

Optimizing Aviobridge Personnel Deployment to Enhance Operational Efficiency at I Gusti Ngurah Rai International Airport

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Article Info	ABSTRACT
<p>Article History: Submitted: 8 July, 2025 Revised: 25 July, 2025 Accepted: 8 August, 2025</p> <hr/> <p>Keywords: <i>Aviobridge, Docking Undocking Delays, Personnel Management, Operational Constraints, Service Efficiency</i></p>	<p>This study aims to analyze personnel deployment of aviobridge operators at I Gusti Ngurah Rai International Airport to improve airside operational efficiency. A descriptive qualitative method was applied, with data collected through direct observation, structured interviews involving AMC officers, aviobridge operators, ground handling personnel, and document review. Findings indicate that the current shift allocation of 12–13 personnel is below the operational requirement of 18 per shift for 33 aviobridges. This shortage results in docking and undocking delays, multitasking, and coordination difficulties, reducing service quality and punctuality, sometimes leading to official warnings. The study emphasizes the need for zone-based task distribution, additional personnel gathering points, strengthened inter-unit coordination, and better pre-operation readiness. Unlike previous studies, this research highlights internal workforce structuring and adaptive shift planning as central to overcoming operational gaps. The recommendations proposed—improved scheduling and task zoning—are expected to enhance responsiveness, minimize delays, and support timely flight operations. These findings are particularly relevant for high-traffic airports where efficient personnel management is essential. Moreover, the insights may serve as a reference for broader staffing strategies in similar airport environments, contributing to improvements in efficiency and service quality.</p>

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INTRODUCTION

Airports are vital hubs in the air transportation system that require operational efficiency and excellent service for all users. In airport operations, airside services are a strategic element as they directly impact flight safety, punctuality, and passenger satisfaction. Airport airside services heavily rely on the operations of the Apron Movement Control (AMC) unit, including the sub-unit responsible for operating the aviobridge when required by airlines [1]. AMC duties include monitoring aircraft movements, vehicles, passengers, cargo, apron cleanliness, recording flight data, and preparing task reports [2]. Time is a crucial factor in aviation, so departure punctuality (on-time performance/OTP) is an important performance indicator [3]. Previous research shows that the performance of aviobridge operators has a positive effect on OTP, with personnel contributing to schedule accuracy by more than 60%. Thus, good ramp personnel management plays a significant role in preventing flight delays [4].

However, practices in the field show that there are obstacles in task distribution and staffing. There are 33 aviobridges at I Gusti Ngurah Rai International Airport in Bali, but there are currently only around 50 operators, divided into 4 shifts ($\pm 12-13$ people per shift). Meanwhile, the AMC Standards of PT Angkasa Pura state that for 33 aviobridges, ideally 72 personnel are required (with each shift comprising 18 personnel). This shortage is among the main obstacles identified by AMC, as observed at various other airports. The shortage of personnel has resulted in a high workload, causing delays in aviobridge services and parking stand assignments, and forcing staff to take on multiple tasks, such as inputting data while supervising the aviobridge. Additionally, poor coordination between shifts, such as the absence of adequate handover reports, forces staff to start supervision from the beginning when changing shifts. During peak hours, the limited AMC team becomes overwhelmed. For example, at Komodo Labuan Bajo Airport, three personnel per shift must handle up to 18 flights per day, and some AMC personnel also serve as ramp operators [3]. This also happens at I Gusti Ngurah Rai Airport. With such a high volume of flight activity, it is not uncommon for the service road area to be closed due to aircraft taxiing for parking. Sometimes there are also sudden changes to aircraft parking stands, which can cause delays for operators preparing to dock the aviobridge.

Based on these issues, this study aims to thoroughly examine the aviobridge personnel management system at I Gusti Ngurah Rai International Airport in Bali as a crucial component in supporting smooth airside operations. This study not only focuses on the technical aspects of task allocation but also explores the effectiveness of shift scheduling and the work zoning system for aviobridge personnel in accommodating high operational loads [5]. Through this approach, it is hoped that the most optimal personnel management patterns can be identified, tailored to the characteristics of air traffic at a high-standard international airport.

