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Risk Assessment in Developing KFX/IFX Fighter

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Abstract

This article is about the activity of risk assessment in developing KFX/IFX Fighters through joint development cooperation between Indonesia and South Korea for Engineering and Manufacturing Development Phase (EMDP). The Risks in EMDP found by using the Life Cycle of Weapon System. Risk assessment aims to identify, analyze and assess the level of risk as a calculation so that the program will always be on the track and the default of the project will be avoided. Moreover, this is the first experience for Indonesia to make fighters. Besides that, KFX/IFX fighters is one of our national program which aims to build the independence of defense industry and to open the road map in mastering on making fighter for PT. Dirgantara Indonesia (PT. DI).

Artikel ini membahas tentang kegiatan penilaian risiko dalam mengembangkan KFX/IFX Fighters melalui kerjasama pengembangan kerjasama antara Indonesia dan Korea Selatan untuk Tahap Pengembangan Teknik dan Manufaktur (Manufacturing Development Phase/EMDP). Resiko dalam EMDP ditemukan dengan menggunakan Life Cycle of Weapon System. Penilaian risiko bertujuan untuk mengidentifikasi, menganalisis dan menilai tingkat risiko sebagai penghitungan sehingga program akan selalu berada di jalur dan default proyek akan dihindari. Apalagi, inilah pengalaman pertama bagi Indonesia untuk membuat pejuang. Selain itu, pejuang KFX/IFX merupakan salah satu program nasional kami yang bertujuan untuk membangun industri pertahanan dan membuka peta jalan untuk menguasai tempur PT. Dirgantara Indonesia (PT. DI).

Introduction

The advancement of technology and science is the main driving force for the creation of change. With the technology that disseminates so fast to make the world community open themselves more and the influence of technology can penetrate the boundaries of the territory of state power.

The depletion of these limits creates a variety of excesses in the joints of the state so that defence technology is required. The development of defence and research technology becomes the main gateway to independence. In response to new security threats in innovative technological development (Neuman, 2010).

In the procurement conception of defense acquisition, defense equipment can be fulfilled by way of purchasing (off the self) or make their own. The option of buying may not continue to be done by Indonesia so that a joint development cooperation with a certain Cost Share is a rational choice to be taken in anticipation of a number of typical problems encompassing the world of defense technology research and development, such as limited defense budget and lack of expertise in creating products and expensive research and development costs.

Based on the formal legal construction set forth in Law No. 18 of 2002 on the National System of Research, Development and Application of Science and Technology which provides sufficient space to integrate research and technology development, so that stakeholders can give a clear direction, priority and policy about defense technology (Karim, 2014).

Policy related science and technology, according to Parthasarathy (2010) there are many proposals incorporate citizen participation in science and technology policy (Anderson & Jaeger, 1999; Durant, 1999; Ferretti & Pavone, 2009; Fischer, 1999; Guston & Sarewitz, 2002; Rayner, 2003).

Defense technology can be developed independently or in collaboration with other parties. Researchers have discussed the various determinants of collaboration (Becker & Dietz, 2004; Montoro,

Mora & Guerras, 2006), including external recruitment and payment, innovation categories, firm size and location (Becker & Dietz, 2004; Fritsch & Lukas, 2001; López , 2008), capabilities and competencies possessed by certain sectors in the collaboration process (Fiaz, 2013), previous collaboration or association relationships (Gulati, 1995; Kim & Song, 2007). In the context of policy implementation on defense technology, a combat aircraft development program undertaken with South Korea has been established by the government as one of the 7 (seven) national programs prioritized.

The program can open a roadmap for fighter technology mastery for the defense industry (PT. Dirgantara Indonesia) to increase its capability to achieve independence. In addition, the embodiment of research institutions and the development of defense technology can be actualized in the Design Center Indonesia (DCI) activities as a crater of knowledge to finalize the fighter-making project so that its implementation practices can be realized as well as possible.

In the Minister of Defense Regulation of the Indonesia Republic Number 6 of 2016 on the Implementation of the IF-X Fighter Development Program, Article 1 is explicitly stated that the IF-X Fighter is a long-term and inter-year national program implemented with the aim of enhancing the ability of Indonesia to master technology and the development of fighter aircraft.

For Indonesia, this is the first aircraft fighter-making project that creates vulnerability to risk, moreover there are also quite high disparities, especially in terms of technology between Indonesia and South Korea. This may give birth to a gap that must be resolved in order not to delay the project. Basically, any project will definitely have a risk. Therefore, the risk assessment is absolutely necessary to be done at each stage in order to avoid the failure of the joint development project.

