# DIGITALIZATION OF DRONE MONITORING PROCESS ON INDONESIA MINISTRY OF TRANSPORTATION

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Abstract

Drone has been used for various commercial activity due to its flexibility and cost efficiency. However, to ensure that each drone operation still obey safety regulation, each drone activity must be monitored and heavily regulated. The administrative process to fly a drone was cost and time consuming. All process must be conducted manually in Jakarta. This activity was conducted as part of consultancy for Directorate of Flight Navigation, Ministry of Transportation. The aim of this activity was to digitize the administrative process of drone operation. The result was a digitalization plan, which consist softwares needed for each administrative process, and implementation plan, which recommend the time and order of implementation.

***Keywords:*** *ministry of transportation, digitalization, drone, monitoring*

## A. INTRODUCTION

Drone usage has been increasing in the last couple years. The world has uses drone in various activity, whether it is commercial or recreational. Drone operation generally uses the same airspace as any other aviation. Some drone operates on high altitude that occupy the same airspace with civil flight. Drone is considered economically attractive for various commercial intent. It is fast, agile, relatively cheap, and able to operate in various environment (where an airplane cannot fly). Figure 1 provide a simple description on type of drone and its relative operational height.

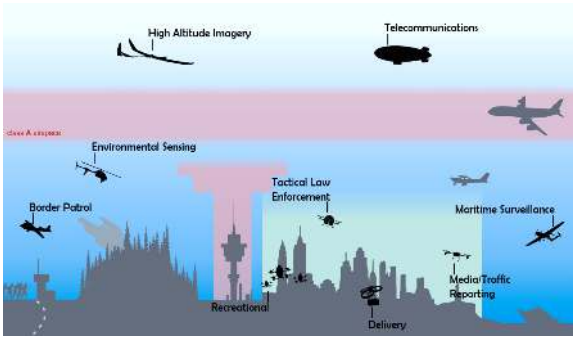

Figure 1 Drone Usage and Its Operational Heights

Based on this condition, the official regulatory body (in this case is Indonesia Ministry of Transportation) is expected to provide a comprehensive framework for drone operation. This framework should open the opportunity to utilize drone in various economic activities, while also protects the citizen from harm. Any accident involving a drone certainly has quite impact to citizen's safety (economic and health). Drone that operates in residential area may crash into building or people and cause serious damage. While drone that operates in high altitude may cause disturbance and serious safety threats for civil aviation.

On a report about drone airspace management by FTMD ITB (Muhammad, Arifianto, & Djenie, 2019), there is a concept of airspace management around National Vital Object (Obvitnas). The concept aims to secure the vital object from any unlawful drone operation. The unlawful behaviour includes flying to near to any vital object, flying with malicious intention toward the vital object, or any rogue drone that fly outside its designated area. The concept provides a definite zoning around the vital object, and how to act if any rogue drone enters the zoning.

To implement this concept, the regulator needs to be able to determine a drone location. The regulator must also need to be able to identify any active drone. To achieve that, the drone operator must register their drone and must have a flight permit to operate drone commercially. This process has been regulated using Ministry of Transportation Regulation No 37, 2020 (Peraturan Menteri Perhubungan Republik Indonesia Nomor PM 37 Tahun 2020, 2020).

However, from the analysis of current condition of Ministry of Transportation, the regulation and the zoning concept cannot be fully implemented. The registration process has been implemented, where any commercial drone operator can register their drone and pilots to receive a registrastion permit. The operator can also submit and receive flight permit from the Ministry. However, there are no means available to track and monitor any active drone flight. The Ministry also does not have any mean to identify any drone directly. Any identification can only be made if they know who the operator of the drone. If there is any drone crash happen, the Ministry will need to spend quite a long time to identify the drone.

The drone registration and flight permit submission are conducted manually. The drone operator needs to come to the ministry's office in Jakarta to submit their drone registration and flight permit. The situation is made more complex due to the numbers of regulatory body included in this process. The operator needs to register their drone and pilot to Directorate of Airworthiness and Aircraft Operation. To submit a flight permit, the operator needs to contact Directorate of Flight Navigation. However, before submitting the flight permit, the operator needs to obtain the flight plan assessment from Airnav, to ensure that the drone flight will not obstruct any civil flight in the area. The operator may also need to obtain permission from flight area owner or security clearance from Ministry of Defence. This condition can be costly and time consuming for drone's operator, especially the one located outside Java Island.

