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Review of Standardization of Parking Area Markings at Aji Pangeran Tumenggung Pranoto Airport, Samarinda

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ABSTRACT

The rapid growth of flight operations at Aji Pangeran Tumenggung Pranoto Airport in Samarinda has raised concerns regarding the standardization and effectiveness of parking stand markings on the apron, which are crucial for ensuring safety and efficiency. This study aims to evaluate and redesign the standardization of parking stand markings to address these concerns. Field findings during On-the-Job Training (OJT) revealed several issues, including inconsistencies in Stopline Marking placements, discrepancies between parking stand data and the Aeronautical Information Publication (AIP), as well as the deterioration of markings due to weather exposure and apron vehicle movement. This research adopts a qualitative descriptive approach with triangulation of observation, interviews, and document review to ensure the validity of findings. Results suggest the need for corrective measures such as repainting faded markings, repositioning Stopline Markings for better visibility and accuracy, and updating parking stand coordinates in the AIP. Implementing these improvements is expected to enhance apron operational safety and align with Regulation PR 21 of 2023 and internationally recognized aviation standards.

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INTRODUCTION

According to Law No. 1 of 2009 concerning Aviation, "An airport is an area on land and/or water with certain boundaries that is used as a place for aircraft to land and take off, for passengers to board and disembark, loading and unloading cargo, and transferring passengers between modes of transportation, equipped with aviation safety and security facilities, as well as basic and supporting facilities."[1]

Aji Pangeran Tumenggung Pranoto Class 1 Airport (IATA: AAP, ICAO: WALS) is located in the Sungai Siring area of Samarinda, East Kalimantan. Officially opened on May 24, 2018, it replaced Temindung Airport, which had limited development capacity. Strategically located in the capital city of East Kalimantan Province, this airport supports regional economic activities, particularly those related to mining and gas industries, and plays a critical role in supporting the development of Indonesia's new capital city (IKN).

The airport has seven parking stands, with Parking Stands 1 and 2 equipped with double tunnel jet bridges and primarily used for narrow-body aircraft. Parking Stands 6, 7, and 8 accommodate smaller aircraft. The highest utilization is seen at Stands 1 and 2 due to their connectivity with the terminal. The airport serves domestic flights through scheduled and non-scheduled airlines such as Batik Air, Super Air Jet, Citilink, Smart Aviation, and Mission Aviation Fellowship, as well as military and police aircraft. Based on the AMC Worksheet (Dec–Jan 2024), the airport operates an average of 14 flights per day, underscoring the growing demand for efficient apron operations.

In response to increased flight activity, Aji Pangeran Tumenggung Pranoto Airport is planning to revise the layout and standardization of apron markings to ensure better spatial utilization and operational safety. Preliminary assessments conducted by the author indicate inconsistencies in marking positions, faded lines, and the need for additional markings in accordance with the revised regulations. The markings require adjustments not only in placement but also in coloring and design to comply with the standards stipulated in the Director General of Civil Aviation Decree No. PR 21 of 2023.

To investigate these conditions, this study employs a qualitative descriptive method, supported by triangulation of observation, interviews, and document analysis. The observation was conducted over a four-week period during the author's On-the-Job Training (OJT), covering daily apron operations, marking visibility, and safety risks. Six informants were interviewed, including ground handling staff, apron safety officers, and airport operations personnel. Documentation tools used include high-resolution digital cameras, apron layout maps, and airport operations manuals. Triangulation was applied to validate data from multiple sources and ensure accuracy of findings.

The problem formulation of this research focuses on how to optimize the standardization of apron markings at Aji Pangeran Tumenggung Pranoto Airport to enhance safety and compliance. The objective is to evaluate existing marking conditions and propose a redesign based on current regulatory standards. The scope of the study is limited to the main apron area and does not cover runway or taxiway markings.