The development program of KFX/IFX Combat Aircraft consists of 3 (three) phases, namely; Technology Development Phase (TDP), Engineering and Manufacturing Development Phase (EMDP) and Production Phase (PP). The focus of

the research is to conduct risk assessment activities on the EMDP Stage because at this stage is within the core work to realize the production of fighter aircraft.

However, because the period is very long and not over, the authors studied it by studying TDP as an early reference for entering the EMDP Stage and observing the ongoing EMDP process. The author also reviews aspects of the Life Cycle of Weapon System to see estimates of risks in EMDP, although the TDP's results are not significantly influenced because of some changes in EMDP involving industries from both countries (PT.Dirgantara Indonesia and Korean Aerospace Industry).

However, the TDP remains important as it is the first foothold in the development of the KFX/IFX Combat Aircraft. This is clearly stated in the provisions of the Regulation on the IF-X in the third part of Engineering and Manufacturing Development Stage article 5, paragraph 4, stating that all activities of the IFM-XM Stage should refer to the results achieved at the Technology Development Phase (TDP).

The Engineering and Manufacture Development Phase (EMDP) stages include: preliminary design, detail design, detail part manufacturing, sub and final assembly, ground and flight test, and certification. Implementation of EMDP is based on Work Share and Cost Share agreed by the Government of Indonesia and the 'South Korean government. The Work Share consists of Engineering Work Package (EWP), Airframe Component Manufacturing and participation in prototype and flight test.

The author then collects questionnaires that have been filled by the respondents and calculate the results using a scale of 1 s/d 6. Ranking of the scale is as follows;

1 = Lowest (ineffective)
2 = Very Low (less effective)
3 = Low (somewhat effective)
4 = Quite high (effective)
5 = High (very effective)
6 = Very High (most effective)

Delphi survey is conducted with 2 (two) iterations (repetition) so that it can reach a concession together and can be accounted for its validity. The views of these experts are then

adjusted according to the real situation so as to produce a near-term approximation of the current and future situation at the EMDP stage. The results of this study found that the technological aspect is the dominant risk or the highest in terms of political, economic and procurement organizations.

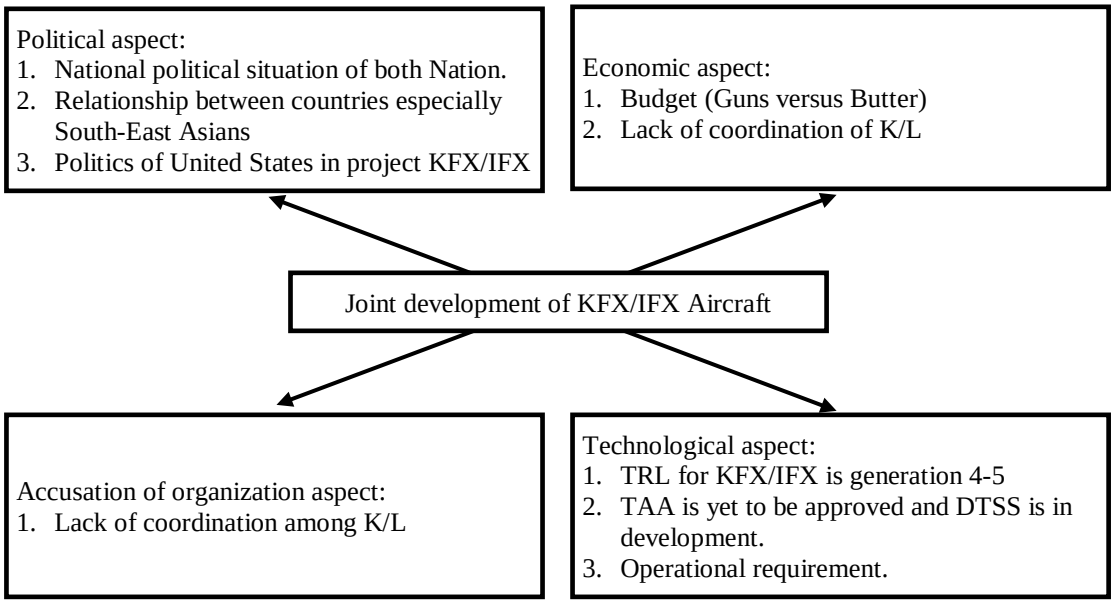

Figure 1. Assesment of The Aspect in Life Cycle of Weapon System (*Source*: Writer's Deduction)

