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Investment Feasibility Analysis for Sustainable Capacity Expansion of Aircraft MRO in Indonesia

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Abstract

According to global market outlooks, the aviation industry is expected to demand 43,975 new aircraft between 2024 and 2043, significantly increasing the need for Maintenance, Repair, and Overhaul (MRO) services. As the leading MRO provider in Indonesia, Aeroantara Technic is well-positioned to capture this growth. However, it faces internal challenges due to its prolonged negative equity position. This study assesses the investment feasibility of an investor in developing a new wide-body aircraft hangar with two to four additional slots that Aeroantara Technic would operate under an Operations Management (OM) scheme. The analysis is approached from two perspectives. First, whether the project is financially viable for the investor, since Aeroantara Technic would not be able to lease the hangar without a feasible investment return. Second, if the project is feasible, the study estimates the potential benefit that Aeroantara Technic could gain from operating the hangar under this arrangement. The analysis integrates financial data projections using discounted cash flow modelling, supported by publicly available data inputs from the industry and internal insights utilized to build credible assumptions and enhance the realism of projections. The results indicate a robust return on investment with a positive NPV of USD 19.2 million, an IRR of 14.2%, and a payback period of 10.6 years, confirming adequate profitability and feasibility. A sensitivity analysis using Monte Carlo simulation is conducted to further account for uncertainties, strengthening the confidence in the project decision under varying risk scenarios. Align with international aviation sustainability goals (ICAO's CORSIA and IATA's Fly Net Zero), Aeroantara Technic could incorporate ESG aspects that may unlock green financing, government incentives, and customer preference for sustainable MROS. In conclusion, expanding Aeroantara Technic's capacity for aircraft maintenance through a new hangar represents a financially sound strategic move aligned with the industry growth forecasts.

Keywords: Maintenance, Repair and Overhaul (MRO); Aircraft Hangar; Investment Feasibility; Net Present Value; Internal Rate of Return; Sensitivity Analysis

A. INTRODUCTION

Maintenance, repair and overhaul (MRO) is an important element of aviation essential for the airworthiness of all aircraft in operation. MRO is a certified entity that offers aircraft, engines, components, and accessories maintenance services. In order to conduct business and operations, MRO must be certified and regulated by authorities such as the Federal Aviation Administration (FAA) of the United States of America, the European Union Aviation Safety Agency (EASA), as well as the Directorate General of Civil Aviation (DGCA) of Indonesia, and other regulators. Under normal circumstances, airlines prioritise minimising aircraft downtime since prolonged groundings cost them money. Hence, MRO services are essential to guarantee operational effectiveness and dependability, which are very important in the highly competitive aviation sector.

The aviation sector is undergoing significant growth due to rising demand for air travel, fueled by a growing middle class, increased tourism, and greater business connectivity. According to (Boeing Commercial Market Outlook, 2024), aircraft fleets will continue to grow; airlines will need 43,975 new aeroplanes over 20 years, and in the Asia Pacific region itself, around 22% for new deliveries, which will raise the need for MRO services. In light of growing pressure on airlines to reduce their carbon footprints, fleet renewal involves more than just expanding capacity; it also involves modernization to improve fuel economy and lower emissions. One intriguing finding is the prediction that 47% of deliveries to the global fleet will be for the replacement of older aircraft, reflecting the industry's shift to more modern, fuel-efficient aircraft in an effort to meet decarbonization goals. This expansion is expected to drive increased demand for Maintenance, Repair, and Overhaul (MRO) services, presenting a strategic growth opportunity for Aeroantara Technic to strengthen its market position. Currently, Aeroantara Technic

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operates at full hangar capacity booked for wide-body base maintenance, limiting its ability to accommodate additional aircraft maintenance. This constraint prevents the company from capturing the growing demand and increasing its market share. To capitalize on this opportunity, Aeroantara Technic must consider a capacity expansion project to enhance its service offerings and revenue potential.

However, several key considerations must be evaluated before committing to this investment. First, the financial feasibility of expansion must be assessed. One of the major challenges in pursuing this expansion is Aeroantara Technic's financial condition, which has been in a negative equity position over recent financial periods. This financial distress creates significant implications for capital costs and financing feasibility. Due to its negative equity, lenders perceive Aeroantara Technic as a high-risk borrower, resulting in higher interest rates on loans, which increases the cost of debt. Therefore, to fund this expansion, Aeroantara Technic needs to explore other options. One potential approach could be a partnership with another party, like an investment company. The investment company could take on the responsibility of building the new hangar, and Aeroantara Technic could come in to manage the operations with the Operation Management (OM) scheme. This arrangement allows Aeroantara Technic to expand its service capacity without bearing the capital burden while ensuring hangar utilization.

This research, therefore, analyzes the feasibility of this project from two perspectives. First, whether the investment would be financially viable for the investor, and second, how much potential benefit Aeroantara Technic could generate from operating the hangar under the OM scheme. The study uses a quantitative approach through discounted cash flow modeling, supported by both internal financial data and publicly available industry projections. In addition to standard indicators such as Net Present Value (NPV), Internal Rate of Return (IRR), and payback period, this research also incorporates sensitivity analysis by using Monte Carlo Simulation to assess the impact of uncertainty and variability in key assumptions such as revenue, costs, and risk of cost overruns. By identifying these financial factors, this research aims to guide Aeroantara Technic in deciding how to best take advantage of the increasing need for aircraft maintenance in Indonesia. The following chapters will first explain the research methodology used, including the financial modelling approach, data sources, and techniques. This will be followed by a comprehensive analysis of the results from both Aeroantara Technic's and investors' perspectives, including base case projections, sensitivity testing, and Monte Carlo simulation. Finally, the study concludes with key findings and recommendations for future action.