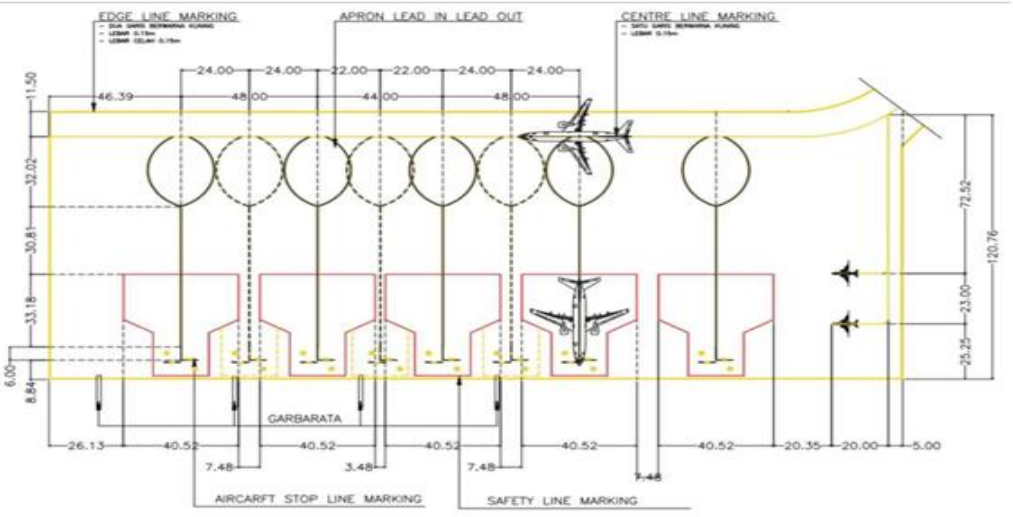

Figure 1 Layout of Apron 1-7 Markings and Garbarata Parking Stand

METHODS

This study employs a qualitative descriptive approach aimed at presenting a detailed and systematic depiction of the phenomena observed in the field. The analysis process involves data reduction, categorization, and conclusion drawing, which are presented narratively to reflect actual conditions. The data were analyzed iteratively, with continuous validation through triangulation of sources and techniques to ensure credibility and reliability.[2]

Data collection was conducted over a period of four weeks during the author's On-the-Job Training (OJT), with a specific focus on the main apron area of Aji Pangeran Tumenggung Pranoto Airport. The data collection methods consisted of: (1) direct observation of apron activities, marking placements, and safety hazards, conducted daily for 2–3 hours per session; (2) semi-structured interviews with one key informants, including airport operations officers, marshallers, marking technicians, and ground handling personnel; and (3) documentation, which involved the use of high-resolution digital cameras to capture current marking conditions, apron layout maps, and internal airport documents such as technical manuals and operational reports.

Table 1. Research Stage

No	Research Stage	Description
1	Problem Identification	Initial observation at the apron and review of PR 21 of 2023 documentation
2	Objective and Scope Formulation	Evaluation and redesign of apron marking standardization
3	Data Collection	Field observations, key informant interviews, photo and map documentation
4	Data Analysis	Coding of findings, issue categorization, validation through triangulation
5	Conclusion and Recommendation	Formulation of improvement recommendations based on aviation regulations

To ensure data validity, a triangulation method was applied by comparing findings from multiple sources and techniques. Additionally, manual coding of interview transcripts was conducted to identify themes, patterns, and potential hazards. The analysis revealed two major findings classified as hazards: the misplacement of Stopline markings and the fading or absence of certain markings due to weather exposure and vehicle activity.

Conceptually, an aircraft parking stand is a designated area on the airport apron where aircraft are parked when not engaged in boarding, deboarding, or maintenance. These stands are typically equipped with facilities for handling passengers and cargo, as well as providing necessary ground services. A parking stand or aircraft parking area can also be defined as a specific area on the airport apron where aircraft are parked when not undergoing boarding, deboarding, or maintenance.[3]

According to PR 21 of 2023, which refers to the *Manual of Standards CASR Part 139 Volume I – Land Aerodrome*, markings are defined as symbols or sets of symbols displayed on movement area surfaces to convey aeronautical information. Markings serve to guide, inform, and establish movement boundaries to ensure aviation safety.

Standardization in aviation refers to the process of establishing and implementing rules, procedures, and technical specifications that must be adhered to across various aviation sectors. Its primary objectives are to ensure safety, efficiency, and operational consistency at both national and international levels.[4] Therefore, apron markings—particularly aircraft parking stands—must comply with the recommendations and standards outlined in PR 21 of 2023.

RESULT AND DISCUSSION

The Apron Movement Control Unit (AMC) has a vital role in ensuring the safety of personnel, vehicles, and aircraft movements on the airside, particularly in the apron area under its authority. To fulfill this function, the standardization of apron markings is essential for ensuring safe, smooth, and secure aviation operations and for minimizing the risk of incidents or accidents.[5].