Result and Discussion

Under the terms of the Minister Of Defense Regulation on IF-X, Article 6 stipulates that the implementation of EMDP takes place since 2015 to 2023 and in paragraph 2 of Article 7 discusses the prototype of the aircraft in which the results of the PRM I-FX stage activities include 6 (six) flying prototypes And 2 (two) prototypes did not fly. One of the flying prototypes must be submitted to the government through the Ministry of Defense. The prototype is a configuration for IF-X so that the development of flight test with the specific configuration required by Indonesia and all production activities of the prototype should involve the Government. Here the government holds the key to becoming a captain who brings together joint development cooperation in order to stay in the right track and can be realized with good results.

Life Cycle of Weapon System

The author uses the Life Cycle of Weapon System as an

analytical tool to identify the problem of the complexity of the current EMDP process with an expert judgment. Various problems are found from the political climate, the state of the economy, the organization for acquisition and technology of availability are examined globally and comprehensively. Life Cycle of Weapon System description is described in Figure 2.

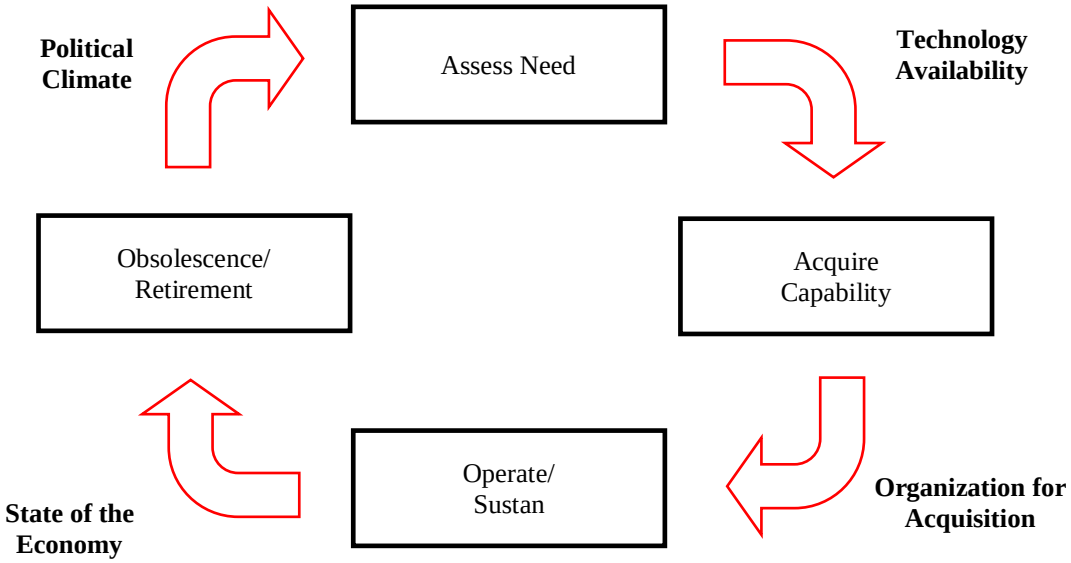

Figure 2. Life Cycle of Weapon System (Source: Johnson, 2005)

Johnson (2005) points out that in the world of weaponry, the availability of technology must be used to meet requirements through trade of study, developing technical information in making decisions related to the selected weapon and properly supervising the course of the acquisition system, while the acquisition organization functions to operate or manifest the weapon to be maintained up to 20-25 years of supply, taking into account the aspects of mission, maintenance, spare parts, upgrading and the skills and availability of personnel.

From the economic side, changing needs will be followed by increased capabilities that demand funding, such as the need for weapon modification to follow the times need enormous cost and it must be met. Herein lies the political aspect that plays a role to determine the needs assessment of the selected weaponry.

Risk Assessment of EMDP

The analysis used by the author is the theory of the Risk Management Guide for DoD Acquisition as a guideline used in the United States Department of Defense.

The scope of risk assessment is only limited from risk identification, risk analysis to risk mitigation planning activities as an effort to handle the risks found. This guideline begins with planning of the program and its implementation schedule as the beginning of risk management being carried out, this step is continued with risk assessment activities. In addition to the application concept of Life Cycle of Weapon System, the author uses Risk Assessment theory written by Newsome (2014) which consists of the following activities;

1. *Risk Identification* is the process of discovering, recognizing and recording existing risks. This process is systematically and continuously conducted to identify potential risks or losses to the project.
2. *Risk Analysis* Is the process of dealing with risks and determining levels and understanding the context of its relationship with the source of risk and Assessment is calculating the relative scale, level, or risk rating.
3. This risk assessment can be informal, unconscious and routine. External sources of this assessment may come from subject matter experts, systematic predictions and structured judgment, ie; using the delphi survey method, ordinal ranking and plotting likelihood and returns.

