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Design Of Fuel Dumping Area at PERUM LPPNPI of Samarinda Sub-Branch

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Abstract— This study aims to determine and design the appropriate location for aircraft to dump fuel to support Air Traffic Controllers (ATC) in air traffic services. The research was conducted at Perum LPPNPI of Samarinda Sub Branch, where fuel dumping area is not yet available in the Standard Operating Procedure (SOP). The method used is the Research and Development (RnD) level 1 research method. The population in this study is ATC personnel of Perum LPPNPI of Samarinda Sub Branch. The sample selection in this study used techniques such as Simple Random Sampling and Purposive Sampling. The sample is ATC personnel of Perum LPPNPI of Samarinda Sub Branch, Academic Lecturers, and Procedure for Air Navigation Services and Aircrfat Operations (PANS OPS) experts at Airnav Indonesia Head Office. Data collection techniques used are documentation studies and interviews. The data analysis technique used are data reduction, data presentation, and verification. The results of this study show that the design of the Fuel Dumping Area must pay attention to the airspace around the design area. According to the results of interviews, the author places the fuel dumping area in south east Samarinda. The existence of a fuel dumping area can improve the quality of service and safety of air traffic.

Keywords— Design, Fuel Dump, SOP, PANS-OPS

I. INTRODUCTION

Flight safety is described as the condition of fulfilling security requirements in the use of airspace, aircraft, airports, flight navigation, air traffic facilities and infrastructure, and other public facilities. Considering this, it can be stated that every part of the aviation sector may be optimised to enhance flight safety [1]. Based on Annex 19 Safety Management, safety is the state in which risks associated with aviation activities, related to, or in direct support of the operation of aircraft, are reduced and controlled to an acceptable level [2]. The ATC (Air Traffic Controller) is one of the parties in charge of flight safety. As a result, ATC's function is critical in ensuring that a flight arrives at its destination airport safely. ATC personnel at airports throughout Indonesia, including the Aji Pangeran Tumenggung Pranoto International Airport, as the executing party of air traffic services. The involvement of ATC in the flight from the departure airport to the destination airport, has a considerable impact on the flight's efficiency. Many elements influence how emergency circumstances are handled, including physical conditions, emergency preparedness, knowledge, and the completeness of SOP (Standard Operating Procedure) for emergency situations. SOP is a collection of documents containing operational guidelines for the air traffic service unit [3]. Understanding

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and the completeness of SOP for emergency circumstances are crucial for the efficiency, safety, and security of air traffic services. To anticipate aircraft experiencing abnormal situations and in understanding with procedures, an immediate landing may be required when the aircraft's fuel is still on board or has exceeded the maximum landing mass. Fuel dumping may be necessary as an emergency measure or in other critical situations. The designated fuel dumping area should be located in an open area away from residential settlements. aircraft should dump fuel over open water and away from areas where frequent thunderstorms are reported or suspected. The permissible altitude for the aircraft to dump fuel must not be lower than 6,000 feet [4]. Each ATC unit must designate an area or airspace arranged for aircraft to dump fuel. The designated area should be documented in the Standard Operating Procedure (SOP) for dissemination to ATC and Pilots. A predetermined area within the SOP is essential for fuel dumping to guarantee that the results of the fuel dumping process don't disrupt or harm the surrounding environment [5].

Based on the SOP of the Perum Lembaga Penyelenggara Pelayanan Navigasi Penerbangan (LPPNPI) of Samarinda Sub-Branch, the area for conducting the Fuel Dumping Procedure has not been designated [6]. Therefore, this research was carried out to design of fuel dumping area at Perum LPPNPI Samarinda Sub-Branch . This research aims to determine and design a fuel dumping area to enable ATC to provide guidance and assistance to aircraft experiencing emergency situations, directing them to an area that is safe from environmental contamination risks and secure for the community.

II. METHOD

The method used is the Research and Development (R&D). The level of research and development that will be conducted is level one, where the author will conduct research and create a design, but will not produce the product and will not externally test it (field-tested) [7]. In level one research and development, three stages are carried out:

1) Identifying and collect information about potential and problems. Potential and problems that may occur as a result of the lack of a fuel dumping area in Perum LPPNPI of Samarinda Sub-Branch.
2) Collect information about the requirements of an appropriate design through documentation studies and need assessment research.
3) Designing a product that will be validated by responsible validators. To design a product based on a need assessment, identify a suitable location for a fuel dumping area using the development of Global Mapper software for geographical location mapping, and then design the product using AutoCad software in accordance with ICAO Document 8168 Vol.II - Procedures For Air Navigation Services.

