

The Concept of an Unmanned Aircraft with Stealth Technology to Support the Air Defense System for the Indonesian Archipelago's Capital

Suherman Mukti ¹, Erzi Agson Gani ², Maykel Manawan ³, Ansori ⁴, Opa Mustopa ⁵

^{1 2 3 4 5} Propulsion Technology Study Program, Faculty of Defense Science and Technology, Republic of Indonesia Defense University; suhermanmukti@gmail.com

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ABSTRACT

Phenomenona The relocation of the new National Capital (IKN) in Indonesia creates a new geostrategic perspective. Where in the process must be prepared carefully, especially in the aspects of the defense and security system. This study aims to provide a planning analysis concept for Unmanned Aircraft (PTTA) with stealth technology in supporting air defense systems in Indonesia's new IKN area. The research method used is through a qualitative approach by conducting literature studies. The results of the study revealed that the air defense system for Indonesia's new IKN is in accordance with the concept of a smart defense system, the need for a platform/air vehicle that can be used in carrying out intelligence, surveillance, reconnaissance is even capable of carrying out attacks in maintaining security in the Indonesian IKN area by minimizing enemy detection. And one suitable platform is to use PTTA with stealth technology which can provide advantages in terms of flexibility, range, minimized operational risk, and the ability to carry out operations undetected by enemy defense radar sensors.

Corresponding Author:

Suherman Mukti

Propulsion Technology Study Program, Faculty of Defense Science and Technology, Republic of Indonesia Defense University suhermanmukti@gmail.com

1. INTRODUCTION

The capital city is a city that is designed as the center of government of a country, physically the national capital generally functions as an office center and a gathering place for government leaders (Yahya, 2018). President of the Republic of Indonesia Joko Widodo plans to move the capital city from Jakarta to Kalimantan. The relocation of the capital city is contained in the 2020-2024 National Medium-Term Development Plan (RPJMN). In fact, according to Wandy Tuturoong as the Main Expert for the Presidential Staff Office (KSP), President Joko Widodo has signed the Law on the State Capital Number 3 of 2022 on February 15, 2022 (kominform.go.id). The relocation of Indonesia's new State Capital

(IKN) from Jakarta to Kalimantan is aimed at equitable development and the formation of a bureaucratic system that reaches all regions in Indonesia (Andjarwati, 2019). To achieve this goal, the new national capital must have ideal characteristics, at least better than the old capital. One of these characteristics is having a safe environment, both safe from disasters and threats that endanger national security and defense (Potter, 2017).

The capital city move also creates a new geostrategic perspective. However, the strategic location of the National Capital City (IKN) is inseparable from defense threats and security disturbances both by state actors, non-state actors, and hybrids. From these various threats an ideal defense concept is needed. The concept of the IKN defense and security system, especially for airspace, refers to the national defense and security system. Furthermore, the National Planning and Development Agency (Bappenas) or the Ministry of PPN disclosed the design of the defense and security system for Indonesia's new State Capital (IKN). And the defense and security system at IKN is called smart defense which is a combination of hard defense and soft defense. This hard defense is deepening technology, meaning that the national defense uses high-tech Main Weapon Systems (Alutsista). Meanwhile, soft defense empowers more local wisdom or local wisdom.

In terms of air defense for Indonesia's new State Capital (IKN) in accordance with the concept of a smart defense defense system, a platform/air vehicle is needed that can be used for intelligence, surveillance, reconnaissance and even capable of carrying out attacks in maintaining security in the territory of the Indonesian IKN by minimizing enemy detection. And one suitable platform is to use PTTA with stealth technology which can provide advantages in terms of flexibility, range, minimized operational risk, and the ability to carry out operations undetected by enemy defense radar sensors.

2. METHODS

This study uses a qualitative research method which is subjective from the participant's point of view in a descriptive way so that the results cannot be generalized. That is, this method is more in the nature of providing a clear picture of a problem in accordance with the facts on the ground. An activity that is systematic and objective in studying a problem to reach an understanding with basic and general principles about a problem. Where research is carried out holding on to information (which manifests as theories) through previous studies whose goal is to add to and refine existing theories about the problem that is the target of the study (Nazir, 2012).