To overcome this problem, we need to create a system where these conditions are applied:

a. The drone can be tracked, monitored, and identified real time by the regulatory body.
b. The operator can operate their drone efficiently, whether in cost or time. The operator should be able to process the registration and permit remotely to save time and cost.
c. The safety of citizen and any vital object should be preserved. Any lost due to a drone operation should be minimized.

These conditions can be applied by using digitalization. The entire process found in Ministry Regulation no 37 should be digitized to increase the process efficienty. Each regulatory body involved in the process can be streamlined by using information technology. Using the same information technology, the operator can process the registration and flight permit from anywhere. No need to process it directly at the Ministry office.

This activity focus on consultation for the Ministry, especially for Directorate of Flight Navigation. The desired outcome of this activity are the digitalized system design and its implementation roadmap. By using the design and roadmap, the ministry is expected to be able to streamline the drone administration process and ease the burden (whether it cost or time) of the drone operator. Thus, ensuring the drone can be used to leverage economics benefit and ensuring the safety of citizen around the drone.

## B. ACTIVITY AND METHOD

The main activity in this work is consultation. A team of expert, consisted of aviation expert and information technology expert, consult the ministry through a comprehensive study. The duration of study and consultation is 2 months, start at October 2020 and end at early December 2020. During that duration, the team conducted the consultancy through a series of event as follow:

a. An initial data and information gathering. The team collect data from existing regulation and previous activity report. This activity results in an initial description of involved stakeholders and their needs.
b. A focused group discussion. The team gather the representatives of each stakeholder. In this discussion, the team confirmed the initial stakeholders' needs and gathered additional data on each stakeholder's problem on drone management and operation.
c. The team constructed and recommended the digitalization plan. The digitalization plan contains the digital system design and implementation plan.

Since the drone monitoring process involves many stakeholders with different administration body, the implementation plan is constructed is several phases. On each phase, coordination

between administrative body is encouraged to determine the budget and the authority of each administrative body.

## C. RESULT AND DISCUSSION

The consultancy is conducted to enable a holistic digitalization. It means that the digitalization is conducted to all involved stakeholder, and on any phase of drone monitoring process. The lifecycle of drone monitoring process consists of 3 phases: initiation, flight planning, and flight operation. Figure 2 show what process conducted in each phase.

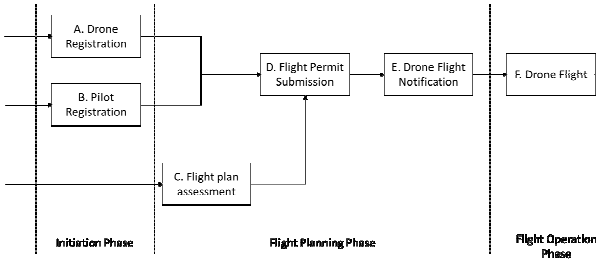


Figure 2 Phases of Drone Monitoring Process

The initiation phase involves two stakeholders: the drone operator and Directorate of Airworthiness and Aircraft Operation (DAAO). The flight planning phase involves 4 stakeholders: the drone operator, Directorate of Flight Navigation (DFN), Airnav, and Airport Authority (AA). While the flight operation phase also involves the same stakeholder as in flight planning phase. In total, there are 5 identified stakeholders involved in drone monitoring process. Each stakeholder can be described as follow.

a. The drone operator. This stakeholder operates the drone for commercial purposes. This stakeholder requires that any process in registering the drone/pilot and submitting the flight permit is conducted in a cost and time efficient.
b. Directorate of Airworthiness and Aircraft Operation (DAAO). The DAAO want that each commercial drone is registered and assessed whether it can fly safely or not. The DAAO has the authority to issue registration permit for drone and its pilot.
c. Directorate of Flight Navigation (DNF). The DNF can be considered the main stakeholder in this whole process. DNF need to ensure that every drone flight is monitored, so that no drone flight possess security or safety threat to any citizen or vital object. The DNF has the authority to issue flight permit based on the assessment from Airnav.
d. Airnav. A commercial body that regulates all civil aviation navigation. The Airnav need to ensure that no drone flight can be a safety threat to any civil aviation. Airnav must issues a flight assessment that state that the drone operation will not affect any civil aviation. The Airnav also must issue a notification to any active flight that state there are drone operation in a certain area to minimize collition risk.
e. Airport Authority (AA). The AA is the least active stakeholder in this whole process. The AA only need an information that there is a drone operation in their area of influence (airport area). This information is needed to regulate any take-off and landing operation to minimize collition risk.