The population in this study is the entire ATC staff in Perum LPPNPI Samarinda Sub-Branch . The samples for this study were collected using non-probability sampling approaches such as Purposive Sampling and Snowball Sampling. The samples were taken from PANS-OPS Perum LPPNPI Central Office Specialists, Academics of PANS/OPS Specialists and ATC personnel of Perum LPPPNPI Samarinda Sub-Branch.

The following data collection methods were used in this study:

1) Documentation Study are data collection procedures used to identify potential problems and get information or data information regarding problems. The method of data collecting used was not directly related to the subject of the study. The sources of data used are international and national aviation documents, laws, and government regulations.
2) Interview can be utilised as collecting information strategies when the author wants to do preliminary research to clarify the problem under investigation or when the writer wants to learn more about the responder, interviews [8].

The data sources utilized comprise international and national documents related to aviation, laws, and government regulations. Interviews were conducted with personnel from the ATC of Perum LPPNPI Samarinda Sub-Branch, Academic Experts in PANS-OPS, and PANS-OPS of Perum LPPNPI Head Office.

III. DISCUSSION

In the preliminary research phase, we identify and collect information to find potential and problems using documentation studies. We find that the fuel dumping area in the Perum LPPNPI of Sub-Branch Samarinda has not been listed. Fuel dumping processes must be carried out in accordance with established procedures to minimize environmental impact and risk to aviation safety. ICAO Document 8168 PANS-OPS Vol.II, the SOP of the PerumLPPNPI Samarinda Branch Office, and the AIP of Aji Pangeran Tumenggung Pranoto Airport were all included in the documentation study.The following information is required to create a design of fuel dumping area:

4) Coordinates of Navaid TPG NDB 00°22'35.90"S 117°15'15.35"E and VOR/DME BPN 01°14'44.70"S 116°56'25.10"E;
5) Aerodrome Reference Point (ARP) of Aji Pangeran Tumenggung Pranoto Airport 00°22'32"S 117°15'05"E; and
6) VFR Route, to determine that the fuel dumping area is located safely away from other flight paths (VFR route) to ensure flight safety.

During the design phase, we conducted a need assessment through interviews to determine an appropriate fuel dumping area design based on the needs at the research site. Interviews were held with ATC staff from the Perum LPPNPI Samarinda Sub-Branch. Based on the results of the need assessment, it can be concluded that, due to the lack of a fuel dumping area, the initial stage should involve establishing a SOP for the fuel dumping area. The appropriate location for a fuel dumping area is southeast of Samarinda. This place is remote from communities, above the sea, and protected from VFR routes.

ICAO Document 8168 PANS/OPS/611/Vol.II - Construction of Visual and Instrument Flight Procedure is used as a guidline for designing fuel dumping area [9]. The steps that were applied when designing fuel dumping area at the Perum LPPNPI of Samarinda Sub-Branch are as below:

1) Setting a VFR corridor in East Kalimantan, specifically the southeast portion of Samarinda, where the fuel dumping location will be located.

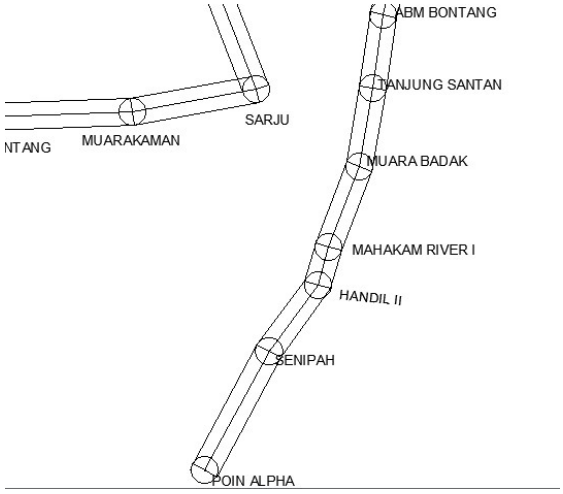

Fig 1. VFR route

2) Setting the coordinates of Aerodrome Reference Point (ARP) for Aji Pangeran Tumenggung Pranoto Airport and the coordinates of Navaids (TG NDB and VOR/DME BPN) as reference points for distance calculation to the coordinates of the fuel dumping.

