

ATS ROUTE DESIGN BETWEEN PKY VOR PALANGKA RAYA AND PNK VOR PONTIANAK

Muhammad Nabil Wahid Zulfikar^{*(1)}, Rany Adiliawijaya Putriekapuja⁽²⁾, Wisnu Darjono T.U.⁽³⁾

^{1,2,3}Politeknik Penerbangan Indonesia Curug

e-mail: ¹nabilwhd@gmail.com, ²rany.adiliawijaya@ppicurug.ac.id, ³wdtu1956@gmail.com

coresponding: ¹nabilwhd@gmail.com

Received :
9 October 2024

Revised :
12 November 2024

Accepted :
20 December 2024

Abstract: ATS route is a specified path that manages air traffic flow for air traffic operations. It is designated based on user requirements, air traffic, and suitable NAVAIDs. Based on preliminary study and interviews, ATS route between Palangka Raya and Pontianak is needed for the operators like ATCs and Pilots for a shorter distance route and simplify the separations to improve safety and efficiency. This study aims to design an ATS route based on the PANS OPS rules and methods from ICAO. by using level 1 Research and Development method, ATS route between Palangka Raya and Pontianak is able to be designed and solved needs from the operators.

Keywords: ATS Route, Efficiency, Safety

Introduction

Perum LPPNPI Palangka Raya Branch serves Visual Flight Rules (VFR) and Instrument Flight Rules (IFR) flights every day and serves scheduled and unscheduled flights. Palangka Raya CTR Airspace has three main ATS routes for IFR flights, namely W15, W15N, and W31. An ATS route is an imaginary route that an airplane takes from one point to another. According to CASR (*Civil Aviation Safety Regulation*) 170 *Air Traffic Rules*, An ATS route is a particular route designed to facilitate the flow of aviation traffic as required to provide aviation traffic steering services.

In practice, there are still flights that do not have ATS routes to reach airport destinations, namely unscheduled flights or unscheduled cargo flights from Tjilik Riwut Airport, Palangka Raya to Supadio Airport, Pontianak and vice versa. The closest flight route from the two airports is W35 which connects BDM VOR Banjarmasin with PNK VOR Pontianak, so indirectly the plane must fly to intercept W35 first.

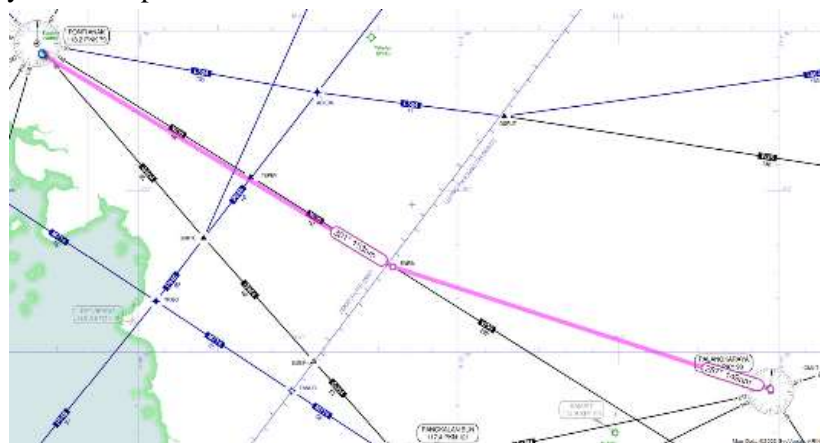


Figure 1. Palangka Raya - Pontianak Flight Illustration via Flight Plan Route

This affects safety, as well as fuel use if the plane does not take a direct route, which has an impact on efficiency. Efficiency is a measure of the level of resource use in a process. The more economical or minimal use of resources, the more efficient the process is said to be (Sedarmayanti, 2017). Apart from that, the separation used for flights from Palangka Raya to Pontianak with flights to Jakarta is the same track, if the application occurs faster at the back, then the separation that can be used is only 5 minutes level cross.