This initial identification is verified using focused group discussion (FGD). The discussion is conducted online using video conference application and on site for one day. In this FGD (Figure 3) there are several inputs gained to construct the more holistic digitalization plan. As has been stated before, the FGD is attended by the representation of each stakeholder. A total of 15 person attended on site, while 20 person attended via video conference.

Figure 3 Focused Group Discussion to verify initial result

The result from this FGD is used to construct the digitalization plan. The digitalization plan maps which process need to be digitized at what stakeholder. The complete digitalization plan can be seen in Figure 4. In this plan, each stakeholder has its own software that represent the process where that stakeholder involved. Each

software must communicate to other software that simulate the phase and process found in Figure 2.

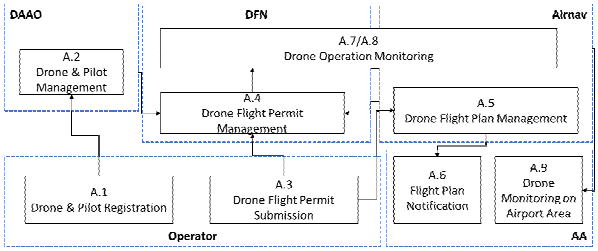


Figure 4 Digitalization Plan of Drone Monitoring Process

As part of the digitalization plan, the team recommend an implementation plan. The implementation plan describes when each software in Figure 4 is implemented. The plan generally divided into 3 implementation stages: initiation, development, and integration. Initiation stage only implement the basic software needed to digitize the process in DFN. This recommendation is made because DFN is the main stakeholder and main partner in this activity. The digitalization of DFN's process should provide a strong basis for further implementation. The first stage also provides enough time for the ministry to conduct coordinative activity between administrative body for further implementation.

The second stage, the development stage, is used to implement the software for each other stakeholder. At the end of this stage, each component in Figure 4 will be implemented. However, the softwares in each stakeholder possession are not connected to each other. Each software only works in its stakeholder area of influence. There is no communication between softwares in different stakeholder (except with operator's software). At integration stage, all connection between software is established. The complete implementation plan can be found in Table 1. The table also shows the duration and implementation activity as recommendation.

Table 1 Implementation Plan

| Stage | Duration | Activity |
|---|---|---|
| Initiation | 1 year | a) The development of A.3: Drone Flight Permit Submission.<br>b) The development of A.4: Drone Flight Permit Management.<br>c) The development of A.7: Drone Operation Monitoring<br>d) The arrangement of drone identification policy, including standard identity format of a drone.<br>e) The arrangement of drone position reporting procedure, including the standard hardware for position calculation. |
| Development | 2-3 years | a) The development of A.1: Drone and Pilot Registration.<br>b) The development of A.2: Drone and Pilot Management.<br>c) The development of A.5: Drone Flight Plan Management.<br>d) The development of A.8: Drone Operation Monitoring.<br>e) The modification of A.7 to add an A.I. modul for active drone monitoring.<br>f) The establishment of inter- |

| Stage | Duration | Activity |
|---|---|---|
| | | stakeholder coordination procedure.<br>g) The arrangement of standard operation procedure for drone operation. |
| Integration | 2 years | :ation.<br>on Airport Area. |

The digitalization plan has been submitted to Directorate Flight Navigation as this activity main partner, as part of consultancy process. The plan has been communicated with the ministry and assessed for feasibility. However, the assessment is not quantified since the assessment only conducted using discussion.

## D. CONCLUSION & SUGGESTION

### Conclusion

The consultancy activity has result in a digitalization plan. The digitalization plan has fulfill each stakeholder needs. Using this digitalization plan, drone can be utilized for economic activity while ensure that the drone operation still uphold safety requirement.

### Suggestion

The recommended digitalization plan can be considered general plan. The impact of this plan cannot be determined yet. To maximize the impact, the plan needs to be detailed into more elaborate plan, in form of detailed engineering design (DED).

## E. REFERENCES

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