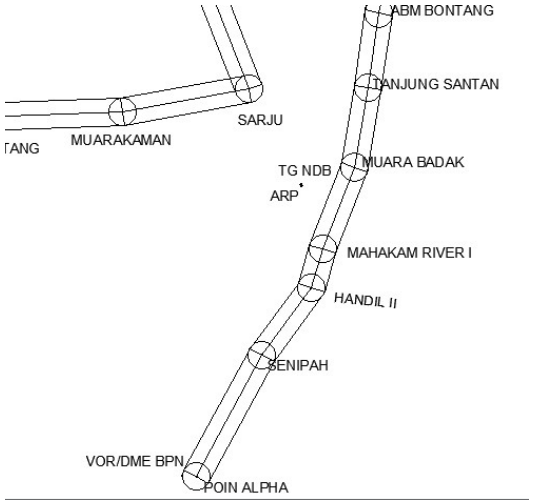

Fig 2. ARP and Navaids

3) Setting the fuel dumping area in the southeast area of Samarinda, specifically at a distance of 30 Nautical Miles from TG NDB.

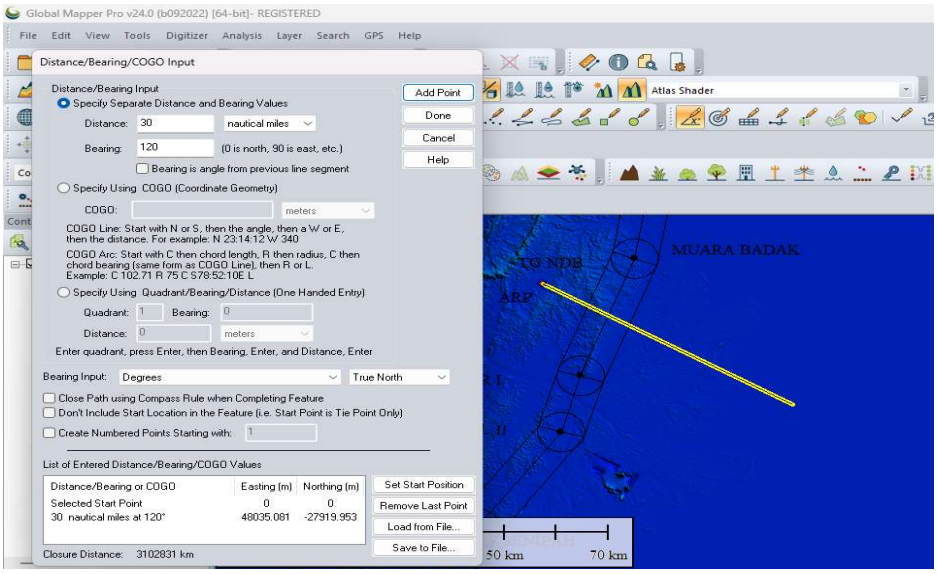

Fig 3. Fuel Dumping Area

The following provides a general overview of the fuel dumping area location:

Table 1. Fuel Dumping Area

Fuel Dumping Area	
Koordinat	003740.29S 1174111.54E
Ketinggian	6000 ft
QDR dari NDB	120º
Radial dari VOR/DME BPN	053º
Jarak dari ARP	30,17 Nm
Jarak dari NDB	30 Nm
Jarak dari VOR/DME BPN	60 Nm

4) Design the holding area For the designing of the holding area, we followed the guidelines in ICAO document 8168, PANS/OPS/611/Vol.II – Construction of Visual and Instrument Flight Procedure. The parameters below use an indicated airspeed (IAS) of 230 knots, which is a speed range on hold, between 170 knots and 230 knots under 14,000 feet. The altitude in the holding area is set at 6000 feet, with a required time for each leg of 1 minute. The temperature used is ISA+15ºC. The following are the results of the calculated parameters for the holding area.