3. FINDINGS AND DISCUSSION

The Phenomenon of Relocating the State Capital

The phenomenon of moving the new State Capital (IKN) in Indonesia creates a new geostrategic perspective. Moving the capital city in Indonesia is very possible because there is no law that regulates it. In the law there is no article that states where and how to regulate the capital city. This means that

there is flexibility in managing the capital city, including moving it. However, in the context of relocating a capital city there must be clear reasons and urgency why the capital city must be moved. Therefore, the government is obliged to prepare a legal basis related to the plan to relocate the national capital and prepare environmental safeguards from the planning stage to the implementation of infrastructure development activities for the national capital in the field.

The relocation of the national capital has previously been carried out by several countries for different reasons. For example, Brazil moved its capital from Rio de Janeiro to Brasilia and Australia moved its capital from Sydney to Canberra. The main reason for moving the national capitals in the two countries is to share the burden on cities as business centers and government centers while reducing population density (Silalahi, 2019). As for several countries that have moved the national capital as follows

The plan to relocate the capital city to be carried out by Indonesia is aimed at equitable development and the formation of a bureaucratic system that reaches all regions in Indonesia (Andjarwati, 2019). According to Bappenas (2021), the reason for relocating the national capital is as follows.

1. About 57% of Indonesia's population is concentrated on the island of Java;
2. Java Island's economic contribution is 59% of National GDP;
3. The crisis of water availability on the island of Java, especially in DKI Jakarta and East Java;
4. The largest land conversion occurred in Java Island;
5. The growth of urbanization on the island of Java is very high, resulting in high congestion and unhealthy air quality;
6. Decreasing the carrying capacity of Jakarta's environment;
7. Threats of floods, earthquakes and landslides in Jakarta.

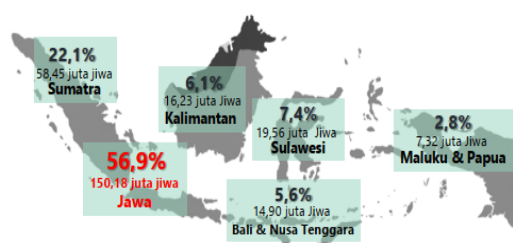


Figure 1. Projection of Indonesia's Population Distribution
Source: (Bappenas, 2021).

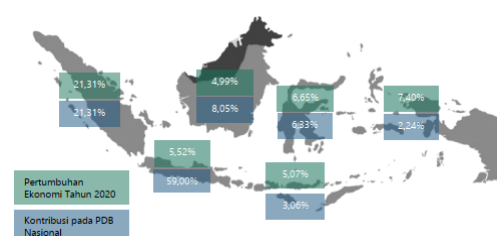


Figure 2. Projection of Economic Contribution
Source: (Bappenas, 2021).

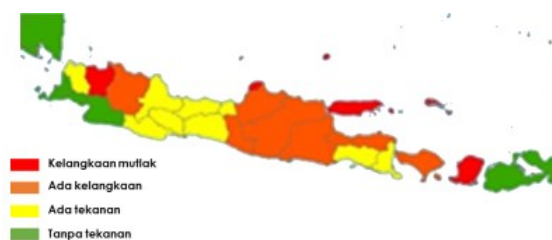


Figure 3. Projection of Water Availability in Java Island

Source: (Bappenas, 2021).

So to achieve these goals, the new capital must have ideal characteristics, at least better than the old capital. A national capital can be said to be ideal if it has the following characteristics. The first characteristic is that the location of the capital city must be strategic, this criterion is intended to represent equity and accelerate regional development. Second, the availability of extensive land owned by the government or State-Owned Enterprises (BUMN) to reduce investment costs. Third, having a safe environment, both safe from disasters, pollution, and other environmental problems. Fourth, the potential for social conflict is low. Locating the capital outside the center of the largest city reduces civil conflict by limiting the ability of any single faction to dominate the government.(Potter, 2017). And the choice of Kalimantan as the location for Indonesia's new state capital was partly due to the strategic location of Kalimantan in the middle of Indonesian territory which made Kalimantan the epicenter of the Unitary State of the Republic of Indonesia (NKRI).

The concept of the Defense and Security System in the Indonesian National Capital (IKN).

