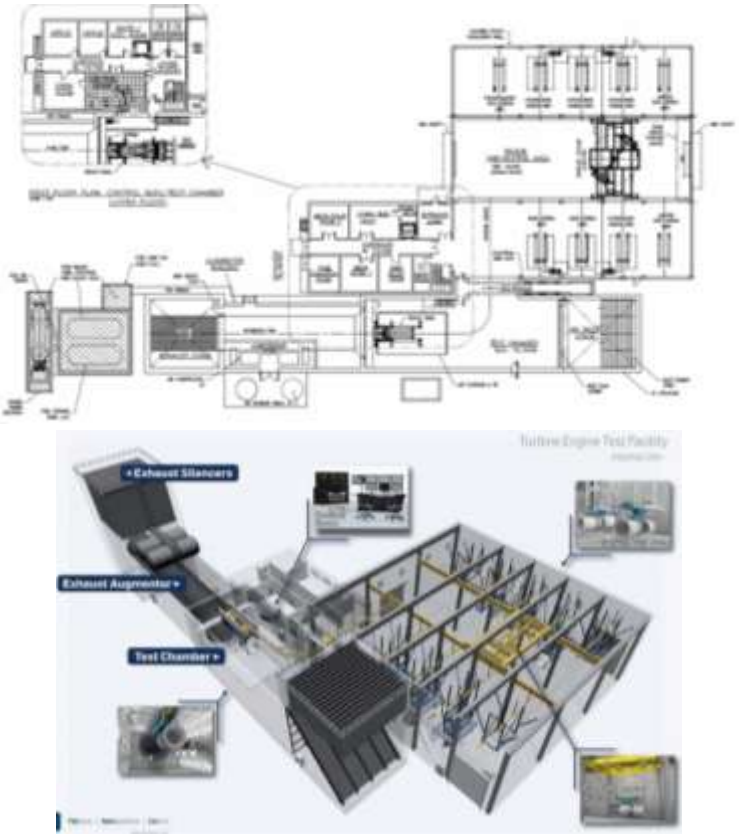


Figure 5 New LEAP Engine Testing Facility Development Plan and Illustration

The capital investment required to develop LEAP engines capability is estimated at approximately USD 75,000,000. It consists of USD 63,000,000 for the construction of new engine testing facility, USD 10,000,000 for LEAP engine special tools, and USD 2,000,000 for personnel training as well as the certifications. These investments are expected to provide annual overhaul capacity up to 100 engines. The capital expenditure is assumed to be depreciated within 20 years in the capital budgeting using straight-line depreciation method.

4. Discount Factor, WACC, and Hurdle Rate

The WACC (Weighted Average Cost of Capital) is calculated using CAPM (Capital Asset Pricing Model) and earning yield approach. DDM (Dividend Discount Model) is not applicable since GG Aircraft Maintenance has not distributed dividend in recent years.

$$K_d = \frac{\text{Interest Expense}}{\text{Average Debt Outstanding}} \times (1 - T)$$

$$\textbf{Average Debt Outstanding} = \frac{\text{Debt at start of year} + \text{Debt at end of year}}{2}.$$

T refers to corporate tax

Referring to 2025 annual report, the parameter can be determined as follows:

Interest Expense (2025) = US $ 20,210,871

Debt at end of the year 2024 = US $ 20,004,877 (borrowing current portion) + US $ 371,217,848 (long-term loan)

Debt at end of year 2024 = US $ 391,222,725

Debt at the end of 2025 = US $ 20,891,815 (borrowing current portion) + US $ 351,889,310 (long-term loan)
Debt at the end of 2025 = US $ 372,781,125
Average Debt = (US $ 391,222,725 + US $ 372,781,125) / 2
Average Debt = US $ 382,001,925.00
Corporate tax = 22%
Therefore, the cost of Debt (Kd) = (US $ 20,210,871 / US $ 382,001,925.00) x (1-22%)
Debt (Kd) (after tax) = 4.13%

$$\text{WACC} = \frac{E}{V} \cdot K_e + \frac{D}{V} \cdot K_d$$

Where:
E = Equity Value
D = Average Debt
V = Total Value (Equity + Debt)