B. METHODS

This research adopts a quantitative research approach utilizing a financial feasibility analysis framework to evaluate the investment decision for constructing a new wide-body hangar at Aeroantara Technic. The research aims to determine the financial viability from both the company's and the potential investor's perspective. Using a case study method focusing on Aeroantara Technic as the subject, this research incorporates secondary data derived from internal company documents and financial statements, publicly available industry reports, and primary assumptions, particularly cost, revenue, and parameters, which were calibrated through internal insights and cross-referenced with industry benchmarks to ensure realism and accuracy.

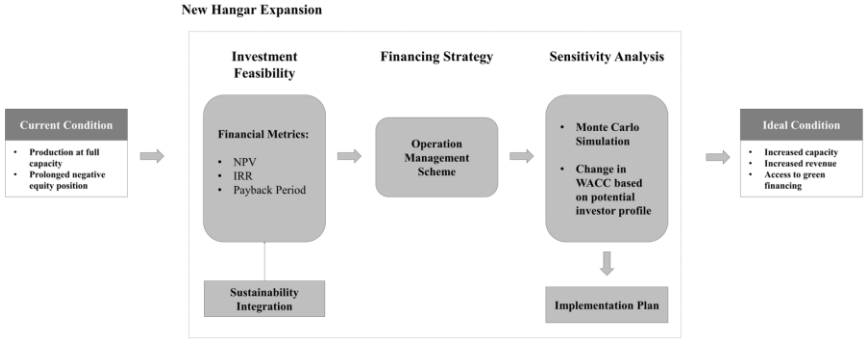

Figure 1. Conceptual Framework
Source: Research data, 2025

This research is built upon the need to respond to Aeroantara Technic's current limitations. Specifically, its inability to increase wide-body aircraft maintenance capacity due to an already fully

utilized hangar and a prolonged negative equity position. These constraints prevent the company from capturing emerging opportunities in the global growing MRO market. As illustrated in the conceptual framework, the core solution explored in this research is the development of a new hangar expansion project, evaluated through a structured and multi-stage approach.

Financial Modelling and Evaluation Criteria

To assess the financial feasibility of the project, several standard capital budgeting techniques and financial modeling formulas are applied in this study:

Operating Cash Flow represents the cash generated by the project from its core operational activities; it is calculated as:

$$OCF = EBIT + Depreciation - Taxes$$

Where:

EBIT = Earnings Before Interest and Tax

Depreciation = Non-cash expense

Taxes = Corporate income tax (22% in this study)

In this case, the analysis assumes a fixed project duration of 25 years, so the terminal Value is not separately projected but implicitly captured within the last year's performance and cash flows. To account for the remaining Value of the project after the projection period, the terminal Value may be estimated using the perpetuity growth method:

$$TV = \frac{FCF_n \times (1 - g)}{\mathrm{r} - \mathrm{g}}$$

Where:

FCF_n = Free Cash Flow in the final year

g = Terminal growth rate

r = Discount rate or WACC

To evaluate the financial feasibility, the following indicators and decision rules are applied: NPV > 0, which project is considered financially viable; IRR at which the NPV of all cash equals zero; and the decision rule IRR > WACC, so the project is financially attractive, and the shorter payback period is preferred.

Initial Investment and Weight Average Cost of Capital

The initial capital investment required for constructing the new wide-body aircraft hangar is estimated at USD 36 million. This investment covers the civil works, mechanical and electrical systems, installation of hangar equipment, and supporting facilities necessary for full operational readiness. Under the proposed scheme, the investor will fund the entire capital expenditure while Aeroantara Technic will manage the hangar operations through an Operation Management (OM) agreement, enabling a capital-light business model for Aeroantara Technic. The financial analysis uses a Weighted Average Cost of Capital (WACC) of 8.48% to reflect the required rate of return for investors based on the characteristic risk of the project. The WACC estimate is derived based on studies between Aeroantara Technic and its partners incorporating Indonesia's sovereign risk premium, industry-specific risk for Maintenance, Repair, and Overhaul (MRO) projects, and the operational risk associated with Aeroantara Technic's current financial position. The use of 8.48% WACC ensures that the Net Present Value (NPV) calculation appropriately discounts future cash flow to reflect the time value and project risk.

To explore alternative financing scenarios, this study also tested different WACC values based on financial profiles of potential investor candidates using publicly available financial statements and Damodaran's WACC estimation method. For instance, using East Asia Airlines as a hypothetical investor, the calculated WACC was approximately 3.24%, reflecting the airline's strong financial position and lower cost of capital. In contrast, applying Middle East Airline's financial structure yielded a higher WACC of around 6.86% illustrating how an investor's capital structure and country risk exposure can influence project valuation. The general formula used to calculate WACC is:

$$WACC = (E/V \times Re\ ) + (D/V \times Rd \times (1 - t))$$

Where:
E = Market value of equity
D = Book value of debt
V = Total capital (E+D)
R_e = cost of equity
Rd = cost of debt
T = Corporate tax rate

Market Absorbance and Revenue Projection

The financial projection for the new wide-body hangar assumes that it will take some time to reach full capacity. In the first year of operations, the hangar is expected to reach around 69% utilization, followed by 89% in the second year. It is projected at close to 100% utilization starting from the third year onward. This gradual increase reflects the time needed for airlines to schedule maintenance slots and for Aeroantara Technic to fully optimize its operations. After reaching full capacity, revenue is expected to grow steadily by about 3% each year, following the industry trends and inflation adjustments. These market absorbance and revenue growth assumptions are based on Aeroantara Technic's internal financial model and align with the general behavior seen in aviation maintenance markets, with each maintenance event revenue ranging from 800.000 USD to 1.2 million USD, depending on the scope of maintenance.