The National Planning and Development Agency (Bappenas) or the Ministry of National Development Planning has revealed the design of the defense and security system for Indonesia's new state capital, namely the State Capital (IKN), Kalimantan. The concept of the IKN defense and security system refers to the national defense and security system. Whatever the doctrine of the Indonesian state defense and security system adheres to the universal people's defense and security system (sishankamrata), namely a system defense and state security involving all the people and all national resources, national facilities and infrastructure, as well as the entire territory of the state which constitutes a complete defense unit.

Furthermore, the National Planning and Development Agency (Bappenas) or the Ministry of PPN disclosed the design of the defense and security system for Indonesia's new State Capital (IKN). In the defense and security system architecture, it consists of four components, the first component is intelligence, the second is defense, the third is security including domestic and public security, and the fourth is cyber. The preparation of the system master plan is based on the principles of cost effectiveness and quality of spending. The master plan is quite efficient and can overcome all kinds of disturbances to the security and defense of the IKN. The defense and security system at IKN adopts a smart defense

and dual strategy. This is to deal with defense and security threats in the form of air vehicles, sea vehicles, land vehicles, and cyber vehicles.

Smart defense This is a combination of hard defense and soft defense. Hard defense is deepening technology. This means that the main tool for the weapon system or defense system will later use high technology. Meanwhile, soft defense empowers local wisdom more traditionally. Meanwhile, the dual strategy is the use of total diplomacy and defense. This means that diplomacy and defense must move together to overcome problems of defense threats and security disturbances. These two components are expected to be able to form a safe IKN.

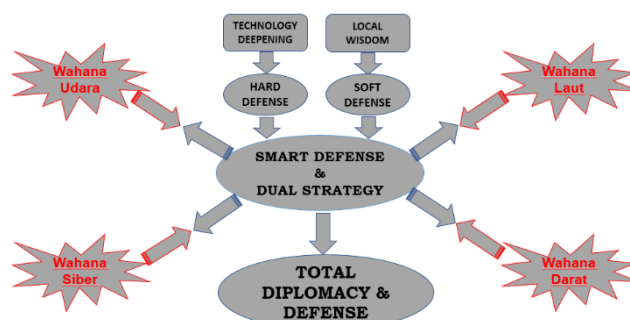


Figure 4. Defense System Concept Chart in IKN

Source: (Bappenas, 2021).

Analysis of Air Defense System Threats in the Indonesian National Capital (IKN).

In the development of the nation's capital, the stability of the country's defense and security is the main variable that must be considered. Therefore it is important for the Indonesian government to anticipate various threats targeting the capital city as the center of government. Figure 5 illustrates various developments of real threats to Indonesia which do not rule out the possibility of threatening the stability of moving the capital city of Indonesia from Jakarta to Kalimantan.



Figure 5. Development of Threats in Indonesia

Source: (Sefriani, 2019)

First, the South China Sea conflict, which is a regional security issue, has yet to reach a settlement point, and is prone to disrupting the stability of the Indonesian National Science Industry in the future. Indonesia's conflict issues with China are related to the South China Sea issue, the Natuna Block is a

conflict related to geopolitics, international law and maritime issues (Arifianto, 2018). The two border conflicts between Indonesia and Malaysia in Ambalat are water conflicts where there are disputes over territorial claims that hold substantial oil and gas wealth. The marine block covering an area of 15,235 square kilometers located in the Makassar Strait holds extraordinary potential for marine wealth (Serpini, et al, 2018). Finally, cases of rebellion in the Papua region which often claim victims are closely related to the Papuan KKB term.

Furthermore, the move to the capital also created a new geostrategic perspective. However, the strategic location of the National Capital City (IKN) is inseparable from defense threats and security disturbances both by state actors, non-state actors, and hybrids. The location of Indonesia's new IKN in Kalimantan is adjacent to the 2,062 km land border to Malaysia, and this is a gateway for defense threats and security disturbances. In addition, the location of the IKN coincides with the Indonesian Archipelagic Sea Lanes (ALKI) II and choke points or narrow points in the world.