1. The current condition of the stopline marking does not correspond to the aircraft parking position.

Aircraft Stopline Marking is defined as a yellow bar that functions as a visual stop guide for pilots when parking at the designated parking stand. According to PR 21 of 2023, Section 5.3.4.2: "Stopline markings shall be located perpendicular to the lead-in line, at a minimum distance of 6 meters from the end of the lead-in line, with a minimum length of 6 meters and width of 15 centimeters[6]. Additionally, ICAO Doc 9157 (Airport Services Manual, Part 2) states: "The stop line should be visible to the pilot and positioned such that the aircraft nose wheel stops at the intended position, ensuring clearance from passenger boarding bridges and other obstacles." (Doc 9157, 2nd Ed., Section 3.4.3)[7]

Currently, the Stopline Markings at Parking Stands 1 and 2 do not comply with these regulations, as they still use outdated positions from before the construction of the new taxiway. Based on the author's observations during On-the-Job Training (OJT) with the AMC unit, this mismatch between markings and aircraft parking positions creates a misalignment with the jet bridges and increases the risk of operational disruption. Aircraft Stopline Marking is a yellow bar-shaped line that serves as a stop sign for aircraft parking at the Parking Stand. The Aircraft Stopline Marking is located at the extension of the lead-in, 6 meters from the end of the lead-in.[6]

Currently, there are issues due to the markings not being in compliance, so improvements are needed. The location of the stopline markings on Parking Stands 1 and 2 is not in compliance because they are still using the old markings from before the installation of the taxiway, so the markings on Parking Stands 1 and 2 must be changed. The image above shows the layout of Parking Stand 1–7 with an area of 300 m x 123 m. Based on observations made by the author during On-the-Job Training (OJT) at the AMC Parking Stand 1–7 unit, the markings on the apron do not comply with applicable regulations, such as the absence of stop line markings and reduced visibility of the markings. It is hoped that these issues can be resolved in accordance with applicable aviation safety standards. Based on the author's observations while at the apron movement control (AMC) unit, the author identified issues with Stopline Marking that do not comply with regulations.