This is considered less efficient because the separation requires time to calculate and the result is a fairly long time difference, making it not speed up air traffic flow (Dmochowski & Skorupski, 2017). In another case, W35 is an active route that connects Pontianak and Banjarmasin, with the direct ATS route from Palangka Raya to Pontianak, this can avoid conflicts for users of the W35 route if separation is not implemented (Trapsilawati et al., 2022). Therefore, supporting facilities are needed so that flights become safer by minimizing the risk and possibility of accidents (Georgiev, 2021). The design of an ATS Route between PKY VOR and PNK VOR is needed to ensure flight safety and create more efficient flights.

Method

In this research, the author used research and development methods or Research and Development level 1, namely the author conducted research by designing a product and validating the product with experts, without conducting product trials in the field (Sugiyono, 2019). The research steps that the author carried out started by looking for potential and problems, continued with product design, and validated the results of the product that had been designed (Pradana, 2019).

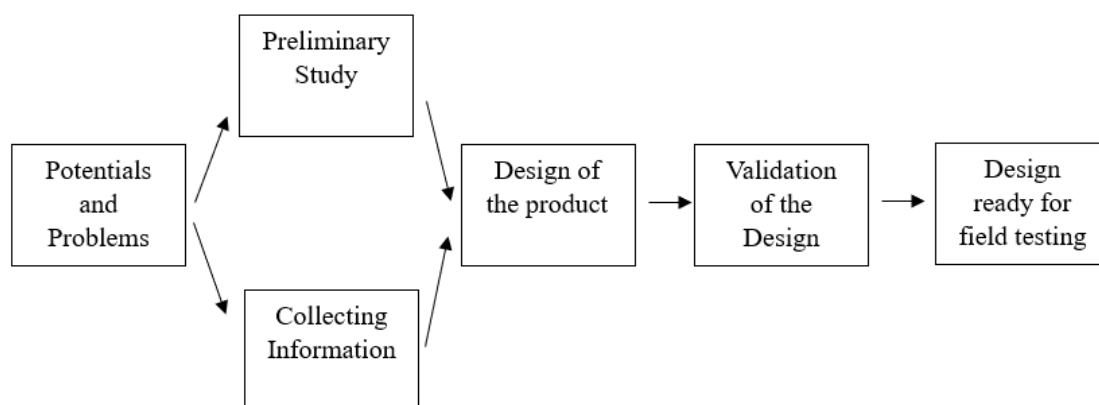


Figure 2. Research and Development level 1 stages.

In this research the author carried out several data collection techniques, namely:

1. Preliminary study

Preliminary study is a study carried out to sharpen the direction of the main study. At the preliminary study stage, the author uses the Gap analysis method to determine the potential and problems that exist at the research location. Gap analysis is the process of identifying differences between the current situation and what should exist in the organization, and is used to design organizational implementation plans and to improve organizational effectiveness (Kim & Ji, 2021). In this research, Gap analysis table were analyzed and resulting ideal conditions where the ATS route helps Pilots to travel in shorter distance which reduce fuels, and ATCs to use more efficient separation which reduce flight delays.

2. Documentation study

This technique is used to explore potential problems and look for information or data related to the problem being studied. The author collected data from Perum LPPNPI Palangka Raya Branch and Perum LPPNPI Pontianak Branch in the Aeronautical Information Publication for the data needed in designing ATS routes. The specified data were Aerodrome Data such as runway and obstacles, ATS airspace, and Navigation aids data type and coordinates to identify the points needed for the ATS route.

3. Interview

As explained by Sugiyono, (2019) interviews are used as a data collection technique if researchers want to conduct a preliminary study to find problems that must be researched. In this research, the author plans to use an unstructured type of interview, the author also used a needs assessment, namely interviews conducted to determine the needs of users in the field related to what plans are needed to meet aviation traffic service needs. The interviews were conducted to 3 (three) ATCs from Palangka Raya as the main object of this article. The interviews answers the needs of the ATS route directly to Pontianak because of the advantages of that route.