Equity value can be calculated by multiplying the current stock price by outstanding shares
Current stock price = US $ 0.0049
Outstanding shares = 120,022,194,445
Equity value (E) = US $588,108,753
Average Debt (D) = US $ 382,001,925.00 (ref 2025 annual report)
Total Value (V) = D + E = US $970,110,678
E/V = 60.64%
D/V = 39.36%

5. WACC Calculation using CAPM

$$\text{Cost of Equity} = R_f + \beta \times (R_m - R_f)$$

Where:
Rf = Risk-free rate (government bonds)
β = Beta coefficient (calculated within 2023-2025 in monthly basis)
Rm = Expected market return
(Rm−Rf) = Market risk premium
The following parameters represent GG Aircraft Maintenance current conditions:
Rf = 6.11
β (3 year) = 0.74
(Rm – Rf) = 6.69
Therefore,
Cost of Equity (Ke) = 6.11 + 0,74 x 6.69
Cost of Equity (Ke) = 11.07%
WACC = 60.64% x 11.07% + 39.36% x 4.13%
WACC = 8.34%

6. WACC Calculation using Earning Yield Approach

$$k_e = \frac{E_1}{P_0}$$

Where:

Ke is Cost of Equity

E1 represents earning per share

P0 is the current stock price

E1 = US $ 0.00090

P0 = Rp 82 = US $ 0.0049 (using BI rate JISDOR as per 31 December 2025)

Therefore, Cost of Equity (Ke) = 0.00090/0.0049

Cost of Equity (Ke) = 18.35%

WACC = 60.64% x 18.35% + 39.36% x 4.13%

WACC = 12.75%

The calculated WACC refers to the end of 2025 data is between 8.34% and 12.75%, while the official WACC issued by corporate in March 2026 is 8.38%, underscoring the sensitivity of corporate investment decisions to the accuracy of WACC estimation (Frank & Shen, 2016; Carluccio et al., 2023).

Furthermore, as a part of corporate policy, a hurdle rate will be applied as WACC+3% for a strategic initiative, especially for initiatives that require big investment or strategic partnerships. Hence, the discount factor applicable for this study will be 11.38%.

7. Free Cash Flow Projection, IRR, NPV, and Payback Period

The free cash flow is developed to evaluate financial feasibility of te proposed investment under the 3 different scenarios. It is projected within 20 years term starting in 2026 (year 0). The comparative results of the IRR (Internal Rate of Return), NPV (Net Present Value), and payback period for each scenario are presented below.

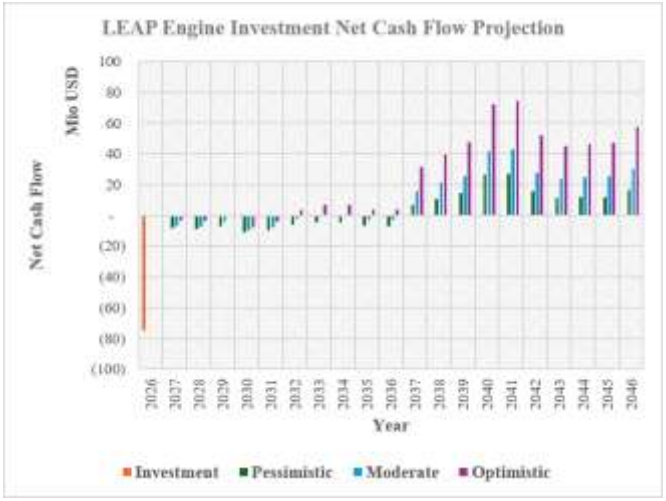


Figure 6 LEAP Engine Investment Free Cash Flow Projection under Different Scenarios

Based on the net cash flow projection, the IRR, NPV, and payback period are calculated and summarized as follows:

Table 3 Financial Feasibility Analysis under Pessimistic, Moderate, and Optimistic Scenarios

Description	Pessimistic	Moderate	Optimistic
NPV (thousand USD)	(91.325)	(50.598)	13.872
IRR	0,06%	6,21%	12,57%
Payback Period (Year)	NA	NA	17,84

The financial analysis indicates that the LEAP engine capability development is financially only viable under optimistic scenario. On the other words, the investment is acceptable if only the third-party demand is assumed to be as big as the captive market from the GG Airlines Group. Consequently, the project's viability is highly sensitive to third party market penetration in addition to the existing captive market.