Table 1. Market and Revenue Projection

	Potential Events					Market Absorbance					Estimated Total Revenue				
	2025	2026	2027	2028	2029	2025	2026	2027	2028	2029	2025	2026	2027	2028	2029
TOTAL	**53**	**56**	**53**	**56**	**53**	**6**	**13**	**17**	**19**	**19**	**5.500.000**	**11.100.000**	**14.300.000**	**15.900.000**	**15.900.000**
Airline A	1	1	1	1	1	1	1	1	1	1	1.100.000	1.100.000	1.100.000	1.100.000	1.100.000
Airline B	2	3	2	3	2	1	1	2	2	2	800.000	800.000	1.600.000	1.600.000	1.600.000
Airline C	1	1	1	1	1	1	1	1	1	1	1.200.000	1.200.000	1.200.000	1.200.000	1.200.000
Airline D	1	2	2	2	2	1	2	2	2	2	800.000	1.600.000	1.600.000	1.600.000	1.600.000
Airline E	4	5	4	5	4	0	1	2	3	3	-	800.000	1.600.000	2.400.000	2.400.000
Airline F	7	4	4	4	4	2	2	2	3	3	1.600.000	1.600.000	1.600.000	2.400.000	2.400.000
Airline G		2	2	2	2		2	2	2	2		1.600.000	1.600.000	1.600.000	1.600.000
Airline H	2	2	2	2	2	0	1	2	2	2	-	800.000	1.600.000	1.600.000	1.600.000
Airline I	31	32	31	32	31	0	1	2	2	2	-	800.000	1.600.000	1.600.000	1.600.000
Airline J	4	4	4	4	4	0	1	1	1	1	-	800.000	800.000	800.000	800.000

Source: Aeroantara Technic Marketing Intelligence, 2025

Investment Credit and Operational Expenses

The initial investment required to build the new hangar at USD 36 million. To simulate the financing model from the investor perspective, it is assumed that this investment is recovered over a 25-year loan term with an agreed interest rate of 15.04% per year. To calculate the fixed annual payment that investor would receive each year over the 25-year term, the formula is used:

$$PMT = \frac{P \times r}{1 - (1 + r)^{-n}}$$

Where:
PMT = Annual payment (principal + interest)
P = Initial investment (Present Value)
r = Annual interest rate 15.04%
n = Loan term (25 years)

Based on these terms, the combined repayment of principal and interest would amount to USD 5.625.604 per year. This repayment figure is treated as the annual lease cost that Aeroantara Technic would pay to the investor for using the hangar facilities. However, recognizing that the hangar will not immediately operate at full capacity in its early years, Aeroantara Technic proposes a staged payment structure for the first five years. During this ramp-up period, the lease payments would be adjusted according to the utilization rate of the hangar, allowing for more manageable Costs while operations gradually scale up. After the fifth year, once utilization stabilizes Aeroantara Technic would begin paying full the annual lease amount consistently.

The operating expenses for managing the new hangar are divided into several categories to reflect both the variable and fixed nature costs. Direct variable expenses, such as material usage and

subcontractor services, are estimated to be 25% of total revenue directly tied to the number of maintenance events performed. Indirect variable expenses, which include marketing and promotion, concessions, and allocated corporate costs, are assumed at approximately 11.25% of revenue. Meanwhile, direct non-variable expenses mainly consist of direct labor costs and indirect non-variable expenses cover overhead items such as indirect labor, office supplies, business travel, training and development, facility repair and maintenance, insurance, professional licensing, land rental, utilities, and IT services are treated as fixed operating cost and projected to grow by 3% per year to reflect expected inflationary pressure over the project lifetime.

Total Present Value for MRO Perspective

The Present Value for the new hangar project was calculated based on Aeroantara Technic's projected net profit generated from the new hangar over 25 years. This method focuses on Aeroantara Technic's financial benefit from managing the hangar operation under the Operation Management scheme. To discount these free cash flows, a WACC of 10.86% was applied. This WACC was determined using Damodaran's spreadsheet method, customized for the Indonesian market and Aeroantara Technic's specific financial structure. Given Aeroantara Technic's highly leveraged condition, where debt accounts for 99.69% and equity for only 0.31% of the capital structure, the cost of debt plays a significant role. By using these assumptions, the NPV analysis reflects the real Value Aeroantara Technic could expect from the project, adjusting for the time value of money and specific operational risks.

Monte Carlo Simulation

To further strengthen the financial analysis, a Monte Carlo simulation was conducted to model the impact of uncertainty on the project's NPV. The simulation introduces variability in key assumptions, such as revenue projections and operating cost levels, which are subject to change due to market conditions and operational factors. A random sampling approach was used to generate 1000 iterations of possible outcomes, creating a probability distribution of the project's NPV results. The simulation was built in Microsoft Excel with add in Python utilizing random number generation functions combined with defined probability ranges for the input variables. Revenue fluctuations and cost escalations were modeled within realistic boundaries based on industry expectations and internal risk assessments. This Monte Carlo approach allows the analysis to capture a range of best-case, base-case, and worst-case financial outcomes. Analyzing the distribution of results can assess achieving positive investment returns under varying future scenarios.