Data analysis method

After collecting the necessary data, it needs to be analyzed so that it can be presented well. The analysis technique is carried out when the data collection process has been completed. The author uses the Miles & Huberman model as explained by Sugiyono, (2019):

1. Data Reduction

Data reduction means summarizing, sorting out the main things, and focusing on things that are considered important. So the reduced data can provide a clear picture and make it easier for researchers in the research process.

2. Data Display

After reducing the data, the author presents it to make it easier for readers to understand what happened. In this case the author presents data using narrative text, tables and graphs if necessary to draw conclusions.

3. Conclusion Drawing/Verification

The next step is conclusion and verification. The author carried out this stage to determine the correctness of the plans made based on the opinions of experts in the specified fields..

Discussion

Based on the data that the author has collected through gap analysis mapping in preliminary research and interviews in the needs assessment, the author then creates an ATS route plan between PKY VOR Palangka Raya and PNK VOR Pontianak. In making plans, the author studied based on ICAO Doc 8168 OPS/611 *Aircraft Operation Volume II Sixth Edition* and ICAO Annex 11 *Air Traffic Services 13rd Edition* using simplified/standard methods.

1. Design of the product

The product design carried out by the author refers to *International Civil Aviation Organization*, *ICAO Quality Assurance Manual for Flight Procedure Design – Doc 9906 Part I Chapter 7 Design Method 23 Points 7.5.3* and one of the design methods is COTS Software. The author uses AutoCAD 2018 and Globalmapper software as a form of COTS software.

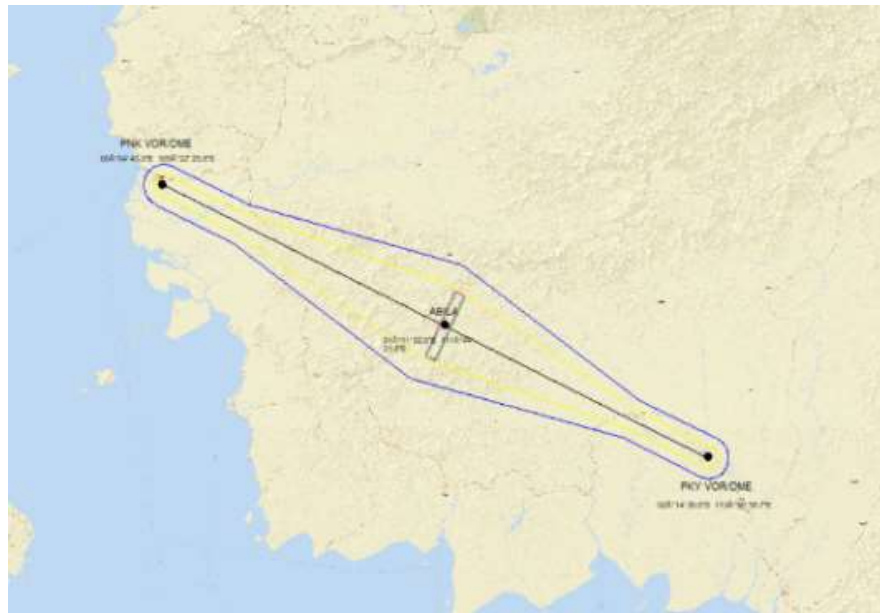


Figure 3. Design of *ATS Route* Palangka Raya – Pontianak

Based on the data that the author obtained from preliminary studies and interviews, the author looks for similarities in views, thoughts and opinions without eliminating other opinions that are different. The author found the potential to design an ATS route between PKY VOR Palangka Raya and PNK VOR Pontianak. The author uses the gap analysis method. After that, the author conducted a needs assessment interview with ATC at Perum LPPNPI Palangka Raya Branch to find out the urgency and needs related to the design. Factors to consider when creating an ATS route according to ICAO Doc. 8168 is obstacle clearance areas, obstacle clearance, construction of areas for VOR routes, and promulgation.