Due to the above results, it is very important to evaluate the strategic partnership financial modelling as an alternative option to develop the LEAP engines capability. This alternative is expected to provide a better financial return and reduce the risk at the same time.

Strategic Partnership Model

This subchapter explains how a strategic partnership affect the feasibility study.

1. Existing GG Aircraft Maintenance Engine Shop Valuation

The existing GG Aircraft Maintenance Engine Shop valuation measure the potential business value generated in the next 10 years (2027 – 2036) based on the projected overhaul event of CFM56 engines operates by GG Airlines Group.

Figure 7 GG Airlines Group CFM56 Engine Overhaul Event Projection for Existing Facility Valuation

The CFM engines overhaul capability is assumed to be shut down in 2037, since the demand will be dropped and shifted to LEAP engines.

The revenue and cost projection are calculated using the same assumptions as LEAP engines. The differences are determined on the following items:

a. Depreciation

The depreciation refers to the 2026 booked value of the exisitng facility and depreciated using the straight-line depreciation method for the next 10 years starting from 2027. The total current booked value is USD 9,262,000, consisting of USD 2,168,000 for the exisitng building

and USD 7,094,000 for the exisit tools and equipment. As a result, the annual depreciation will be USD 926,200.

b. Discount Factor

In the valuation, the discount factor applied is same as hurdle rate used in the LEAP financial model. This value represents the expected discount rate for an MRO business, within 10-12%.

Based on the above assumptions, the CFM56 engines only operation will generate free cash flow as follow:

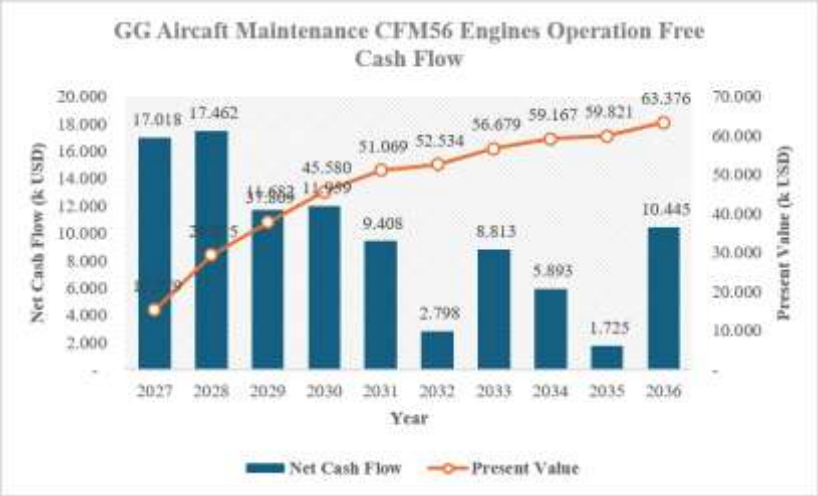


Figure 8 GG Aircraft Maintenance CFM56 Engine Operation Free Cash Flow and Valuation Projection

The valuation of the existing facility at USD 63,376,000 to be included as a part of GG Aircraft Maintenance contribution to establish a joint venture.

2. Strategic Partnership/JV Financial Model

The JV financial model is developed under 3 scenarios outlined in the previous chapter. Most of the assumptions are similar to the stand-alone financial modelling. However, several specific considerations applicable for JV structure have been incorporated into the analysis. The key assumptions and calculations are described as follows:

a. Revenue Projection/Market Demand

The market demand is determined in 3 scenarios with the following assumptions:

b. Pessimistic Scenario

The non captive demand is assummed exactly same as captive market provided by GG Airlines Group. This will be the baseline to compare between stand-alone investment and JV at the same assumed demand.