Table 2. Holding Parameter

DATA		
Parameter	Value	Unit
IAS	230	kt
Altitude	6000	ft
Time	1	min
Temperatur	ISA+15ºC	

Table 3. Holding Parameter

No.	Parameter	Formula	Value	Unit
1	K (Conversion factor)	Altitude 6000 ft and ISA+15ºC	1.1231	
2	V	V= Kx IAS	247.082	kt
3	v	v= V/3600	0.068634	NM/s
4	R	R= 509.26/V	2.061097	°/s
5	r	r=V/62.83R	1.907988	NM
6	h	in thousand feet	6	ft
7	w	w = 2h+47	59	kt
8	w'	w'=w/3600	0.016389	NM/s
9	E45	E45= 45w'/R	0.357819	NM
10	t	t = 60T	60	S
11	L	L= v x t	4.118033	NM
12	ab	ab = 5v	0.343169	NM
13	ac	ac= 11v	0.754973	NM
14	gi1 = gi3	gi1=gi3= (t-5)v	3.774864	NM
15	gi2=gi4	gi2-gi4= (t+21)v	5.559345	NM
16	Wb	Wb=5w'	0.081944	NM
17	Wc	Wc= 11w'	0.180278	NM
18	Wd	Wd = Wc +E45	0.538097	NM
19	We	We= Wc +2E45	0.895916	NM

20	Wf	Wf= Wc + 3E45	1.253735	NM
21	Wg	Wg= Wc +4E45	1.611554	NM
22	Wh	Wh = Wb+4E45	1.513221	NM
23	Wo	Wo = Wb+5E45	1.87104	NM
24	Wp	Wp = Wb+6E45	2.228859	NM
25	Wi1=Wi3	Wi1=Wi3 =(t+6)w'+4E45	2.512943	NM
26	Wi2=Wi4	Wi2=Wi4 = Wi1 +14w'	2.742388	NM
27	Wj	Wj = Wi2 +E45	3.100207	NM
28	Wk = Wl	Wk = Wl = Wi2 +2E45	3.458026	NM
29	Wm	Wm = Wi2+3E45	3.815845	NM
30	Wn3	Wn3= Wi1 +4E45	3.94422	NM
31	Wn4	Wn4 = Wi2 +4E45	4.173664	NM

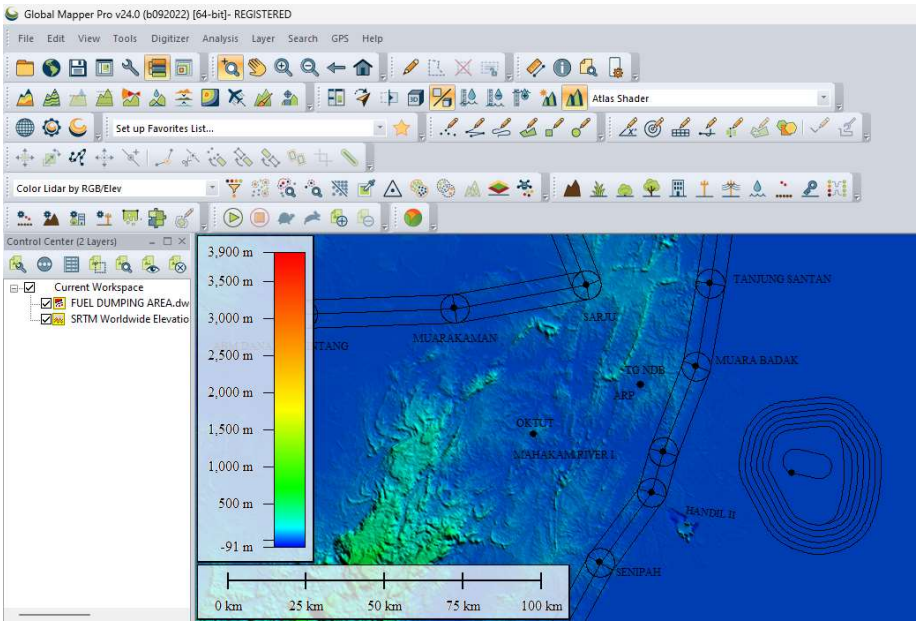

Fig 4. Fuel Dumping Area

With the parameters set, the design of the fuel dumping area using AutoCAD and Global Mapper, as the picture above.

In the validation phase of the research, interviews were conducted to verify the designed of fuel dumping area. Interviews were carried out with PANS-OPS experts from the Perum LPPNPI Head Office, Academic Experts in PANS-OPS, and ATC personnel from the Perum LPPNPI Samarinda Sub-Branch . the results of the interviews is the protection of the designed fuel dumping area in compliance with applicable standards based on ICAO Document 8168 PANS-OPS. Data usage is consistent with the design requirements and it is from valid sources. The data utilized for designing the fuel dumping area complies with the required specifications. The criteria and methods employed in this design are also comply with requirements.