2. Product advantages

Based on the results of preliminary study and interviews, the ATS route design is needed in accordance with operational needs, both from the ATC side and the Pilot side. This design is included in the en-route flight segment, where the en-route phase from Palangka Raya to Pontianak currently has to go through a non-direct ATS Route, making en-route phase flights inefficient (Liu et al., 2021). This design also has a positive effect on flights in terms of safety and efficiency, this happens because pilots who request to fly directly from Palangka Raya to PNK VOR can be accepted by ATC, and the separation is shorter because the difference in the angle of the two routes is greater (Chu et al., 2024). The ATS route designed by the author meets the requirements of PM 65 of 2017 regarding area protection in accordance with ICAO Doc. 8168, this ensures the safety of aircraft passing through this route.

After studying potential problems and the design to be made, the author created an ATS route design between PKY VOR and PNK VOR that could be implemented. Flight safety can be more guaranteed because the position of the aircraft can be ensured and there is area protection (Akzigitov et al., 2022). The efficiency factor can also be achieved because the route directly connects the two VORs, without the need for other ATS route intercepts, this can cut the distance by up to 10 NM compared to the previous route used.

Apart from that, this design can also be useful for determining the separation between flights from Tjilik Riwut Airport, Palangka Raya to Supadio Airport, Pontianak, and planes to

Soekarno-Hatta International Airport, due to the different angles of the route designed by the author with route W15 (to Jakarta) has a difference of more than 45° so that different track separation can be applied, thereby reducing the time used in implementing separation which makes flights more efficient (CAI et al., 2023). Flights using this new separation can save 10 to 15 minutes, this can have a positive effect on fuel emissions and thus reduce air pollution. (Čokorilo, 2016). This research is also future proof or can be useful for further research, for example the creation of Standard Instrument Departure (SID) and Standard Arrival (STAR) if implemented, so that it can facilitate ATC performance in its operational activities (Rezo, 2020).

3. Validation of the design

Design validation is a design stage where the design results are given an assessment of their suitability for later implementation. At the design validation stage, the author conducted interviews with people who were considered experts in the field of PANS-OPS or design. There were 3 people such as Lecturer of air traffic controller expert (Mr. Djoko Jatmoko), PANS-OPS Designer expert (Mr. Obor Rudiansyah Mandala), and Air Traffic Controller with PANS-OPS certified (Mr. Wahyudi Prasetyo). All of those three experts had validated the design and the ATS route declared eligible for field testing.

Table 1. Interview Results from Validation of the design

Question 1: What user needs must be considered when designing an ATS route?		
No	Respondents	Answers
1.	Djoko Jatmoko (Air Traffic Controller Education Expert)	There are three needs that users must pay attention to when designing an ATS route, namely ATC personnel who understand the procedures, the procedures to be implemented, and the facilities and instruments related to the design.
2.	Obor R. Mandala (PANS-OPS Designer)	User needs that must be considered are the amount of traffic from Palangka Raya to Pontianak and vice versa, as well as overflying traffic that crosses. As well as navigation (VOR/DME) which is used in designing ATS routes.
Conclusion: User needs that must be considered in designing an ATS route include ATC personnel, procedures implemented in accordance with Doc 8168 PANS OPS, facilities/instruments on the aircraft and on the ground, and the ATS route specifications used.		
Question 2: Is the ATS route design in accordance with user needs?		
No	Respondents	Answers
1.	Wahyudi Prasetyo (ATC with PANS-OPS certified)	The design is in accordance with user needs, what must be paid attention to is that it must comply with Doc 8168 regarding PANS-OPS. Previously, traffic heading to Palangka Raya used the W35 route towards Banjarmasin,