C. RESULTS AND DISCUSSION

Financial Projection

To assess the financial feasibility of the project, the analysis looks at two different perspectives: one from Aeroantara Technic as the operator under the Operation Management scheme and the other from the investment company that provides the capital for the hangar construction. Each side has a different way of earning and carrying risks, so their financial result is analyzed separately.

Table 2. Financial Projection for Aeroantara Technic's Perspective from 2026 to 2050

		2026	*2027*	*2028*	*2029*	*2030*
REVENUE		**11.100.000**	**14.300.000**	**15.900.000**	**15.900.000**	**16.995.000**
PRODUCTION COST		**(4.900.228)**	**(5.774.611)**	**(6.251.597)**	**(6.331.278)**	**(6.687.498)**
NON PRODUCTION COST		**(5.843.115)**	**(7.405.562)**	**(8.183.438)**	**(8.206.811)**	**(8.390.209)**
EBITDA		**356.657**	**1.119.827**	**1.464.965**	**1.361.911**	**1.917.293**
Depreciation						
EBIT		**356.657**	**1.119.827**	**1.464.965**	**1.361.911**	**1.917.293**
Interest Expense	*5%*	(43.179)	(50.260)	(54.234)	(55.061)	(57.998)
EBT		**313.478**	**1.069.567**	**1.410.731**	**1.306.850**	**1.859.295**
Tax	*22%*	(68.965)	(235.305)	(310.361)	(287.507)	(409.045)
NET PROFIT		**244.513**	**834.262**	**1.100.370**	**1.019.343**	**1.450.250**
WACC	10,86%					
Free Cash Flow		244.513	834.262	1.100.370	1.019.343	1.450.250
Disc Factor		0,902038607	0,813673649	0,733965045	0,662064807	0,597208016
Present Value		220.560	678.817	807.633	674.871	866.101
PV Cumulative		**220.560**	**899.377**	**1.707.010**	**2.381.881**	**3.247.982**

	2031	*2032*	*2033*	*2034*	*2035*
REVENUE	**17.504.850**	**18.029.996**	**18.570.895**	**19.128.022**	**19.701.863**
PRODUCTION COST	**(6.888.123)**	**(7.094.766)**	**(7.307.609)**	**(7.526.838)**	**(7.752.643)**
NON PRODUCTION COST	**(8.473.147)**	**(8.558.574)**	**(8.646.563)**	**(8.737.192)**	**(8.830.539)**

		2031	2032	2033	2034	2035
EBITDA		**2.143.580**	**2.376.655**	**2.616.723**	**2.863.993**	**3.118.681**
Depreciation						
EBIT		**2.143.580**	**2.376.655**	**2.616.723**	**2.863.993**	**3.118.681**
Interest Expense	*5%*	(59.738)	(61.530)	(63.376)	(65.277)	(67.235)
EBT		**2.083.842**	**2.315.126**	**2.553.348**	**2.798.716**	**3.051.446**
Tax	*22%*	(458.445)	(509.328)	(561.736)	(615.718)	(671.318)
NET PROFIT		**1.625.397**	**1.805.798**	**1.991.611**	**2.182.999**	**2.380.128**
WACC	10,86%					
Free Cash Flow		1.625.397	1.805.798	1.991.611	2.182.999	2.380.128
Disc Factor		0,538704687	0,485932426	0,438329809	0,39539041	0,356657415
Present Value		875.609	877.496	872.983	863.137	848.890
PV Cumulative		**4.123.591**	**5.001.087**	**5.874.070**	**6.737.206**	**7.586.096**

		2036	2037	2038	2039	2040
REVENUE		**20.292.919**	**20.901.706**	**21.528.758**	**22.174.620**	**22.839.859**
PRODUCTION COST		**(7.985.222)**	**(8.224.779)**	**(8.471.522)**	**(8.725.668)**	**(8.987.438)**
NON PRODUCTION COST		**(8.926.687)**	**(9.025.720)**	**(9.127.723)**	**(9.232.787)**	**(9.341.002)**
EBITDA		**3.381.009**	**3.651.208**	**3.929.512**	**4.216.166**	**4.511.419**
Depreciation						
EBIT		**3.381.009**	**3.651.208**	**3.929.512**	**4.216.166**	**4.511.419**
Interest Expense	*5%*	(69.252)	(71.330)	(73.470)	(75.674)	(77.944)
EBT		**3.311.757**	**3.579.878**	**3.856.042**	**4.140.492**	**4.433.475**
Tax	*22%*	(728.587)	(787.573)	(848.329)	(910.908)	(975.364)
NET PROFIT		**2.583.171**	**2.792.305**	**3.007.713**	**3.229.584**	**3.458.110**
WACC	10,86%					
Free Cash Flow		2.583.171	2.792.305	3.007.713	3.229.584	3.458.110
Disc Factor		0,321718758	0,29020274	0,261774076	0,236130323	0,212998667
Present Value		831.054	810.335	787.341	762.603	736.573
PV Cumulative		**8.417.151**	**9.227.485**	**10.014.827**	**10.777.429**	**11.514.002**