Figure 6. Indonesian Archipelagic Sea Lanes (ALKI)

Source: (Sefriani, 2019)

Meanwhile on the air side, the IKN location is close to the Flight Information Region (FIR) belonging to neighboring countries, such as Singapore, Kinabalu Malaysia and Manila Philippines. Indonesia's new IKN is also within the cruising range of certain countries' ICBMs (intercontinental ballistic missiles) and hypersonic missiles. Another threat is that currently the island of Kalimantan is the location and route of trans-nation crime, such as people smuggling, drugs, and so on. IKN is also with the terrorist transit triangle in Sulu, Sabah and Poso. And lastly, the position of the new IKN is surrounded by defense alliances, such as FPDA (Five Power Defense Arrangements), AUKUS (Australia, United Kingdom, United States) and OBOR (One Belt One Road)/BRI (Belt Road Initiative).

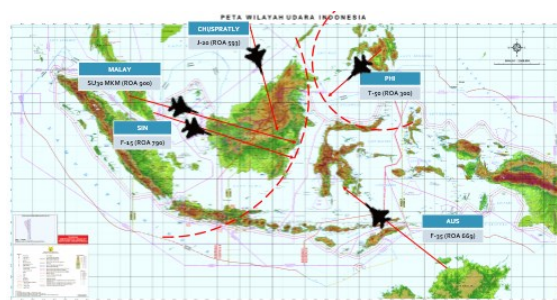


Figure 7. Illustration of IKN Air Defense Threats

Source: (Sefriani, 2019)

These threats have become the center of attention for the security and defense of Indonesia's new National Capital (IKN). Commander of the National Air Defense Command (Pangkohanudnas) Marsda TNI Novyan Samyoga said that there were 498 airspace violations by foreign military aircraft until May 17 2021. Some of these cases included in 2015, the US military jet Dornier Do-328 110 made by Fairchild Aircraft, United States, landed without having security clearance at Sultan Iskandar Muda Airport, Banda Aceh. Malaysia was also recorded as having violated Indonesian airspace in 2016, when a Malaysian foreign fighter jet was caught on radar flying without permission over Unarang Reef, Ambalat Waters, East Kalimantan (Sefriani, 2019).

Use of PTTA with Stealth Technology in Supporting Air Defense Systems in Indonesia's IKN

Based on the results of an analysis of various threats that are likely to occur in IKN, it has the potential to pose threats whose patterns and forms are increasingly complex and multidimensional. The air defense system for Indonesia's new IKN is in accordance with the concept of a smart defense defense system, the need for a platform/air vehicle that can be used in conducting intelligence, surveillance, reconnaissance and even being able to carry out attacks in maintaining security in the territory of the Indonesian IKN by minimizing enemy detection. And one suitable platform is to use an Unmanned Aircraft (PTTA) with stealth technology which can provide advantages in terms of flexibility, range, minimized operational risks, and the ability to carry out operations undetected by enemy defense radar sensors.

Utilization of the Unmanned Aircraft (PTTA) system can basically be an appropriate alternative to address existing problems, as well as a response to the effects of rapid technological advances, and in line with the implementation of the Revolution in Military Affairs (RMA), which among other things is aimed at achieving the capability Network Centric Operations or Network Centric Warfare. In the future the development of the PTTA system will prioritize technology, integration and interoperability, so that it is hoped that it will be an effective and efficient solution for carrying out supervision in Indonesia's new IKN area to avoid all forms of threats

Unmanned Aircraft (PTTA)

Based on the Regulation of the Minister of Defense of the Republic of Indonesia Number 26 of 2016 concerning Unmanned Aircraft Systems for State Defense and Security Tasks, where Unmanned Aircraft, hereinafter abbreviated as PTTA, is a type of aircraft that is categorized as a means of defense and security equipment which in flight operations is not manned by humans, and remotely controlled either manually or automatically. This PTTA system is a unmanned aircraft flight system, which is controlled remotely either manually or automatically, consisting of PTTA, payload, human resources, control system, data network, and supporting elements.