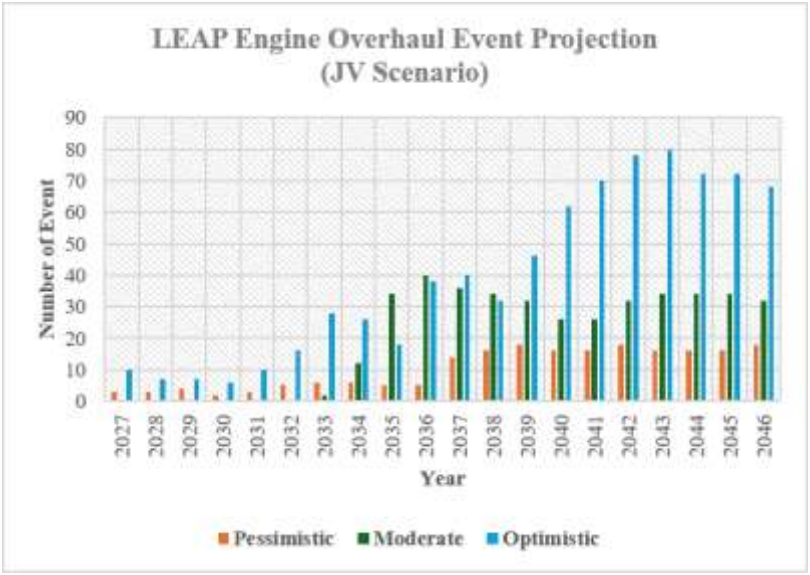
c. Moderate Scenario

The scenario is projected using captive market plus market projection simulation using LEAP engines projected overhaul event of an aircraft lessor with 114 aircraft with 228 engines, almost double compared to GG Airlines Group fleet plan powered by LEAP engines. The potential partner will generate approximately 67% of the total demand as outlined in the prevous sub-chapter.

d. Optimistic Scenario

Similar to the previous scenario, the market demand is projected using captive market plus market projection simulation using LEAP engines projected overhaul event of an aircraft

lessor with nearly 400 fleet number with 800 engines. The potential partner will provide approximately 80% of the total demand.



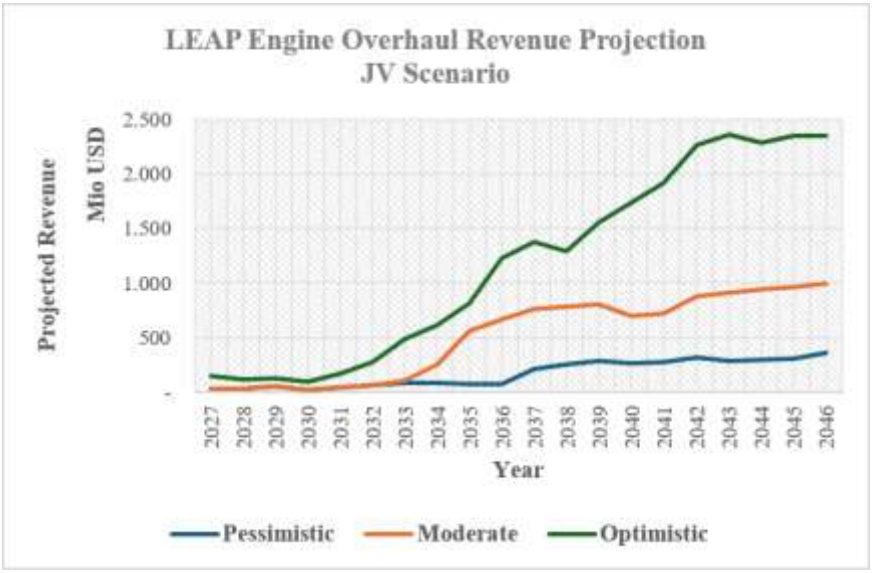


Figure 9 LEAP Engine Overhaul Event and Revenue Projection under Joint Venture Scenarios

3. Cost Projection

Most of the assumptions applied the cost projection are aligned with the assumptions in the stand-alone financial model. However, the fixed direct labor cost and staff expenses are expected to increase significantly under the optimistic scenario. This reflects the additional workforce required to increase the annual overhaul capacity from 50 engines to 100 engines in the 11th year.