		2041	2042	2043	2044	2045
REVENUE		**23.525.055**	**24.230.806**	**24.957.730**	**25.706.462**	**26.477.656**
PRODUCTION COST		**(9.257.061)**	**(9.534.773)**	**(9.820.816)**	**(10.115.440)**	**(10.418.903)**
NON PRODUCTION COST		**(9.452.464)**	**(9.567.270)**	**(9.685.520)**	**(9.807.318)**	**(9.932.769)**
EBITDA		**4.815.529**	**5.128.763**	**5.451.395**	**5.783.704**	**6.125.984**
Depreciation						
EBIT		**4.815.529**	**5.128.763**	**5.451.395**	**5.783.704**	**6.125.984**
Interest Expense	*5%*	(80.282)	(82.691)	(85.172)	(87.727)	(90.359)
EBT		**4.735.247**	**5.046.073**	**5.366.223**	**5.695.978**	**6.035.625**
Tax	*22%*	(1.041.754)	(1.110.136)	(1.180.569)	(1.253.115)	(1.327.838)
NET PROFIT		**3.693.493**	**3.935.937**	**4.185.654**	**4.442.863**	**4.707.788**
WACC	10,86%					
Free Cash Flow		3.693.493	3.935.937	4.185.654	4.442.863	4.707.788
Disc Factor		0,192133021	0,173311403	0,156333576	0,141018922	0,127204512
Present Value		709.642	682.143	654.358	626.528	598.852
PV Cumulative		**12.223.644**	**12.905.787**	**13.560.145**	**14.186.673**	**14.785.525**

		2046	2047	2048	2049	2050
REVENUE		**27.271.986**	**28.090.146**	**28.932.850**	**29.800.835**	**30.694.860**
PRODUCTION COST		**(10.731.471)**	**(11.053.415)**	**(11.385.017)**	**(11.726.568)**	**(12.078.365)**
NON PRODUCTION COST		**(10.061.984)**	**(10.195.075)**	**(10.332.160)**	**(10.473.356)**	**(10.618.789)**
EBITDA		**6.478.531**	**6.841.655**	**7.215.673**	**7.600.911**	**7.997.707**
Depreciation						
EBIT		**6.478.531**	**6.841.655**	**7.215.673**	**7.600.911**	**7.997.707**
Interest Expense	*5%*	(93.069)	(95.861)	(98.737)	(101.699)	(104.750)
EBT		**6.385.462**	**6.745.794**	**7.116.936**	**7.499.212**	**7.892.957**
Tax	*22%*	(1.404.802)	(1.484.075)	(1.565.726)	(1.649.827)	(1.736.450)
NET PROFIT		**4.980.660**	**5.261.719**	**5.551.210**	**5.849.385**	**6.156.506**
WACC	10,86%					
Free Cash Flow		4.980.660	5.261.719	5.551.210	5.849.385	6.156.506
Disc Factor		0,11474338	0,103502959	0,093363665	0,08421763	0,075967554
Present Value		571.498	544.604	518.281	492.621	467.695
PV Cumulative		**15.357.022**	**15.901.626**	**16.419.907**	**16.912.529**	**17.380.223**

Source: Research data, 2025

From Aeroantara Technic's point of view, the new hangar is an opportunity to earn additional income without needing to invest heavily upfront. The financial projection shows that Aeroantara Technic would generate a positive net profit every year over the 25-year project period, indicating stable and sustainable financial performance. Using a discount rate WACC of 10.86%, the NPV of Aeroantara Technic's projected cash flows reaches approximately USD 17.380.223. This positive NPV, combined with consistent profitability across all years, confirms that the project is financially attractive from Aeroantara Technic's perspective. Beyond the financial returns, the new hangar also offers strategic Value. By expanding its operational capacity, Aeroantara Technic will be better positioned to capture the growing demand for aircraft maintenance services. The additional capacity strengthens Aeroantara Technic's competitive presence in the MRO market, enabling the company to serve more customers, increase market share, and support its long-term business growth. While the project offers a positive financial outcome for Aeroantara Technic with relatively low capital exposure, the investment risk and capital commitment are primarily carried by the investor. From the investor's perspective, the financial evaluation focuses on the recovery of the full construction cost and the expected return from long-term lease payments made by Aeroantara Technic.