Table 1. Classification of PTTA Based on Minister of Defense No. 26 of 2016

No	Classification	Weight (Kg)	Operating Altitude (ft)	Operating Radius (Km)	Operating Time (Hours)	User Unit	Military Operation Mission
1.	Micro	< 2	<200	< 5 LOS	< 5	Individuals – Platoons	
2.	Mini	2 – 20	< 3,000	< 20 LOS	< 10	tactical battalion	photoshoot; Data collection; Inspection;
3.	Small	20 – 150	< 5000	< 50 LOS	< 24	tactical brigade	Launcher Tool; Cargo Transportation;
4.	Currently	150 – 600	< 10,000	< 200 LOS	< 48	tactical formation	Relay Stations; Mitigation; deterrence; Security; Reconnaissance; and Supervision
5.	Big	< 600					
	1. MALE	< 600	< 45,000	Unlimited BLOS	>120	Operational Theatre	
	2. HALE	< 600	< 65,000	Unlimited BLOS	>120	Strategic/National	
	3. STRIKE/COMBAT	< 600	< 65,000	Unlimited BLOS	>120	Strategic/National	

Source: Draft Minister of Defense No. 26 of 2016

The Defense Industry Policy Committee (KKIP) which was formed through Law Number 16 of 2012 concerning the Defense Industry has compiled seven national programs for the independence of the main defense system equipment (alutsista), namely the development of the KFX / IFX jet program, the submarine development program, the propellant industry development program, development of national rockets, development of national missiles, development of national radars, and development of medium tanks. Then the government has also established a priority program policy for technological and industrial development based on Presidential Regulation Number 8 of 2021 concerning the General Policy of National Defense for 2020-2024 (Jakumhanneg). So that three other priority programs were added, namely the development of military satellites, the development of underwater sensing,

Unmanned Aircraft (PTTA) is known by many names and acronyms throughout history, namely; Drone, RPV (Remotely Piloted Vehicle), UAV (Unmanned Aerial Vehicle), UCAV (Uninhabited Combat Aerial Vehicle), FVO (Organic Aerial Vehicle), UCAV/S (Uninhabited Combat Aircraft Vehicles/ System), RPA (Remotely Piloted Aircraft), RPH (Remotely Piloted Helicopter), Aerial Robotics, and MAV (Micro Aerial Vehicle) (Noor, 2020). This PTTA technology is one of the technologies that can be used as supporting equipment or equipped with weapons to support military operations. Military PTTA being one of the newest technologies that have been used in war for the last few years, this technology increases the effectiveness in warfare (Gupta, et al, 2016).

In Indonesia, PTTA, which is owned by the Indonesian National Armed Forces (TNI), is a CH-4 product from the Chinese state, whose use is more towards reconnaissance. In addition to CH4, the TNI also has 4 PTTA Aerostar which are used for mapping the mountainous Poso area, security and aerial observation of action 212 in the capital Jakarta in September 2016, identifying the presence of the Santoso group, in November 2017 securing vulnerable areas in the Timika region of Papua. Apart from that, there is a domestically made PTTA Wulung which is used for the task of monitoring border areas and handling forest fires. And finally, there is an unmanned aircraft (PTTA) of the Medium Altitude Long Endurance (MALE) type with the name Elang Hitam which is still being developed not just for reconnaissance but also for carrying out attacks (Utama and Anwar, 2021).



Figure 8. PTTA CH-4

Source: (Main and Anwar, 2021).



Figure 9. PTTA Aerostar

Source: (Main and Anwar, 2021)



Figure 10. PTTA Wulung

Source: (Main and Anwar, 2021)



Figure 11. Black Eagle PTTA MALE

Source: (Main and Anwar, 2021)

Stealth Technology Concept

Emergence of technology *stealth* one of them is because the emergence of major changes in the scope of warfare that bring about the application of technological innovations combined with fundamental changes in the doctrine, operations and organizational concepts of the military, which are fundamentally related to the character and manner of conducting military operations. This change is generally known as the Revolution in Military Affairs (RMA) (Sloan, 2003). Therefore, major countries seek to develop weaponry as a product of their defense industry by prioritizing advanced technology applications.

Aircraft with stealth technology or so-called silent aircraft are aircraft designed with stealth technology to absorb and deflect radar electromagnetic waves, thereby making the aircraft more difficult to detect. In general, the purpose of using this technology is to carry out attacks using aircraft in enemy areas without being detected by the air defense radar (Noor, 2019).