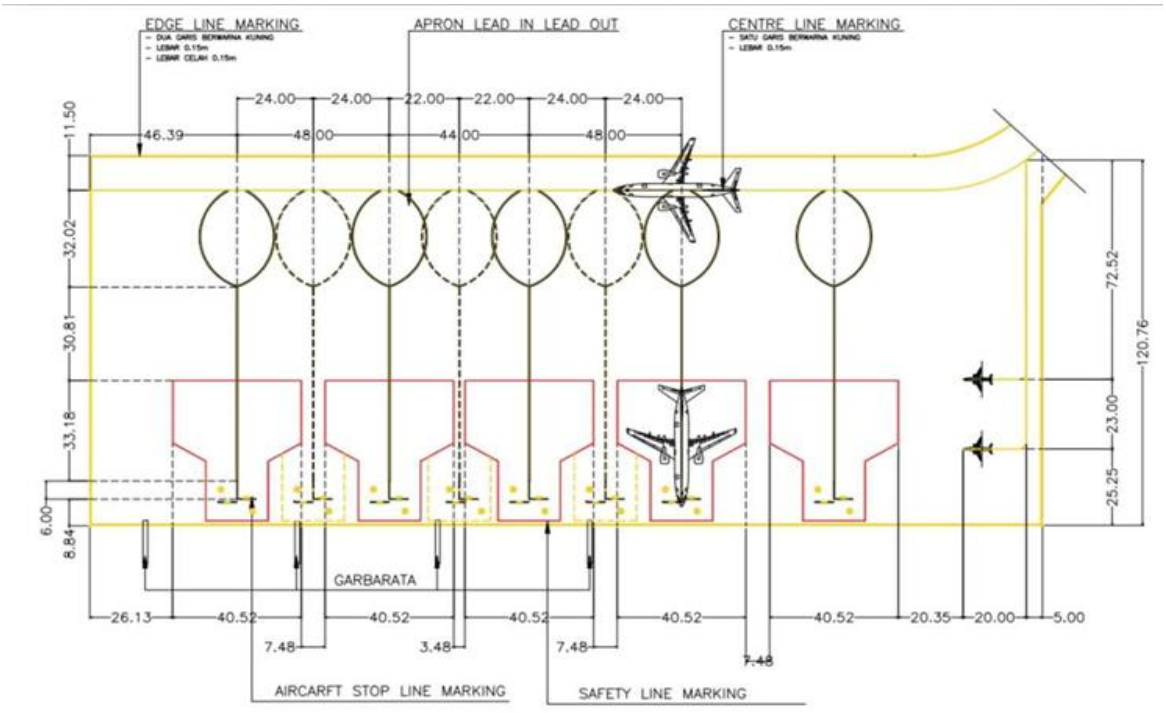

Figure 2 Layout of Apron 1-7 Markings and Garbarata Parking Stand

Figure 3 Stopline Marking at A.P.T. Pranoto Airport

2. Current Conditions Aircraft Safety Lines Have Begun to Fade

Based on the author's observations, there are several factors that cause damage or fading of markings on Parking Stands 3, 4, 5, 6, and 7, namely:

1) Use of Parking Stands. The more frequently Parking Stands are used, the more intense the traffic of GSE vehicles operating there will be. This causes friction and abrasion from tires, causing markings to fade and gradually become invisible. Additionally, oil spills from GSE vehicles can affect the visibility of airport markings.
2) Weather and Temperature Conditions. Weather changes can cause markings to fade. Weather changes from hot to rainy and vice versa cause markings to fade if they are not repainted periodically within a certain time frame. The faded condition of the markings poses potential hazards when providing services to aircraft, including:
    a. Ground handling personnel may misplace equipment because the boundaries on the markings are not visible due to fading, potentially leading to incidents.
    b. The absence of no-parking area markings means that information about boundaries in areas where vehicles or equipment are not permitted to enter is not communicated.

Figure 4 Parking Stand 3 Condition

A similar issue was recorded at Soekarno-Hatta International Airport (Angkasa Pura II, 2022), where faded apron markings contributed to several minor ground incidents. As a response, they

introduced UV-resistant paint materials and established a CCTV-based real-time monitoring system to assess wear and tear of apron surfaces. A.P.T. Pranoto Airport can adopt this best practice to strengthen preventive maintenance and reduce risks.

Problem Sloving

1. Stopline Marking Location Not Appropriate

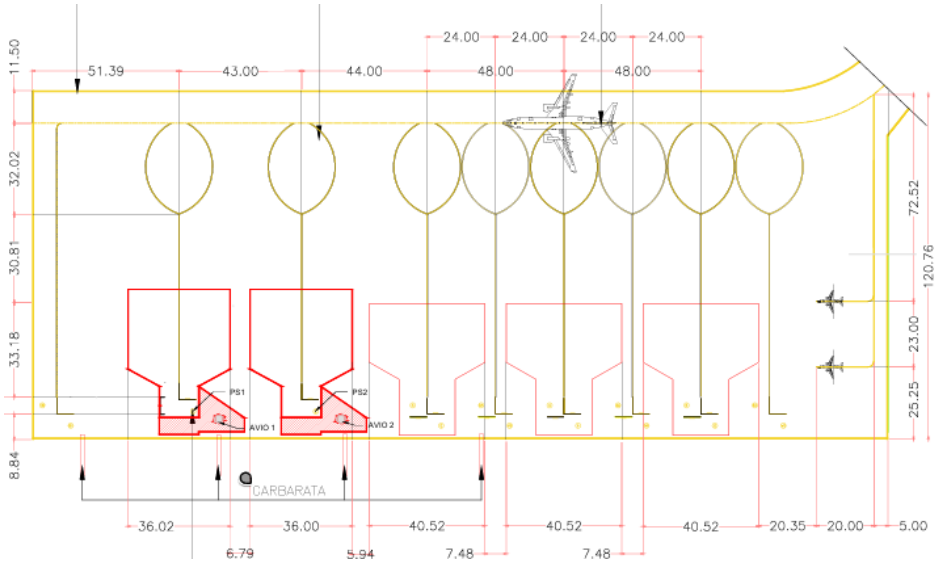

Figure 5 Illustration of Apron Marking Changes

Aircraft Stopline Marking is a yellow bar that serves as a stop sign for aircraft parking at the Parking Stand. Aircraft Stopline Marking is located on the extension of the lead-in, 6 meters from the end of the lead-in. Based on the author's observations while at the apron movement control (AMC) unit, the author found that the Stopline Marking did not comply with the relevant regulations in PR 21 of 2023. Given the issues outlined above, a solution is needed to address the existing problems to ensure safety, security, and orderliness in providing aviation services at Aji Pangeran Tumenggung Pranoto Airport.