Table 3. New Hangar Financial Projection for Investor Company

Year	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
REVENUE	**0**	**3.902.763**	**5.027.883**	**5.590.444**	**5.590.444**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**
Hangar Rent	-	3.902.763	5.027.883	5.590.444	5.590.444	5.625.604	5.625.604	5.625.604	5.625.604	5.625.604	5.625.604	5.625.604	5.625.604
EBITDA	-	**3.902.763**	**5.027.883**	**5.590.444**	**5.590.444**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**
Depreciation	(1.451.406)	(1.451.406)	(1.451.406)	(1.451.406)	(1.451.406)	(1.451.406)	(1.451.406)	(1.451.406)	(1.451.406)	(1.451.406)	(1.451.406)	(1.451.406)	(1.451.406)
Net Profit	**(1.451.406)**	**2.451.357**	**3.576.478**	**4.139.038**	**4.139.038**	**4.174.198**	**4.174.198**	**4.174.198**	**4.174.198**	**4.174.198**	**4.174.198**	**4.174.198**	**4.174.198**
Cash Inflow													
Net Profit/(loss) (excl interest)	(1.451.406)	2.451.357	3.576.478	4.139.038	4.139.038	4.174.198	4.174.198	4.174.198	4.174.198	4.174.198	4.174.198	4.174.198	4.174.198
Depreciation	1.451.406	1.451.406	1.451.406	1.451.406	1.451.406	1.451.406	1.451.406	1.451.406	1.451.406	1.451.406	1.451.406	1.451.406	1.451.406
Cash Outflow													
Investment	**(36.285.147)**												
Free Cash Flow	**(36.285.147)**	**3.902.763**	**5.027.883**	**5.590.444**	**5.590.444**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**
Present value	**(36.285.147)**	**3.597.679**	**4.272.537**	**4.379.225**	**4.036.896**	**3.744.732**	**3.452.002**	**3.182.156**	**2.933.403**	**2.704.096**	**2.492.714**	**2.297.855**	**2.118.230**
Cumulative PV	**(36.285.147)**	**(32.687.467)**	**(28.414.930)**	**(24.035.705)**	**(19.998.809)**	**(16.254.077)**	**(12.802.075)**	**(9.619.919)**	**(6.686.516)**	**(3.982.420)**	**(1.489.707)**	**808.149**	**2.926.378**
Disc Factor	1,00	0,92	0,85	0,78	0,72	0,67	0,61	0,57	0,52	0,48	0,44	0,41	0,38
PBP	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	0,65	-
FCFF (with TV)	**(36.285.147)**	**3.902.763**	**5.027.883**	**5.590.444**	**5.590.444**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**
Terminal Value													
FCFF Cummulative	**(36.285.147)**	**(32.382.384)**	**(27.354.501)**	**(21.764.057)**	**(16.173.613)**	**(30.659.543)**	**(25.033.939)**	**(19.408.335)**	**(13.782.731)**	**(10.548.009)**	**(4.922.406)**	**703.198**	**6.328.802**
Discount factor	1,00	0,92	0,85	0,78	0,72	0,67	0,61	0,57	0,52	0,48	0,44	0,41	0,38
Present value	**(36.285.147)**	**3.597.679**	**4.272.537**	**4.379.225**	**4.036.896**	**3.744.732**	**3.452.002**	**3.182.156**	**2.933.403**	**2.704.096**	**2.492.714**	**2.297.855**	**2.118.230**
Cumulative	**(36.285.147)**	**(32.687.467)**	**(28.414.930)**	**(24.035.705)**	**(19.998.809)**	**(16.254.077)**	**(12.802.075)**	**(9.619.919)**	**(6.686.516)**	**(3.982.420)**	**(1.489.707)**	**808.149**	**2.926.378**

Year	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
REVENUE	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**
Hangar Rent	5.625.604	5.625.604	5.625.604	5.625.604	5.625.604	5.625.604	5.625.604	5.625.604	5.625.604	5.625.604	5.625.604	5.625.604	5.625.604
EBITDA	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**
Depreciation	(1.451.406)	(1.451.406)	(1.451.406)	(1.451.406)	(1.451.406)	(1.451.406)	(1.451.406)	(1.451.406)	(1.451.406)	(1.451.406)	(1.451.406)	(1.451.406)	(1.451.406)
Net Profit	**4.174.198**	**4.174.198**	**4.174.198**	**4.174.198**	**4.174.198**	**4.174.198**	**4.174.198**	**4.174.198**	**4.174.198**	**4.174.198**	**4.174.198**	**4.174.198**	**4.174.198**
Cash Inflow													
Net Profit/(loss) (excl interest)	4.174.198	4.174.198	4.174.198	4.174.198	4.174.198	4.174.198	4.174.198	4.174.198	4.174.198	4.174.198	4.174.198	4.174.198	4.174.198
Depreciation	1.451.406	1.451.406	1.451.406	1.451.406	1.451.406	1.451.406	1.451.406	1.451.406	1.451.406	1.451.406	1.451.406	1.451.406	1.451.406
Cash Outflow													
Investment													
Free Cash Flow	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**
Present value	**1.952.645**	**1.800.005**	**1.659.296**	**1.529.587**	**1.410.018**	**1.299.795**	**1.198.189**	**1.104.525**	**1.018.183**	**938.591**	**865.220**	**797.585**	**735.237**
Cumulative PV	**4.879.023**	**6.679.028**	**8.338.325**	**9.867.912**	**11.277.930**	**12.577.725**	**13.775.914**	**14.880.439**	**15.898.623**	**16.837.213**	**17.702.433**	**18.500.018**	**19.235.255**
Disc Factor	0,35	0,32	0,29	0,27	0,25	0,23	0,21	0,20	0,18	0,17	0,15	0,14	0,13
PBP	-	-	-	-	-	-	-	-	-	-	-	-	-
FCFF (with TV)	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**	**5.625.604**
Terminal Value													
FCFF Cummulative	**11.954.406**	**17.580.009**	**23.205.613**	**28.831.217**	**34.456.821**	**40.082.425**	**45.708.028**	**51.333.632**	**56.959.236**	**62.584.840**	**68.210.443**	**73.836.047**	**79.461.651**
Discount factor	0,35	0,32	0,29	0,27	0,25	0,23	0,21	0,20	0,18	0,17	0,15	0,14	0,13
Present value	**1.952.645**	**1.800.005**	**1.659.296**	**1.529.587**	**1.410.018**	**1.299.795**	**1.198.189**	**1.104.525**	**1.018.183**	**938.591**	**865.220**	**797.585**	**735.237**
Cumulative	**4.879.023**	**6.679.028**	**8.338.325**	**9.867.912**	**11.277.930**	**12.577.725**	**13.775.914**	**14.880.439**	**15.898.623**	**16.837.213**	**17.702.433**	**18.500.018**	**19.235.255**