To meet the stealth requirements of the aircraft, there are three things that can be minimized, namely:

- (1) Visual aspects, such as eliminating smoke trails, repainting or re-painting the plane so that it resembles the environment where the mission is carried out.
- (2) Infrared aspect, which reduces the use of after burner.
- (3) Radar aspect, namely reducing the radar cross section (RCS) of the aircraft itself. The use of low surveillance fighter aircraft is felt to be able to increase the probability of success of a fighter aircraft in carrying out its mission because it is able to provide an element of surprise in the opponent's area. Apart from that, with low surveillance combat aircraft, it is hoped that aircraft will be able to have a longer life cycle than combat aircraft that have a higher RCS (Purnomo and Bura, 2018).

Radar Cross Section (RCS) is the ability of an object to reflect the radar signal back to the transmitter source. The smaller the RCS value of an object, the more difficult it is for the object to be detected by enemy radar. The advantages of reducing RCS are as follows:

- (1) Reduction of the detection distance from the target or aircraft.
- (2) Reducing the search area or search volume of the enemy radar will take longer to scan than for the same amount of space.
- (3) With only a small part of the reflected radar or electromagnetic signature, it will make the enemy or opponent unable to detect what objects are approaching. (Purnomo and Bura, 2018).

Therefore stealth technology on aircraft is currently being developed by various methods, one of which is by modifying the shape of the aircraft (shaping) and with material technology that can absorb and deflect radar electromagnetic waves or commonly known as the Radar Absorbing Material (RAM)

method (Noor, 2019). The following is a graphic illustration of the differences in RCS values on conventional aircraft and aircraft with stealth technology.

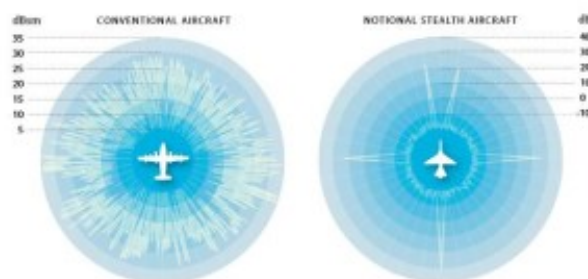


Figure 12. Graph of comparison of RCS values between conventional aircraft (± 20 dB) by stealth aircraft (± 10 dB)
Source: (Noor, 2019).

As can be seen in the picture above, it shows that by modifying the shape of an aircraft that uses stealth technology, it has a much smaller RCS value than conventional aircraft, meaning that an aircraft with stealth technology is able to provide an advantage over the effects of enemy radar monitoring range so that it is suitable for use on unmanned aircraft. PTTA) for military missions or in this case for surveillance, reconnaissance and even attack missions in the new Indonesian National Capital (IKN). Now PTTA or UAV products in the world have turned to stealth technology which aims so that when carrying out operational missions it is not detected by enemy defense radar sensors. Recently the USA has been carrying out trials of an armed PTTA or commonly called the Unmanned Combat Aerial Vehicle (UCAV) named X-47B with stealth technology to land and fly on aircraft carriers. And now PTTA for the purposes of intelligence, surveillance, reconnaissance and attacks has also used stealth technology to minimize the possibility of detection of air defense radars. Here are some examples of PTTA images with stealth technology in the world and their prowess in carrying out their missions.



Figure 13. MQ-9 Reaper PTTA UCAV type on a mission in Afghanistan



Figure 14. RQ-170 Sentinel with stealth technology during a flight mission over Kandahar, Afghanistan (2007)



Figure 15. X-47B PTTA UCAV type with stealth technology is in trials for landing and fly on an aircraft carrier.



Figure 16. General Atomics MQ-9 Reaper, successfully carrying out selected target attack tasks.

The several examples of PTTA with stealth technology above show their superiority and effectiveness in carrying out their various missions. This is very suitable to be developed as a defense technology in the new capital city of Indonesia.

4. CONCLUSION

The phenomenon of moving the capital city of Indonesia creates a new geostrategic perspective. Where in the process must be prepared carefully, especially in terms of handling in terms of maintaining defense and security in the new capital city area. The defense and security system in the IKN area adopts a smart defense and dual strategy. This is to deal with defense and security threats in the form of air vehicles, sea vehicles, land vehicles, and cyber vehicles. Particularly for the air defense system for Indonesia's new National Capital (IKN), in accordance with the concept of a smart defense defense system, a platform or air vehicle is needed that can be used to carry out intelligence, surveillance, reconnaissance and even be able to carry out attacks in maintaining security in the territory of Indonesia's new IKN. by minimizing enemy detection.

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