The combination of the theory used can strengthen the author's argument about the risks occurring at the EMDP stage with the Life Cycle of Weapon System aspect and get the highest risk and become the main vigilance so that the immediate form of solution must be solved so that the risk does not have the potential to disrupt the smoothness the course of the program in the present and future.

Risk Identification and Analysis Activity of EMDP

The process mechanism at the ongoing EMDP stage when viewed from the 4 (four) aspects of the Life Cycle of Weapon System is still going well up to now, but because the tempo of EMDP work takes a very long time, from 2015 to 2026 (Based on project milestones), so we need to be aware of the risks.

Therefore, it is necessary to list the risks of these various aspects of the review by observing ongoing events that could potentially be a risk, as well as risk estimation at the EMDP stage. The risk estimation here is related to the problem in the real situation occurring from the Life Cycle of Weapon System aspect.

For identification and risk analysis activities, the authors begins by using questionnaires and interviews of experts comprised of policy makers, actors, academics, diplomats and international political observers to identify what are the risks of the Life Cycle of Weapon System.

From the expert judgment, the researcher will get an estimate of the general description of risks from the current and ongoing EMDP stages until 2026.

It is expected to provide guidance on specific systematic information dynamics that can be used to analyze risks and assess and prepare mitigation actions in the face of those risks. The goal of risk identification is the risk register developed from risk sources (Life Cycle of Weapon System aspect review) and is an ongoing issue and an expected problem that may occur in the future in the EMDP Stages.

The list of risks to the development of the KFX/IFX Combat Aircraft is seen from a review of the 4 (four) aspects of the Life Cycle of Weapon System (political, economic, procurement organization and technology) as shown in Figure 1.

The items in the Political Life Cycle of Weapon System review (the political situation between the two countries, the relations between countries in the region and the United States project in the KFX/IFX Project), the economic (budget and inter-ministerial or agency coordination).

In terms of procurement organizations (coordination between ministries or agencies, the role of KKIP) and technological aspects (TRL for the KFX/IFX Combat Aircraft is a sophisticated 4.5 generation, no TAA approval and differences regarding opsreq from both countries) have been obtained from interviews with competent experts.

Technological Aspect as the Dominant Risk

Based on the analysis used, after the risk assessment activity is done, the next step is to make a plan to address the risks found through the abatement plan. In the abatement plan will be decided together that the risk will be faced or avoided so that mitigation planning can be done and also consider how the impact of the decision to be taken.

From the research result, technological alertness is the highest risk so it needs to be examined holistically. The first problem is the Technology Readiness Level (TRL) for the KFX/IFX Combat Aircraft is a sophisticated 4.5 generation and Indonesia has not experienced making fighter aircraft so that Indonesia should be able to increase TRL in line with industrial readiness level. If that is not immediately done, then this problem will have an impact on the lack of optimal mastery of technology making the KFX/IFX Combat.

Efforts to increase TRL are especially done on areas that will support this fighter project (eg in structural areas, aerodynamics, air combat systems, etc.) are not maximized since it was only started in 2013 so that its internal mitigation form is increasing capability of PT.DI, either through the quality of its human resources, as well as the facilities available.

Implementers of this mitigation not only belong to PT.DI alone so that strict coordination from all parties (ministries and agencies) is needed so that the objectives can be achieved, especially for the Program Management Unit (PMU) that manages the project.

The PMU includes PT.DI as a defense industry that knows clearly the specifications required by its company as the implementer of this

EMDP stage with KAI. For example; Preparation of human resources, laboratory and construction of project supporting facilities and PT.DI also contemplates strategic investment to encourage the growth of industrialization in the long term so that PT.DI will act as lead integrator.

While the mitigation is Human Resources (HR) that is sent by PT.DI to participate in South Korea should be able to absorb the science of making combat aircraft and transfer knowledge into the country, so it takes a certain level of industry readiness to overcome.

This complicated problem while PT.DI increases its TRL in all areas. The core implementer of this mitigation is PT.DI, but needs to be supported by all parties so that the results may be optimal.