Source: Research data, 2025

From the investor perspective, the financial projection demonstrates a good return profile. The project achieves an Internal Rate Return (IRR) of 14.2%, which is higher than the applied discount rate WACC of 8.48%, indicating a healthy profitability margin relative to the investment risks. The Net Present Value (NPV), including the terminal value at the end of the project's life, is estimated at USD 19.24 million, further confirming the project's ability to create positive value over time. The payback period is projected to be around 10.6 years, allowing the investor to recover the initial capital investment well before the end of the 25-year project term. Overall, the investment is expected to deliver a total return of USD 138.25 million across the project duration. These results highlight that the project offers stable, long-term cash flows with an attractive risk-return profile, making it a financially sound opportunity for investors seeking steady income from aviation infrastructure assets. To assess how different investor profiles affect project attractiveness, two alternative scenarios were also simulated using WACC assumptions based on public financial statements and Damodaran's method. When applying Middle East Airlines estimated WACC of 6.86%, the NPV increased to USD 27.92 million, and the payback period was shortened to 9.6 years, reflecting improved value creation due to a lower cost of capital. In a more favorable scenario using East Asia Airline WACC of 3.24%, the NPV further increases to USD 56.81 million, and the payback period drops to just 7.9 years, offering an even more compelling investment case. In addition to the favorable financial returns, targeting airlines as potential investors provides strategic benefits for both parties. For the airline, securing equity to partnership in the hangar project ensures guaranteed access to maintenance slots which is especially during peak demand periods or when turnaround time is critical. From Aeroantara Technic's side, collaborating with airline investors could help secure long-term lease agreements and improve revenue predictability. This alignment of interests creates a mutually beneficial relationship where airlines gain operational certainty, and MRO ensures consistent utilization of its expanded capacity.

Sensitivity Analysis

In real world investments, financial outcomes are rarely predictable with certainty. Sensitivity analysis allows us to test probability distributions to model uncertainty and generates a range of possible outcomes for financial metrics. The result of sensitivity analysis was conducted with Monte Carlo simulation built in three distinct simulation scenarios. The first scenario examines routine operational variability revenue swings, variable cost rate uncertainty, and fixed cost drift. The second scenario intensifies revenue risk by increasing top-line volatility and measuring its impact on project value. The third scenario injects low frequency, high severity cost events to capture the effects of rare but material

overruns. The first Monte Carlo run was configurated with 1000 iterations with assumptions that annual revenue follows the baseline forecast, which already incorporates a 3% growth trend but is randomly perturbed by 10%, variable costs follow the 25% portion but due to uncertainty changes of 5% of 25% is introduced, each fixed cost follow the baseline trend but can creep up and down 0-2%.

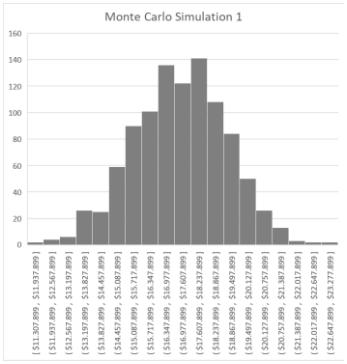

Figure 1. First Scenario Monte Carlo Simulation

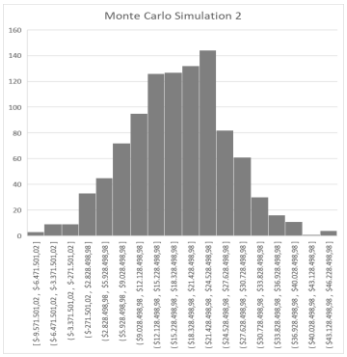

Figure 3. Second Scenario Monte Carlo Simulation

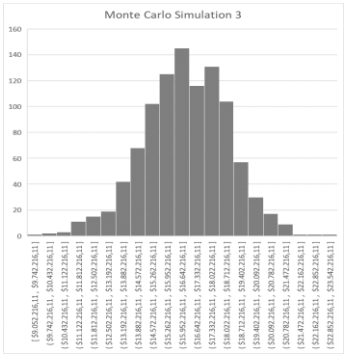

Figure 4. Third Scenario Monte Carlo Simulation

Table 4. Result of Sensitivity Analysis Using Monte Carlo Simulation

Scenario	First Scenario (Baseline Volatility)	Second Scenario (Stress Test Revenue ±50%)	Third Scenario (Cost Overrun Included)
Revenue Deviation	±10%	±50%	±10
Variable Cost Uncertainty	±5% of 20%	±5% of 20%	±5% of 20%
Fixed Cost Volatility	±2%	±2%	±2%
Special Condition	None	Revenue stress only	5% chance per year of cost overrun (triangular: 5%-10%-30%)
WACC	10.86%	10.86%	10.86%
Iterations	1000	1000	1000
Mean NPV	USD 17.44 million	USD 17.06 million	USD 16.46 million
Median NPV	USD 17.35 million	USD 18.02 million	USD 16.48 million
Probability NPV < 0	0%	2.2%	0%

Source: Research data, 2025

The project remains financially resilient across a range of uncertainties. In the baseline case with ±10% revenue variation, the average NPV is USD 17.44 million with all simulations remaining above zero and the confidential level is 100%. Under the stress test scenario with ±50% revenue swing, the mean NPV is still USD 17.06 million, though 2.2% of outcomes fall below zero, indicating higher risk with a confidential level of 97.8%. In the third scenario, which adds a 5% annual probability of cost overrun, the NPV slightly decreases to USD 16.46 million, but the project still shows zero probability of negative NPV means the confidential level is 100%. These results confirm the project's strong financial viability even under moderate to severe uncertainty.