In addition, this study also explores the operational challenges faced by aviobridge personnel directly in the field, whether they stem from limited personnel numbers, an imbalance in task distribution between shifts, or obstacles in coordination and communication with other work units [6]. As such, the findings of this study are expected to provide a comprehensive overview of the relationship between personnel management systems and aviobridge service performance, as well as offer recommendations based on actual field conditions that can serve as a basis for managerial considerations in enhancing efficiency, safety, and service quality on the airport's airside [7].

METHODS

This study uses a descriptive qualitative approach. Data was collected through observation in the airside area of the aviobridge personnel and AMC work units at I Gusti Ngurah Rai Airport, followed by interviews with one AMC officer, three aviobridge personnel, and three ground handling personnel working at I Gusti Ngurah Rai Airport in Bali. Structured interviews were conducted to explore details of work schedules, task distribution, operational issues, and suggestions for improvement. The data collected through observation and interviews served as primary data, which was then compiled and analyzed to address the research questions of this study [8]. This study was also supported by document studies and field documentation to obtain supporting data, thereby strengthening the main focus of this research [9]. The field data was then analyzed using qualitative reduction, presentation, and interpretation techniques to formulate findings regarding personnel arrangements and improvement recommendations.

This study took the population from the operations side of the AMC unit of PT Angkasa Pura at I Gusti Ngurah Rai Airport, so the sample coverage taken was a small part of the authorized aviobridge operators and ground handling personnel, which was deemed representative of the population of this study.

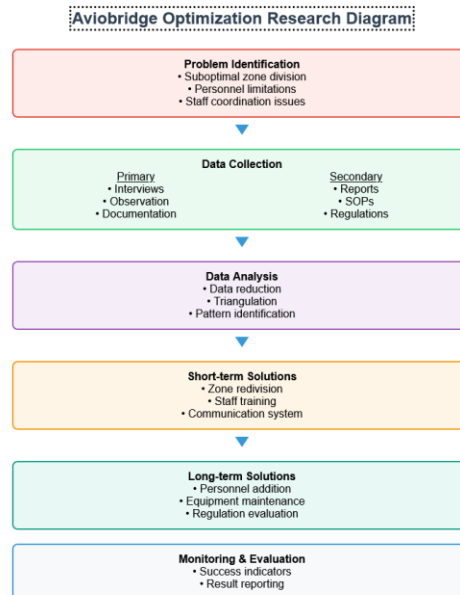


Figure 1 Aviobridge Optimization Research Diagram[8]

Problem Identification Description: The first step in this process is to identify existing problems in Aviobridge operations. This includes: Suboptimal zoning Indicates that the division of work areas for Aviobridge operators may be inefficient, which can cause delays in service. Personnel limitations Indicates that the number of available personnel may be insufficient to handle high traffic volumes. Coordination between personnel Highlights the importance of good communication and coordination between all personnel involved in the process.

Data Collection Description Once the problem is identified, the next step is to collect relevant data for analysis. This data is divided into two categories Primary Data Data obtained directly from sources, such as interviews, observations, and documentation. Secondary Data Data obtained from reports, SOPs (Standard Operating Procedures), and existing regulations

Data Analysis Description In this stage, the collected data is analyzed to find patterns and useful information. The analysis process includes Data Reduction Eliminating irrelevant data to focus on important information. Triangulation Verifying data from multiple sources to ensure accuracy. Pattern Identification Looking for patterns or trends in the data that can aid decision-making

Short-Term Solutions Description: Based on data analysis, temporary solutions are proposed to address the existing problem. These solutions include Zoning Reorganizing work areas to improve efficiency. Training: Providing training to personnel to improve their skills and understanding of operational procedures. Communication Improving communication systems between officers to ensure better coordination

Long-Term Solutions Description In addition to short-term solutions, long-term solutions are also planned for continuous improvement. These include Human Resource Enhancement: Recruiting more personnel to meet operational needs. Maintenance: Performing routine maintenance on equipment and vehicles to prevent breakdowns. Regulatory Evaluation: Reviewing and updating existing regulations to ensure compliance and efficiency.