The second problem is about the absence of approval from the United States government to Lockheed Martin to provide technical assistance. Joint cooperation between Indonesia and South Korea also involves the United States as a technology provider that will be applied to the KFX/IFX Combat Aircraft because not all of its products come from South Korea. Its radar, engine and avionics are the product of Lockheed Martin as an offset of the purchase of 40 F-35 Joint Strike Fighter Lightning II aircraft. Because there are products from the United States, then South Korea must ask permission first to the United States to share knowledge with Indonesia.

While Lockheed Martin as a technologist who must also follow the applicable procedures in Uncle Sam's Country and request an approval request to the United States Government regarding the Technical Assistance Agreement (TAA) or a form of assistance from Lockheed Martin for the technology to be adopted into the KFX/IFX Combat Aircraft.

The United States government must grant Lockheed Martin permission to transfer his knowledge to South Korea that will share knowledge with Indonesia.

Until now, TAA has yet to sign and the United States government also asked Indonesia to immediately have Defense Technology Security System (DTSS),

namely: a technological safeguard system that if Indonesia gained knowledge from South Korea and the United States, Indonesia should be able to convince the American States that it will not leak to third parties.

The DTSS is still constrained, in this case the legal umbrella in the form of existing law has not been fully regulated from top to bottom to develop a comprehensive mechanism and should also think about which government institutions will handle it.

Meanwhile, in view of Indonesia's cooperation partners, South Korea itself already has Directorate General Defense Security to take care of the country's security system well. This can serve as an example for Indonesia for its future implementation.

Therefore, the form of internal mitigation that can be done is the full support of the government, especially the President as a state-man of this KFX/IFX Combat development project.

The government should enhance cooperation with the United States in all fields including enhanced cooperation with Lockheed Martin in order to persuade the United States Government to immediately approve TAA.

Therefore, the need for close coordination between ministries and institutions (such as the Ministry of Defense, the Ministry of Foreign Affairs, PT.DI as the defense industry actors, etc.) to jointly enhance good relations with the United States in order to obtain agreement on TAA.

The last issue is about the need for operational requirements (Opsreq) between the Air Force and ROKAF which can not be incorporated as a common requirement, fulfilled in a unique requirement for Indonesia and how specific differences can be addressed at the implementation level.

The TDP results in a compromise that will unify end-user needs of both countries that must be met by industry players (PT.DI and KAI) with the selected technology. This technology must be able to combine in fulfilling opsreq, especially to pay attention to the fundamental differences between the two countries. The real impact of the

opsreq difference is the creation of 2 (two) designs for Indonesia and South Korea in order to fulfill the irreconcilable differences.

This requires strict escort by both countries in particular the role of the PMU, so that the two countries remain highly committed to developing fighter aircraft together, not on their own as a result of the opsreq differences.

The role of the PMU is apparent in the TDP by bridging the intense encounter between the Air Force and the ROKAF to discuss opsreq and it has resulted in concessions for both. Therefore, the form of mitigation out of this issue is the absolute oversight done by both countries to guard the implementation practice in order to run well.

The supervision should be done in the Government (G to G) realm with a strategic partnership framework that can further strengthen the cooperation, as well as from the Government to the executing industry (G to B) or conducted between the implementing industries (B to B).

A table on technology risk estimation and its impact and mitigation form can be seen in Table 1.

Plans on Handling Technology Precaution

The author pursed more specifically in making a plan of abatement (plan) so that the problem can be examined more clearly and comprehensively. Technological precautions include 3 (three) things, ie;

Technology Readiness Level (TRL) for the KFX/IFX Combat Aircraft is a Sophisticated 4.5 Generation

Indonesia is not yet experienced in making fighter aircraft so that its for industry readiness to solve this complex problem. Tables on the identification of TRL rising risks and industry capabilities can be seen in Table 2.

For optimal, the key lies in PT.DI capability and TRL improvement in all areas. However, the target of TRL achievement in particular and the mastery of this fighter achievement can be optimal, Indonesia must be able to increase TRL and eliminate technology disparity gap with South Korea. Therefore, there is a need technology

needs to be fully supported by the government because if the political support is lacking or the government to turn the direction by canceling this program, the implications of the loss are massive because not only judging in terms of material costs already incurred, But also many other things that can actually harm Indonesia's position when the cancellation is done in the middle of it.