The safety assessment has been conducted following the design procedures. The fuel dumping area is not intersect with flight procedures in the surrounding area. Potential future challenges that may arise in the implementation of the fuel dumping

area are subject to evolving airspace developments, such as the establishment of new flight routes. These changes could impact the location of the fuel dumping area in the future if issues arise. Moreover, validation is necessary before field implementation.

IV. COMPLETION

The absence of a fuel dumping area in the SOP can lead to difficulties in emergency handling and decision-making that may affect operational and flight safety. Furthermore, it could result in environmental pollution due to fuel discharge into the air without a designated airspace. Therefore, we have designed a fuel dumping area at the Perum LPPNPI Samarinda Sub-Branch that adheres to airspace conditions and required regulations. The designed fuel dumping area is located over open water in accordance with ICAO Document 4444 Air Traffic Management regarding fuel dumping. The coordinates of the fuel dumping area are Latitude 00° 37` 40.29" S and Longitude 117° 41' 11.54" E. The design positions the fuel dumping area away from VFR corridor routes to ensure enhanced flight safety. Based on the results of validation from validators, it has been determined that the protection of the designed fuel dumping area adheres to the prevailing standards as outlined in ICAO Document 8168 PANS-OPS. The use of data is suitable for design requirements, and the data sources are valid. The data employed in designing the fuel dumping area align with the required specifications. The criteria and methods utilized in this design are also in compliance.

V. CONCLUSION

Based on the results of the research and discussion that have been described, it can be concluded that the design of the fuel dumping area that aligns with appropriate flight navigation procedures in Samarinda complies with the applicable provisions in ICAO Document 4444 Air Traffic Management, ICAO Document 8168 PANS/OPS/611/ Vol.II – Construction of Visual and Instrument Flight Procedure, and the relevant local procedures. The research and design of the fuel dumping area at the Perum LPPNPI Samarinda Sub-Branch is located at a distance of 30 Nautical Miles from TG NDB, exactly at coordinates 00° 37` 40.29" S and 117° 41' 11.54" E. The design of the fuel dumping area can be utilized as an attachment to be included in the SOP of the Perum LPPNPI Samarinda Sub-Branch and LOCA (Letter of Operational Coordination Agreement). The results of this research can serve as a reference when implemented, but require further assessment by relevant aviation authorities. We hope that this fuel dumping area design progresses to Research and Development (R&D) level 2, involving product testing, as this research has only reached the validation phase of the design.

REFERENCES

[1] Undang-Undang Republik Indonesia Nomor 1 Tahun 2009 Tentang Penerbangan.

[2] International Civil Aviation Organization. (2013). Annex 19 : Safety Management.

[3] Kementrian Perhubungan. (2021). Peraturan Menteri Perhubungan Republik Indonesia Nomor

PM 29 Tahun 2021 Tentang Peraturan Keselamatan Penerbangan Sipil Bagian 172 Tentang Penyelenggara Pelayanan Manajemen Lalu Lintas dan Telekomunikasi Penerbangan.

[4] International Civil Aviation Organization. (2016). Document 4444 : Procedures for Air

Navigation Services : Air Traffic Management.

[5]Direktorat Jenderal Perhubungan Udara. (2010). Safety Circular Nomor :

AU.3652/DNP/660/2010 Tentang Pedoman Pelayanan Lalu Lintas Penerbangan Dalam Melayani Pesawat Udara Yang Melakukan Pembuangan Bahan Bakar (Fuel Dumping).

[6] Perum LPPNPI. “Prosedur Operasi Standar Pelayanan Lalu Lintas Penerbangan Aerodrome Control Service (TWR).

[7] Pradana, Aminarno Budi. Metode Penelitian Ilmiah Sekolah Tinggi Penerbangan Indonesia.

[8] Sugiyono, D. (2013). Metode Penelitian Kuantitatif, Kualitatif, Dan Tindakan.

[9] International Civil Aviation Organization. (2006). Document 8168 - Procedures for Air

Navigation Services Aircraft Operations Volume II - Construction of Visual and Instrument Flight Procedures.