This flowchart provides a clear overview of the Aviobridge personnel management process at I Gusti Ngurah Rai International Airport, Bali. By following these steps, it is expected that services can be improved, delays minimized, and passenger satisfaction enhanced. This process also emphasizes the importance of systematic data analysis and effective communication in achieving operational goals. The overall process can be seen in Figure 1, which visually illustrates the sequence of problem identification, data collection, data analysis, and the formulation of both short-term and long-term solutions.

RESULT AND DISCUSSION

Observation Results

LAYOUT BANDAR UDARA INTERNASIONAL I GUSTI NGURAH RAI BALI

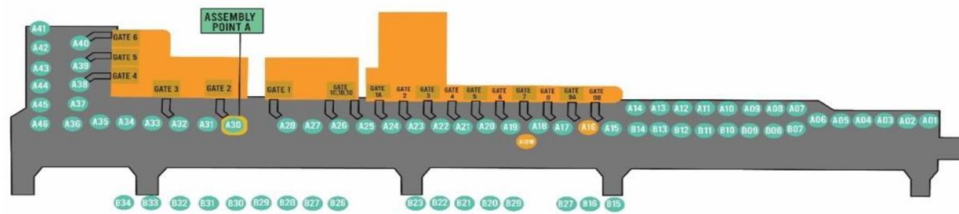


Figure 2 I gusti Ngurah Rai International Airport Layout [4]

Due to the heavy daily flight traffic, the author observed delays in Aviobridge personnel performing docking and undocking during -specific hours when vehicle usage frequency increases at a single gathering point at Office A 30, with 12 Aviobridge personnel per shift, which does not align with the Apron Movement Control Manual's Operational Standards for Apron Movement Control (Manual of Airside Operational Standards) at PT Angkasa Pura regarding the calculation of Aviobridge operator manpower, with the number of Aviobridges at I Gusti Ngurah Rai International Airport in Bali totaling 33 units.

According to the Apron Movement Control Manual regarding the Standard Operating Procedures for Apron Movement Control (Manual of Standard Airside Operations) at PT Angkasa Pura regarding the calculation of aviobridge operator manpower, with 33 aviobridges, the ideal number of personnel on standby as aviobridge operators should be 72 people, which, when divided into small groups (shifts), would be 18 personnel per shift. This issue requires resolution by the airport management, either by increasing personnel or by implementing innovative solutions to address the problem.

The lack of sufficient personnel has led to operational inefficiencies, including delays in service provision, which have prompted internal warning memos and delay reports from AMC. These reports serve as reminders for aviobridge operators to adhere to performance standards and support flight punctuality targets. Similar issues have been identified in other Indonesian airports; for example, on previous research at Ahmad Yani Airport, Akbar noted that limited personnel caused operational disruptions and poor aviobridge service delivery at Ahmad Yani Airport. Likewise, Utami & Jumlad emphasized that on-time performance (OTP) is closely linked to the coordination and availability of ground handling and aviobridge operators [10]. This condition suggests that in addition to increasing the number of personnel, the airport operator should consider implementing strategic scheduling systems or zone-based task distribution to optimize manpower utilization. According to Dowling et al. , well-integrated shift planning and personnel rostering can significantly reduce service delays and improve ground operational efficiency in high-traffic airports [11].

In Depth Interview Results

1.1.1 Interview with Apron Movement Control (AMC) Personnel

Table 1 Data Reduction on AMC Interviews

No	Topic	Interviewee 1	Interviewee 2	Interviewee 3	Interviewee 4
1	Number of Aviobridge Personnel	Suboptimal	Suboptimal	Consideration for (additional personnel) is needed	There is a need to increase the number of aviobridge personnel.
2	Problems that Happen with Docking/Undocking Aviobridge Delays	Suboptimal communication	Standby location (insufficient number of gathering points)	Lack of gathering points	There needs to be a permanent zoning division
3	Solutions for delays in docking/undocking	Increase in the number of aviobridge personnel	improvement of coordination and communication	Improvement in operational efficiency	Establishment of zoning to improve coordination efficiency

Based on the results of the interview data reduction table with AMC, the following conclusions can be drawn:

1. There is a need for a study on docking/undocking the aviobridge without adding Aviobridge personnel at I Gusti Ngurah Rai International Airport in Bali.
2. There is a need to add one gathering point for Aviobridge personnel at I Gusti Ngurah Rai International Airport in Bali. This aligns with information from the third source that operational efficiency needs to be improved as a solution to docking/undocking delays.
3. There is a need to improve coordination and communication regarding operational efficiency at I Gusti Ngurah Rai International Airport in Bali.
4. There is a need for a standby location for Aviobridge personnel 15 minutes before docking/undocking the boarding bridge.