		whereas on this route there was already a lot of traffic crossing it.
Conclusion: The ATS route design is in accordance with user needs.		
Question 3: Is the data collected in accordance with the data needed in making the ATS route design?		
No	Respondents	Answers
1.	Obor R. Mandala	The data collected is in accordance with the needs of ATS route design, namely data originating from AIP Indonesia and terrain data (DTM).
Conclusion: The data collected and its supporting elements are appropriate and complete.		
Question 4: Is the data collected based on appropriate and valid data sources?		
No	Respondents	Answers
1.	Djoko Jatmoko	Overall, the data collected is in accordance with the guidelines and regulations, namely Doc. 8168 PANS OPS.
Conclusion: The data required is sufficient and based on appropriate sources		
Question 5: Are the Nav aids, TMA and Obstacle data used appropriate to actual conditions?		
No	Respondents	Answers
1.	Wahyudi Prasetyo	The navigation data, TMA and obstacle data used are in accordance with those in the field.
Conclusion: the Nav aids, TMA and Obstacle data used are in accordance with actual conditions.		
Question 6: Is the method used in creating this design in accordance with the ATS route design procedure?		
No	Respondents	Answers
1.	Obor R. Mandala	The method used in making the design is in accordance with the procedures referred to in Doc 8168 Vol II Edition 7, 2020.
Conclusion: The method used in making the design is in accordance with the ATS route design procedure.		
Question 7: Are the media or tools used in creating the ATS route design appropriate?		
No	Respondents	Answers
1.	Obor R. Mandala	The media or tools used are appropriate, in accordance with the PANS OPS learning process at PPI Curug, cadets are required to understand how to make drawings manually with CAD software (AutoCAD and GlobalMapper). Furthermore, for future design you need to use design software.
Conclusion: The media used in creating the ATS route design is appropriate and appropriate.		

Question 8: Is aircraft movement efficiency included in the criteria for designing ATS routes?		
No	Respondents	Answers
1.	Djoko Jatmoko	The main need in designing an ATS route is the safety aspect, then the efficiency aspect. In this design, both aspects have been fulfilled.
Conclusion: Aircraft movement efficiency is included in the criteria for designing ATS routes after safety.		
Question 9: Does the ATS route design take into account the efficiency of aircraft movements?		
No	Respondents	Answers
1.	Wahyudi Prasetyo	In terms of efficiency, it is clearly more efficient because the aircraft can move directly without passing certain points, but the priority is safety because the aircraft has flown directly several times without an ATS route being used.
Conclusion: The design of this ATS route has taken into account the efficiency of aircraft movements.		
Question 10: Is the area protection in this design in accordance with the ATS route design procedure?		
No	Respondents	Answers
1.	Obor R. Mandala	The area protection in this design refers to Doc 8168 Vol II Edition 7, 2020.
Conclusion: The design rules including area protection in this design are in accordance with the procedure, namely Doc 8168 PANS OPS.		
Question 11: Will the implementation of this ATS route design improve the safety of aircraft movements?		
No	Respondents	Answers
1.	Djoko Jatmoko	ATS routes can increase aircraft movements because they have restricted areas that refer to safety. Apart from that, procedures, users and facilities must be supportive.
Conclusion: Implementation of ATS route design can indirectly improve the safety of aircraft movements.		
Question 12: What are the potential obstacles that might arise if this ATS route design is implemented?		
No	Respondents	Answers

1.	Wahyudi Prasetyo	So far there has been no estimate of the potential obstacles that might arise if this ATS route design is implemented.
Conclusion: There are no potential obstacles that are expected to arise if this design is implemented.		
Question 13: Is this ATS route design feasible to implement? If not, what needs to be improved?		
No	Respondents	Answers
1.	Djoko Jatmoko	Based on this draft design, the ATS route between PKY VOR and PNK VOR is feasible, but still requires approval from the relevant parties, namely the operator and the regulator.
2.	Obor R. Mandala	This ATS route design is feasible, you only need to add a map between the PNK-ABILA-PKY segments.
3.	Wahyudi Prasetyo	In my opinion, this ATS route design is feasible to implement. Flights to Palangka Raya have become safer and more efficient.
Conclusion: Based on three experts who are experts in their respective fields, this ATS route design is feasible to implement.		