Table 1 Technological Aspect List of Risk

No	Probability	Consequence	Inward Mitigation	Outward Mitigation
1	Technology Readiness Level (TRL) for KFX/IFX is a sophisticated 4.5 generation and Indonesia has never built a fighter	Mastery fighter technology becomes less optimal	Strengthen defense industry capability (Industry readiness) and improve TRL Executor: K/L Coordinator	Absorb the science of making the KFX/IFX Combat Aircraft
2	No approval yer of the Technical Assistance Agreement (TAA) from the United States Government to Lockheed Martin	Data is not fully opened for all programs	Support from the government Executor: Government	Strengthen cooperation with the United State
3	The existence of Operational Requirement (Opsreq) In Both Countries	Two (2) designs are created and do not let the two countries run independently	PMU Implementation	Executor K/L Coordinator Supervision in particular by both countries (G to G) and (G to B)

Source: Writer's Deduction

One of them is about the road map in mastering the fighter jet technology pioneered by Indonesia could experience failure again and it will have a wide impact on the level of absorption of labor will fall, even the target leverage in terms of mastery of this technology for the economy can be neglected just like that.

Therefore, the government must fully support the sustainability of this national program and it certainly requires strong support from the House of Representatives, for example by issuing in the form of Law to further strengthen the essential position of joint development project

of the development of KFX/IFX Combat Aircraft.

In addition to support, strict supervision is also required to lead the EMDP stage to run well. The government should be able to monitor the fulfillment of the program milestone not to retreat from the planned year. Even in the process do not let both countries change the technology that has been determined together thereby impacting the delay of the schedule resulting in cost swelling as well as the inclusion of more human resources to do it. The authors prepare a handling plan for the improvement of TRL and industry capabilities as below:

Table 2. Risk of Increasing TRL and Industrial Capabilities

Date Identified : Date Reported: **Update :**	
Risk : Increasing TRL and Industrial Capabilities	
Description: TRL for the KFX/IFX fighter jet is a sophisticated 4.5 generation and Indonesia has no experience in making fighter aircraft.	Consequence : Less optimal mastery of combat aircraft manufacturing technology, if Indonesia is not able to follow the tech leap Risk Level: Main Executor: PT.DI Leader: PMU

Source: Writer's Deduction

Table 3. Abatement Plan for TRL Improvement and Industrial Capability

No	Activity	Executor	Challenges	Development
1.	Increase TRL in areas supporting the manufacture of fighter aircraft	PT.DI	There is a technology gap on the capabilities of Indonesia and South Korea	Currently the area of the structure and aerodynamics are already at level 7, the weak areas are in the weapon system and strive to continue to be improved
2.	Improving the quality of human resources, especially personnel sent to participate in the KFX/IFX Combat development project	PT.DI	The ability or capacity of each person (HR) in absorbing the science is different as well as the specification of expertise	PT.DI often provides training for the development of fighter aircraft SDM upgraded knowledge and expertise through scholarship
3.	Tackling labor issues that will retire and brain drain	PT.DI	Regeneration of human resources in PT.DI	Future human resources can be taken from qualified universities
4.	Building hangars and supporting facilities for the manufacture of fighter aircraft	PT.DI	The addition of capital structures by the Government through APBN funding is often	Coordination between ministries and agencies in particular the clear planning of the PMU by involving PT.DI who know the specifications of each requirements

No	Activity	Executor	Challenges	Development
			hampered by coordination	
5.	Supporting strategic investment in order to empower local industries	PT.DI along side PMU	Still in process because the jet has yet to be finished	New in the consolidation phase because it requires a long period of time and wait for the product jet, then the product will be developed independently with local components.

Source: Writer's Deduction

The absence of Approval (Approval) for Technical Assistance Agreement (TAA)

This can create a crucial problem that hampers the development of the KFX/IFX Combat Engine. Lockheed Martin will provide knowledge to South Korea on the offset of purchase of F-35 Joint Strike Fighter Lightning II aircraft which later with the technology will be adopted to the KFX/IFX Combat Aircraft where South Korea work together Indonesia as a joint development partner of the fighter's development.

The United States government then asked Indonesia to build a Defense Technology Security System (DTSS) so that when given science by Lockheed Martin, the science will not be leaked to third parties and until now DTSS is still being built by Indonesia. The table on risk identification of TAA can be seen in Table 4.

Unopened data for Export Lisense (EL) related components is the core technology of the fighter. Therefore, Indonesia should undertake a series of direct and indirect approaches to the United States Parties.