Therefore, changes must be made to the Stopline Marking area at Parking Stand A.P.T. Pranoto Samarinda by relocating the stopline markings on the Parking Stand in accordance with the diagram. The stop line must be positioned at a right angle to the alignment bar, perpendicular to the pilot's left position at the desired stopping point. The length and width must not be less than 6 meters and 15 centimeters, respectively. The distance between the stop line and the lead-in line may vary depending on the type of aircraft, taking into account the pilot's field of view.

2. Parking Markings Fading

Based on the author's observations, there are several factors that cause damage or fading of markings on Parking Stands 3, 4, 5, 6, and 7, namely:

1) Use of Parking Stands. The more frequently Parking Stands are used, the more intense the traffic of GSE vehicles operating there will be. This causes friction and abrasion from tires, causing markings to fade and gradually become invisible. Additionally, oil spills from GSE vehicles can affect the visibility of airport markings.
2) Weather and Temperature Conditions. Weather changes can cause markings to fade. Weather changes from hot to rainy and vice versa can cause markings to fade if they are not repainted periodically within a certain time frame. The faded condition of the markings poses potential hazards when providing services to aircraft, including:
    a. Ground handling personnel may misplace equipment because the boundaries on the markings are not visible due to fading, which could lead to incidents.

b. The absence of no-parking area markings means that information regarding the boundaries of areas where vehicles or equipment are not permitted to enter is not communicated.

According to ICAO Annex 14, Volume I, Chapter 5: "Markings shall be maintained in a manner that ensures visibility and legibility during both day and night, and under varying weather conditions"[7]. Likewise, PR 21 of 2023, Section 5.3.2, requires: "Markings must be repainted periodically to maintain operational visibility and ensure safety compliance"[6]. The airport authority must conduct repainting of all faded markings using durable thermoplastic paint as recommended in PM 67 of 2018 (Ministry of Transportation)[8]. This includes repainting stop lines, lead-in lines, equipment routes, and no-parking areas. A regular maintenance cycle (every 6–12 months) should be implemented based on apron usage and local climate conditions.

CONCLUSION

Based on comprehensive observations at the Apron Movement Control (AMC) Unit of Aji Pangeran Tumenggung Pranoto Airport in Samarinda, two major safety-related issues have been identified:
(1) Non-compliant Stopline Markings – Several parking stands feature markings that are misaligned or no longer visible, violating PR 21 of 2023 and posing risks during aircraft parking;
(2) Faded Safety Markings – The visibility of critical safety lines at Parking Stands 3 through 7 has significantly deteriorated due to frequent use, weathering, and oil contamination, potentially causing equipment misplacement and increasing incident risks on the apron.

Address the identified operational hazards and enhance overall safety, the author proposes several actions that should be promptly undertaken by relevant stakeholders. First, the Apron Movement Control (AMC) unit and airside operations team should immediately reposition and repaint the stopline markings to comply with the standards set forth in PR 21 of 2023 and ICAO Doc 9157. Additionally, a routine inspection protocol—such as quarterly evaluations—should be established to ensure ongoing compliance and visibility of apron markings. Second, airport management authorities PT. Anngkasa Pura Indoensia are advised to develop and implement a periodic maintenance program for apron and parking stand markings, ideally every 6 to 12 months. Paint materials should be selected based on durability against extreme weather conditions and resistance to wear from heavy equipment traffic. A dedicated budget should be allocated for this program, which should also be integrated into the airport's airside safety performance indicators. Third, regulators such as the Directorate General of Civil Aviation should conduct regular audits of apron marking compliance and enforce technical standards consistently. Any non-conformities should be followed up with structured corrective actions.

All recommendations should ideally be implemented within the next three to six months to prevent further degradation and reduce the risk of incidents in the apron area. Proper and well-coordinated implementation will support improved ground operation safety, ensure regulatory compliance, and contribute to sustainable efficiency and order in apron area management. By clearly delineating responsibilities and timelines, this action plan serves not only as a corrective strategy but also as a long-term preventive approach that aligns with international best practices in apron safety management.

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