Conclusion

In conclusion, the ATS route design between PKY VOR Palangka Raya and PNK VOR Pontianak aims to enhance flight safety and efficiency by providing a direct route and created more efficient separations. This direct path reduces travel distance, leading to fuel savings and reduced emissions. The study utilized research and development methodologies, including preliminary studies, gap analysis, and needs assessments, to identify and address existing inefficiencies.

By aligning the design with ICAO standards and PM65 of 2017, the proposed route meets essential safety requirements and offers operational advantages for ATCs and pilots. Validation from experts in air traffic control and PANS-OPS confirmed the design's feasibility, indicating its potential for future application and further integration with SID and STAR procedures, supporting more efficient air traffic flow. This route design is not only practical but also forward-looking, providing a framework that can benefit ongoing air traffic management advancements.

Bibliography

- Akzigitov, R., Kuznetsov, E., Musonov, V., & Timokhov, A. (2022). Ensuring the Safety of Aircraft Flights in Ornithological Terms. *Transportation Research Procedia*, 68, 566–572. <https://doi.org/10.1016/j.trpro.2023.02.077>
- CAI, Q., Jie ANG, H., & ALAM, S. (2023). Collision risk assessment of reduced aircraft separation minima in procedural airspace using advanced communication and navigation. *Chinese Journal of Aeronautics*, 36(4), 315–337. <https://doi.org/10.1016/j.cja.2022.11.016>
- Chu, N., Ng, K. K. H., Liu, Y., Hon, K. K., Chan, P. W., Li, J., & Zhang, X. (2024). Assessment of approach separation with probabilistic aircraft wake vortex recognition via deep learning. *Transportation Research Part E: Logistics and Transportation Review*, 181(November

- 2023). <https://doi.org/10.1016/j.tre.2023.103387>
- Čokorilo, O. (2016). Environmental Issues for Aircraft Operations at Airports. *Transportation Research Procedia*, 14, 3713–3720. <https://doi.org/10.1016/j.trpro.2016.05.491>
- Dmochowski, P. A., & Skorupski, J. (2017). Air Traffic Smoothness. A New Look at the Air Traffic Flow Management. *Transportation Research Procedia*, 28, 127–132. <https://doi.org/10.1016/j.trpro.2017.12.177>
- Georgiev, K. (2021). *Aviation safety training methodology*. 7.
- Kim, S., & Ji, Y. (2021). Gap Analysis. *Gap Analysis*, April, 116–127. <https://doi.org/10.1201/ebk1439839560-9>
- Liu, Y., Hansen, M., Ball, M. O., & Lovell, D. J. (2021). Causal analysis of flight en route inefficiency. *Transportation Research Part B: Methodological*, 151(July), 91–115. <https://doi.org/10.1016/j.trb.2021.07.003>
- Pradana, A. B. (2019). *Metode Penelitian Ilmiah Sekolah Tinggi Penerbangan Indonesia*. 1–120.
- Rezo, Z. (2020). South East Common Sky Initiative Free Route Airspace. *Transportation Research Procedia*, 45(2019), 676–683. <https://doi.org/10.1016/j.trpro.2020.02.111>
- Modeling, 53(9), 1689–1699.
- Sugiyono. (2019). *Metode Penelitian Kuantitatif Kualitatif dan RND*. ALFABETA.
- Sedarmayanti. (2017). Manajemen Sumber Daya Manusia. *Journal of Chemical Information and Modeling*, 53(9), 1689–1699.
- Sugiyono. (2019). *Metode Penelitian Kuantitatif Kualitatif dan RND*. ALFABETA.
- Trapsilawati, F., Prastiwi, P. B., Vista, Y., Myesha, Z., Herliansyah, M. K., & Wijayanto, T. (2022). Investigating traffic and controller factors in spatial multitasking: The context of air traffic conflict resolution. *International Journal of Transportation Science and Technology*, 11(3), 536–544. <https://doi.org/10.1016/j.ijtst.2021.07.006>