Additional Revenue by Adding Investment Solar Photovoltaic Integration

In addition to the base financial analysis, an alternative scenario was simulated to incorporate an Environmental, Social, and Governance (ESG) initiative through the installation of an on-grid solar photovoltaic (PV) system in the new hangar. Based on industry case studies, including research highlighting MRO facilities' preference for solar energy despite slightly higher costs (Budiman et al., 2024), an additional investment of approximately USD 2.4 million was assumed for the solar PV system. After factoring in this additional investment, the initial investment cost added makes changes to the principal and interest for investment credit simulation that impacts to hangar lease fee become USD 5.9 million each year. From an investor perspective, the project's NPV is adjusted from approximately USD 19.24 million to around USD 20.50 million with IRR 13.2%, which the result remains positive, indicating that the project would still deliver solid financial returns while advancing sustainability goals.

From Aeroantara Technic's financial projection perspective, the NPV is adjusted from approximately USD 17.38 million to around USD 15 million due to hangar rent fee raises following the

investment credit simulation. Despite the modest reduction, incorporating solar energy would position Aeroantara Technic as an early mover in sustainable MRO operations, and accumulated savings are favorable using solar PV rather than conventional electricity energy. This movement also potentially attracts green investors, unlocking sustainability-linked financing opportunities and enhancing alignment with ICAO's CORSIA. This strategic step would not only future-proof the hangar investment but also reinforce Aeroantara Technic's brand image as a responsible and forward-looking aviation services provider.

Table 5. Perspective Resume

Perspective	Indicator	Without Solar PV	With Solar PV	Strategic Value
Investor	NPV (USD)	19.24 million	20.50 million	Higher return and green project positioning
	IRR	14.2%	13.2%	Attractive investment with ESG profile
	Lease Fee	5.63 million	5.9 million	Slightly increase, offset by green premium
Aeroantara Technic	NPV (USD)	17.38 million	15 milllion	Lower NPV but long-term energy savings
	ESG Benefit	None	Solar PV Integration	Access to green funding and branding
	Strategic Position	Conventional	Early adopter in sustainable MRO	Competitive advantage

Source: Research data, 2025

This study provides important practical implications for various stakeholders. For investors, it offers a financially sound business case to enter Indonesia's aviation infrastructure sector through sustainable projects. For Aeroantara, Technic presents an alternative financing scheme that allows the company to expand capacity without worsening its financial position while still generating long-term revenue. For the government, especially in the context of green financing and national emission targets, the model shows how ESG-driven investments like solar PV integration can be viable and support Indonesia's commitments under ICAO's CORSIA and IATA fly net zero targets. From a theoretical perspective, this research fills a gap in the literature as there is currently limited academic work, especially in Indonesia, that evaluates the financial feasibility of hangar development under an Operation Management scheme combined with ESG considerations. While prior studies may have explored MRO business models or green airport initiatives, the integration of investment feasibility, risk simulation, and ESG value creation for aircraft MRO is still underrepresented. This study, therefore, offers a foundation for future research on sustainable financing models in the aviation maintenance sector.

D. CONCLUSIONS

This research assesses the financial feasibility of investing in a new wide-body hangar at Aeroantara Technic to capture the growing MRO market opportunity. The financial analysis performed both from Aeroantara Technic's and the investor's perspective confirms that the project was financially viable. From Aeroantara Technic's perspective, the project offers positive net profit across all 25 years of projection with an NPV of USD 17.38 million. The Operation Management scheme enables Aeroantara Technic to expand its service capacity with low capital risk while strengthening its market positioning and ability to serve additional wide-body aircraft maintenance demand. From the investor's side, the financial projection demonstrates a solid return with an NPV of around USD 19.24 million, an IRR of 14.2%, and a payback period of 10.6 years, based on a WACC of 8.48%. This indicates a favorable risk-return profile supported by stable long-term cash flow generated through lease payments from Aeroantara Technic.

Sensitivity analysis using Monte Carlo simulations further validates the robustness of the project's financial outcomes, showing resilience under varying revenue and cost scenarios. Even under stress conditions, the probability of negative NPV remains extremely low. Also, integrating ESG initiatives through the installation of a solar PV system demonstrates that sustainable practices can be adopted without compromising financial viability. Although it slightly reduces the NPV from Aeroantara Technic's perspective, the solar PV investment strengthens Aeroantara Technic's strategic positioning by aligning with global aviation sustainability goals such as CORSIA and enhancing attractiveness to green financing. It could bring efficiency for long-term operational expenses rather than using conventional electricity energy.

While the investment feasibility is strong, several suggestions are recommended to further maximize the project's success. First, Optimize Operational Ramp-Up: Aeroantara Technic should prepare early strategic marketing and operational readiness plans to shorten the ramp-up period to full hangar utilization, maximizing early revenue generation. Secondly, Enhance ESG Reporting and Certification: By adopting a solar PV system, Aeroantara Technic should seek green certifications or sustainability-linked financing options, enhancing the hangar's market value and strengthening ESG branding. Third, Continuous Risk Monitoring: Regular updates of financial assumptions, especially regarding revenue volatility, cost escalation, and market changes, are essential. A risk monitoring framework should be established to proactively manage operational and financial risk. Fourth, Explore Further Strategic Partnership: Aeroantara Technic could explore a partnership with other investors, aircraft lessors, or airlines seeking dedicated maintenance slots by offering long-term maintenance agreements. Aeroantara Technic could secure a committed customer base, ensuring a steady flow of work and predictable revenue for the new hangar. This model benefits aircraft lessors and airlines as well, providing guaranteed maintenance availability, potentially preferential turnaround times, and pricing certainty.

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