Table 4. Identification of Risk Management Regarding TAA

Date Identified : Date Reported: **Update :**	
Risk : TAA has yet been approved	
Description: Lockheed Martin has not yet been approved to provide technical assistance to Indonesia working with South Korea in the creation of the KFX/IFX Combat Aircraft	Consequence : Data not opened for EL related components Risk Level : Executor: K/L Coordinator Leader: Government

Source: Writer's Deduction

A to-the-point approach is to increase Indonesia's cooperation with Lockheed Martin so that the giant company wants to persuade its government to immediately approve TAA. Indonesia also has to build DTSS comprehensively.

Indonesia is currently building DTSS and in its development process, Indonesia should be able to convince the US that its development process is in accordance with standard operating procedures (SOPs). Indonesia realizes that the nature of armaments is highly confidential so that Indonesia will maintain strict confidentiality.

Indirect approach can be done by obtaining credit points in the eyes of the United States so that the American attitude can soften, for example Indonesia must always support anti-terrorism and uphold the values of democracy.

Indonesia should not take a counter position with American policy so that when the Indonesian Party asks Lockheed Martin to inquire about TAA, his hope TAA can be immediately approved by the American government.

Indonesia must also be good at exploiting existing gaps with its strengths, for example the United States needs strong countries in Asia, so that Indonesia as one of the major countries in this region should increase its strength and even be a center of gravity in area.

This will make Indonesia an increasingly important position for the United States, let alone our region is an area traversed by international logistics. Here we can take an active role by enhancing security to safeguard our shipping traffic so that the United States will find it helpful.

This will certainly increasingly tighten the relationship between Indonesia and the United States. The author prepares a handling plan for TAA as in Table 5.

The existence of Operational Requirement (Opsreq) in Both Countries

The last technological issue concerns the need for operational requirements (opreq) between TNI AU and ROKAF that can not be incorporated in the common requirement, fulfilled in the unique requirements for Indonesia and how the specific differences can be

overcome at the level of implementation of the concessions generated in the TDP for the technology that must be able to be realized by both defense industry especially for PT.DI. The table on risk identification of Opsreq needs in both countries can be seen in Table 6.

Table 5. Abatement Plan for TAA

No	Activity	Executor	Challenges	Development
1.	Fostering good relations with the United States through a direct approach	All Parties	TAA has yet to approved	The US government wants Indonesia to have DTSS so it should be built as soon as possible
	a. Cooperating with Americans in all fields	Coordination of Ministries and Institutions	America has yet consider Indonesia a strong nation	Improve strategic partnership with the United States
	b. Fostering good relations with Lockheed Martin	Coordination of Ministries and Institutions	Lack of connection with Lockheed Martin	An intense approach was made with Lockheed Martin in order to persuade the US Government to immediately approve TAA
2	Fostering good relations with the United States through an indirect approach	Coordination of Ministries and Institutions	Indonesia has not earned enough credit points in the eyes of America	Supporting anti-terrorism and upholding democratic values, Indonesia should not take a counter position with US policy. Helping the stability of the region, can be a bridge to the Islamic world.

Source: Writer's Deduction

Table 6. Risk Identification of Opsreg Needs in Both Countries

Date Identified :	**Date Reported:**
Update :	
Risk	**: *Operation Requirements (Opsreq) needs in both countries***
Description: Opsreq differences must be met by industry with mutually agreed technology.	Consequence: There are 2 (two) designs according to their individual requirements, need to be guarded so as not to operate separately. Risk Level : Main Executor: PT.DI Leader: Government

Source: Writer's Deduction

At the TDP stage, the Air Force and ROKAF have met each other to discuss the compromise of the opsreq, the difference of needs between the

two countries can be unified, but there are 3 (three) fundamental differences that cannot be united as a unique requirement. This is due to the geographical conditions of each country, the difference in terms of purpose in building fighter aircraft and export license problems.

First, Indonesia needs a combat range of about 450 miles due to its vast territory, while South Korea as a peninsula country wants a shorter radius of about 300 miles so that with the technology used, engineers must be able to meet the opsreq's distinction. As a solution the engineers prepare external tanks on different aircraft (external tankers) for both countries as per their respective radius requirements.

Secondly, Indonesia needs a parachute (drag chute) which is an umbrella component that is located on the tail of the plane (tailboom) to shorten the landing roll by braking on used combat aircraft. It is usually done on a short runway. The airstrips in Indonesia are generally short, in contrast to South Korea whose long airstrips are above 3000 meters so they do not require drag chute.