The cost comparison using 2026 baseline is shown in the table below:

Table 4 Cost Comparison Based on Engine Overhaul Capacity Scenarios

Description	2026 Amount (USD) for 50 Engines Capacity	2026 Amount (USD) for 100 Engines Capacity	Annual Escalation
Direct Cost			
Material Cost	65% of package price	65% of package price	NA
Sub-contracted	19% of package price	19% of package price	NA

Operating Expenses			
Marketing & Administration	1.080.000	1.242.000	3%
License Fee	10.000.000	10.000.000	3%
Concession	1.25% of package price	1.25% of package price	NA

4. Free Cash Flow Projection, IRR, NPV, and Total Value

The projected free cash flow for each scenario are presented as follows:

Table 5 JV Financial Model Results under Pessimistic Scenario

Entity	Share	Investment (kUSD)	Add Contribution (kUSD)	NPV (kUSD)	IRR	Add Value (kUSD)	Total Value (kUSD)
JV Entity	100%	75.000	-	13.872	12,57%	-	13.872
GG	51%	7.196	63.376	38.129	23,89%	(31.054)	7.075
Partner	49%	67.804	-	(24.257)	8,31%	31.054	6.797

Table 6 JV Financial Model Results under Moderate Scenario

Entity	Share	Investment (kUSD)	Add Contribution (kUSD)	NPV (kUSD)	IRR	Add Value (kUSD)	Total Value (kUSD)
JV Entity	100%	75.000	-	89.234	16,84%	-	89.234
GG	51%	7.196	63.376	76.563	26,57%	(31.054)	45.509
Partner	49%	67.804	-	12.670	12,58%	31.054	43.724

Table 7 JV Financial Model Results under Optimistic Scenario

Entity	Share	Investment (kUSD)	Add Contribution (kUSD)	NPV (kUSD)	IRR	Add Value (kUSD)	Total Value (kUSD)
JV Entity	100%	75.000	-	265.083	26,5%	-	265.083
GG	51%	7.196	63.376	166.247	58,51%	(31.054)	135.193
Partner	49%	67.804	-	98.837	19,73%	31.054	129.891

The summary above indicates that the investment under pesimistic scenario is financially feasible for the JV entity, yet not feasible for the potential strategic partner. However, it will generate possitive NPV since there is additional value gained by the potential strategic partner from 49% portion of the exisitng CFM business, on the other hand GG Aircraft Maintenance will decrease the NPV since the CFM business will be shared 49% to the potential strategic partner. This is not sufficiently attractive to either GG Aircraft Maintenance or the potential strategic partner.

The moderate scenario can be considered as the minimum target case for establishing a JV entity. To achieve this financial returns, the potential strategic partner is expected to contibute a minimum of 20 annual engines overhaul event in average.

The optimistic scenario will generate the best financial returns for both GG Aircraft Maintenance and potential strategic partner.

Qualitative Perspective

Qualitative study through semi-structured interview has been conducted as additional input and considerations in the investment scenario selections. The respondents included Head

of Marketing, Head of Engineering & Planning, and Head of Business Strategy who are directly responsible for strategic initiatives and business development, especially for engine maintenance segment. Several valuable insights are gathered from the discussion and has been incorporated into the business case.

1. Market Aspect

The captive market provided by GG Airlines Group plays a significant role in the capability development analysis. It will not only provide the revenue stream but also become a mandatory requirement in order to apply the LEAP engine capability to the engine manufacturer. Moreover, there are already 2 engine shop in South East Asia who has the LEAP engines overhaul capability and one them them belongs to the manufacturer.

As outlined in the previous subchapter, a stand-alone investment scenario requires additional third-party market at least the same volume as the captive market in order to make the investment feasible. In fact, the historical data indicates that the thidr-party market of CFM engines has contributed only approximately 20% of the total revenue.

It is challenging securing the minimum volume to support stand-alone investment. It is hard to justify the investment decision, unless GG Airlines Group substantially expand its fleet plan up to 120 aircraft powered by LEAP engines.

2. Enginering/Quality Aspec

Technically, it is not too difficult to develop LEAP engines overhaul capability, as GG Aircraft Maintenance has the basic competencies and expertise of performing CFM engines. The biggest challenge is only the investment on the new engine testing facility.

While waiting for the evaluation, tha alternatives option is to develop the partial capability for minor repair level which doesn't require engine testing. This allows the personnel to gain the competency and experience step by step.

3. Strategic Aspect

From the strategic perspective, developing LEAP engines capability is mandatory to maintain the sustainability of the engine maintenance business. Ideally, the capability to be developed by 2030, otherwise, it would be too late.

Considering the snsitivity to the market demand, developing the LEAP engines capability through strategic partnership is more preferable. It will minimize the risk and is expected to provide a better financia paramaters. However, the Board of Directors have to convince the shareholders to establish a new entity. Therefore, the investment has to be financially feasible and GG Aircraft Maintenance has to become a majority shareholder.