1.1.2 Interview with Ground Handling and Airline Personnel

Table 2 Data Reduction on Ground Handling and Airline Personnel Interviews

No	Topic	Interviewee 1	Interviewee 2	Interviewee 3
1	Are you satisfied with the airline	Pretty good, but there needs to be	It's good, but it could be	During peak hours, pay
2	What is expected regarding the services provided by Aviobridge operators in the future?	Enhanced coordination and cooperation	Coordination between AMC, ground handling, and Aviobridge operators needs to be improved.	Improving coordination
3	Possible solutions that can be provided to aviobridge operators in the future	Standby on the aviobridge	Addition of Aviobridge personnel	There may be a permanent standby location not far from Avioridge.

Based on the results of the interview data reduction table with AMC, the following conclusions can be drawn:

1. There needs to be increased cooperation between AMC, Aviobridge operators, ground handling parties, and airlines at I Gusti Ngurah Rai International Airport in Bali.
2. There is a need for additional rest/standby areas for personnel to facilitate docking/undocking.
3. There is a need for additional AMC personnel.

Problem Solving

This study differs from previous studies in that it focuses on the internal organization of the workforce, particularly the distribution of work zones and the absence of adaptive shift schedules at high-capacity airports. While previous studies have discussed the use of aviobridges in general, this study highlights the root causes of problems in workforce structure, emphasizing the impact of inadequate allocation and the absence of role rotation models.

An important assumption in this study is that all personnel are equally trained and competent to operate across different zones. However, this may not be the case in real conditions, which raises concerns about fatigue, inefficiency, and skill mismatch, particularly during unexpected flight schedule changes or equipment malfunction. This also limits the adaptability of a limited crew, especially in the international apron section, where traffic density is higher.

Given that this study focuses on a tier-one international airport with heavy operational demand, generalizing these findings to smaller or regional airports must be done cautiously. Nonetheless, the core implication, that poor workforce planning significantly affects service delivery, can be extrapolated more broadly across similar high-traffic hubs in Indonesia or other Southeast Asian countries facing staffing shortages.

A potential advantage of implementing zone-based task distribution is a reduction in idle time and increased accountability within smaller teams. However, the drawback may involve initial resistance to change, increased complexity in scheduling, and the need for ongoing personnel upskilling.

CONCLUSION

This study concludes that the current personnel deployment strategy for aviobridge operations at I Gusti Ngurah Rai International Airport is not yet optimal, particularly due to the insufficient number of personnel assigned per shift, which is only 12–13 instead of the recommended 18. This shortage of manpower has led to several operational inefficiencies, including delays in docking and undocking activities, multitasking among personnel, and inadequate shift coordination. The resulting impact is a decline in service quality and a potential threat to the airport's on-time performance (OTP).

The novelty of this study lies in its focus on internal manpower management, especially the need for zone-based personnel distribution and adaptive shift planning as strategies to improve operational responsiveness. In addition, findings from field observations and interviews reveal a need for stronger inter-unit coordination, improved personnel readiness before operations, and additional infrastructure to support aviobridge personnel performance.

To enhance operational efficiency, airport management should consider revising personnel allocation strategies, establishing dedicated standby points, and increasing collaboration between AMC, aviobridge, ground handling, and airline units. These recommendations are particularly relevant for international airports with high operational loads, though the principles can also be adapted to other busy airport environments across Southeast Asia facing similar resource challenges. work areas are divided. Work Area Zoning: Divide the work area into several zones based on flight type and aviobridge location, International Zone: Stands A15-A23 for international flights, domestic Zone Stands A24-A40 for domestic flights.

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