Thirdly, Indonesia wants refueling as used on Sukhoi Aircraft or European planes with 'probe and drogue' system with its fuel distribution using a rigid pipe shuttlecock badminton. Unlike the South Koreans who want the aircraft to use the system of 'boom and receiver' or flying boom with the distribution of fuel through a rigid pipe with a camera system controlled by two small wings on a tanker that is above the fighter through the tank, as on the plane F-16 or US Aircraft.

In order to overcome the opsreq issues concerning this technology, strict supervision must be made by the government especially regarding differences of interest because the greatest probability level that can thwart the course of the program as a whole does not lie in the difference in capability between Indonesia and South Korea, Countries in developing this aircraft, for example; The existence of unique requirements and the different development goals of the aircraft. Indonesia's goal is to achieve self-defense industry independence, while South Korea's goal is to self-defense from North Korean attacks.

These differences can lead to dispute, although the differences regarding opsreq have been addressed by both, but must be guarded in the practice of implementation.

Supervision should continue to be undertaken to oversee the political climate and the flexibility of political relations and other aspects. For its preventive action, Indonesia and South Korea should have 1 (one) vision to jointly build the interests of the two countries so as to not only maintain intergovernmental relations (G to G), but they also have to control the two countries' Combat KFX/IFX (G to B). In this case, South Korea is organically established by DAPA.

While Indonesia has not been as such that KKIP is expected to play that role and to safeguard the advancement of the defense industry well, KKIP can learn much from the experience of DAPA who is able to release South Korea's dependence on the United States in fulfillment of its necessities.

To maintain cooperation with South Korea at the Government level, Indonesia should be able to fulfill all agreements by its stages. And if the two countries have agreed, must always be led by the process mechanism to be thorough and successful both from the level of inter-government and industry involved between the two countries (KAI and PT.DI) in particular to avoid dispute due to differences.

In order to achieve a common vision, the two countries can instill a sense of 'we feeling' because if both countries share the same feeling, strong comradice and benefit so that it can be a glue to dilute disputes both at the government level and at the industry level.

Feelings 'we feeling' can be developed with intense communication and improved facilities that encourage the occurrence. The intensity of communication between elite and non-elite, or elites and non-elites of other countries, the interaction of communications become more dynamic between Government to Government (G to G), Business to Business (B to B) and People to People (P to P).

However, the implementation of the concept of 'we feel' is not as easy

as turning the palm of the hand so it needs support from all parties, especially the readiness of the executor.

Building together with South Korea is done incrementally or gradually, starting from cultural adaptation and work ethic first. Indonesian workers should start getting used to working together with all these differences. If our personnel have been trained with such cooperation pattern, then this joint development project will be successful in the future.

The key is to recognize the cooperation partners from the experience of working with South Korea before. The author prepares a handling plan for Opsreq needs in both countries as in Table 7.

Table 7. Abatement Plan for Opsreq Needs in Both Countries

No	Activity	Executor	Challenges	Development
1.	Apply the chosen technology to answer the different needs of opsreq	PT.DI andKAI	There are three differences that can not be put together	Made 2 (two) designs to meet their individual needs
2.	Conduct strict supervision	Government	Is not yet going well	Supervision conducted at G to G and G to B levels
3.	Good relationships with partners	PT.DI	Not familiar with cultural differences or cooperation patterns	Approach to cultural adaptation and understand the characteristics of the pattern of cooperation with South Korea

Source: Writer's Deduction

Conclusion

Using the Delphi survey method through expert judgment and correlated with the real situation occurring at the EMDP Stage and the development milestone of the KFX/IFX Combat Aircraft it was found that the dominant risk or the highest was technological aspect. Conclusion of this study include:

1. From the economic point of view there are 2 (two) issues that are found as risk estimates, namely the availability of budget and the lack of coordination among Ministries or Institutions that could impact on the delay of this program.
2. In terms of procurement organization, there is 1 (one) subject matter that is found as risk

estimation, that is still lack of coordination of ministry or institution.

3. In terms of technology, there are 3 (three) principal problems encountered as risk estimation, namely improvement of Technology Readiness Level (TRL), no Technical Assistance Agreement (TAA) approval and Operational Requirement (Opsreq) needs in both countries as unique requirement.

Recommendation

The national program of IFX fighter development is also very important for the establishment of defence industry independence and opens the road map of the mastery of aircraft technology for PT. Dirgantara Indonesia (PT.DI).

For optimal achievement, all parties needs to support this KFX/IFX Combat development project to run well and can be completed in accordance with a predetermined schedule. The authors provide advice and inputs especially for the government to conduct a series of intense approaches in order to strengthen diplomatic relations with South Korea and the United States.

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