There are several potential partner clusters to be explored, which are:

a. **Original Equipment Manufacturer (OEM)**

LEAP engines are manufactured by CFM Internatioanl, a joint venture company between GE Aerospace and Safran Aircraft Engines. Establsihing a strategic partnership with the OEM would provide significant benefits, consistent with partner-selection literature on strategic and organizational fit in joint ventures (Arora et al., 2023), as the OEM posses the proprietary technical expertise and have a direct control over the supply chain. As a result, it would enhance the operational efficiency by providing competitive pricing, material availability, and better turnaround time of the overhaul.

However, the possibility of establishing the partnership for GG Aircraft Maintenance is relatively limited, since GE Aerospace has operated the engine maintenance facility in

Malaysia. Furthermore, GG Airlines Group fleet plan is not sufficiently attractive for the OEM.

b. **Airlines or Lessor**

GG Aircraft Maintenance has previous experince in exploring a strategic partnership opportunities with airlines in the Middle East and Asian region, particularly in the airframe and component maintenance segments. These experiences provide valuable insights into the complexities in developing the collaboration scheme.

Several airlines and lessors have an intention to collaborate with GG Aircraft Maintenance. Most of them provide a promising market. On the other side, they often expect specific commercial expectations, such as securing dedicated maintenance slots for their fleet. It may create competing priorities once GG Airlines Group also requires the dedicated slots for its own fleet.

c. **MRO (Maintenance Repair and Overhaul) Company**

The last cluster is MRO companies. The most ideal and suitable candidate is an engine MRO with the exisitng LEAP engine capability who is willing to expand its market presence into the Asian region. Currently, the number of potential MROs within this cluster is limited. There are only few MROs that currently have possed LEAP engines capability and have no significnat footprint in the Asian region.

The key challenge associated with this cluster is securing the market volume as they don't directy control aircraft or engines assets. Consequently, the success of the strategic partnership with the MRO depends on their ability to bring sufficient third-party engine maintenance volume. The scenario becomes more viable once the potential partner have secured a long-term contract that require additional capacity other than their existing facility.

Business Solutions

Given the above findings, pursuing the strategic partnership should be the prioritized as the preferred approach Arora et al., (2024) for developing LEAP engines capability, as it reduces GG Aircraft Maintenance financial and operational risks, while offering more attractive financial returns for both GG Aircraft Maintenance and potential partners.

However, to implement such business solution, it would not depend on the financial feasibility study only. As part of corporate internal procedures, such business case recommendations must undergo a comprehensive internal review process. It should be prepared by the related departments and submitted to the Board of Directors and Commissioners to for their review and approval.

In practice, the process would be much more complicated as it requires business justifications, risk assessments, and legal reviews to ensure that all decisions align comply with the corporate procedures, government regulations, and the principle of good corporate governance.

Extensive discussions and alignment process to be conducted to accommodate the interest of each party and gain the mutual benefit at the same time. The long-term objectives to be addressed to gain a sustainable collaboration.

CONCLUSION

Based on the quantitative and qualitative analyses conducted in this study, the development of LEAP engine maintenance capabilities is considered essential to ensuring the long-term sustainability of GG Aircraft Maintenance's engine maintenance business. The findings indicate that a standalone investment is financially feasible only if sufficient business volume can be secured through either an expanded captive market or substantial third-party demand. Meanwhile, a strategic partnership provides more attractive financial performance by reducing capital requirements and operational risks. However, such a partnership requires an appropriate partner that is willing to contribute significant market volume and investment capital.

To strengthen the business case and improve decision-making accuracy, GG Aircraft Maintenance should first confirm the LEAP-powered fleet expansion plan within the GG Airlines Group to validate future demand projections and seek technical support from CFM International. In parallel, the company should initiate discussions with potential strategic partners to evaluate their investment interests, commercial expectations, and willingness to collaborate. Furthermore, consultation with the original equipment manufacturer (OEM) regarding modifications to the existing engine testing facility is recommended as a potential alternative for reducing investment costs and improving project feasibility. A comprehensive cost-benefit analysis and risk mitigation plan should also be conducted to ensure that the selected investment strategy delivers sustainable value and maintains the company's competitiveness in the evolving MRO industry.

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