Jurnal Teknologi Kedirgantaraan (JTK)
Vol. 11, No. 1, February 2026, page. 116 – 122
ISSN: 2528-2778 (Print); 2684-9704 (Online)
https://doi.org/10.35894/jtk.v11i1.300

JTK
Jurnal Teknologi Kedirgantaraan
(Journal of Aeronautical Engineering)

Maintenance Study of Vehicles and Equipment Ground Support Equipment (GSE) to Support Flight Safety on The Side of Sultan Thaha Jambi Airport

Dian Dwi Indriyani[1*], Nawang Kalbuana[2], Irwan Faizal[3]
Airport Operation Study Program, Politeknik Penerbangan Indonesia Curug, Tangerang, Banten

Article Info

Article History:
Submitted: July 21, 2025
Revised : July 25, 2025
Accepted : January 04, 2026

Keywords:
Ground Support Equipment, Apron Movement Control, Maintenance, Aviation Safety, Sultan Thaha Jambi Airport

ABSTRACT

This study reviews the feasibility of Ground Support Equipment (GSE) vehicles and equipment operated by Ground Handling Companies on the air side of Sultan Thaha Jambi Airport. As well as evaluating the role of the Apron Movement Control Unit in supervision and maintenance. The background of this study found various technical problems, such as broken brakes, dead sign lights, oil leaks, bald tires, and fire extinguishers that are not suitable for use. Maintenance procedures by the Ground Handling Company are still reactive and not consistently carried out preventively. The research method used is a descriptive qualitative method with data collection techniques through field observations, interviews with AMC and Ground Handling personnel, and documentation. The results showed that most of the GSE vehicles and equipment in operation have not fully met the eligibility standards according to KP 635 Year 2015. Supervision by the AMC Unit has not been optimal, characterized by many undetected violations. This study concludes that strengthening supervision by the AMC unit, implementing a digital system for reporting and inspection, and improving operator discipline through retraining and administrative witnesses are needed. This strategy ensures that the safety of airside flight operations is maintained and in accordance with applicable standards.

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Correspondence Author:
Dian Dwi Indriyani
Email:
dian.dwi1302@gmail.com

INTRODUCTION

Air transportation is a type of transportation that is experiencing rapid growth in Indonesia. This is evident from the increase in the number of service users from year to year[10]. The airport is a gateway or access to an area from other areas. The Directorate General of Civil Aviation asserts that the role of airports includes several aspects, such as becoming the center of the air transportation network based on the airport hierarchy, opening economic access, becoming a place for business transactions to change modes of transportation, as a driver and supporter of industrial, commercial and tourism activities, opening the isolation of an area, as well as strengthening the infrastructure area, vision and sovereignty of the nusantara[8].

To provide flight services to passengers, baggage, cargo, post, and equipment that support aircraft activities on the air side, Ground Handling officers are needed who have the appropriate expertise and competence[1]. Aircraft services include operations, which include aircraft placement, loading and unloading of air transportation, and aircraft maintenance. In order to support flights at Sultan Thaha Jambi Airport, there is a Ground Handling service company to support aircraft ground equipment, Ground Support Equipment (GSE).

Each airport is required to have a work unit that is responsible for supervising order and all activities in the airside area in order to comply with the Decree of the Director General of Civil Aviation Number SKEP 140/VI/1999 concerning "Requirements and Procedures for Operating Airside Vehicles" and Regulation of the Director General of Civil Aviation Number KP 635/2015 concerning "Standards for Aircraft Ground Support Equipmen (GSE) and Operational Vehicles Operating on the Airside" [2][3][9]. The importance of safety on the airside, especially in the apron area, must be understood by all personnel involved in tasks related to flight safety. The goal is to prevent and minimize the occurrence of accidents and incidents that can threaten flight safety on the air side of Sultan Thaha Jambi Airport.

Based on the author's observations in the field, currently, the AMC unit at Sultan Thaha Jambi Airport is still not optimal in supervising GSE in the airside area, and is also less than optimal in ensuring that all GSE vehicles and equipment operating on the airside are fit for use. Previous studies have examined the operational feasibility testing of Ground Support Equipment (GSE) at Indonesian airports, highlighting the importance of compliance and periodic inspection [7]. There are still some GSE vehicles and equipment that are not in accordance with Standard Operating Procedures, such as rusty bodies, broken brakes, broken and non-functioning sign lights, smooth tires, and GSE vehicles that experience oil leaks. Efforts were made by officers in this research, namely, checking the vehicle before it was operated. The officer conducts several checks, such as a Random Check, checking the vehicle engine, vehicle letter, vehicle pass, and other equipment. There are vehicles that are not suitable, but are still operated to support aircraft services. The feasibility of GSE vehicles and equipment that are not in accordance with standardisation should be repaired, renewed, or replaced so that they are suitable for use on the air side [6].

Ground Support Equipment (GSE) vehicles and equipment operated by Ground Handling personnel must comply with the requirements of KP 635 Year 2015 concerning “Aircraft Ground Service Support Equipment (GSE) Standards and Airside Operations Emergency Vehicles”[3]. The role of the Apron Movement Control (AMC) unit is to monitor vehicles and equipment for Ground Support Equipment (GSE) maintenance to maintain safety on the airside. Vehicles and equipment operating on the airside are in accordance with SOP/regulations, and the role of related units in the maintenance of Ground Support Equipment is the focus of the problem.

METHODS

This research is a study that uses descriptive qualitative methods, the process of understanding phenomena by creating a comprehensive and complex picture made in the form of words. The first step in this research is to describe the phenomena that occur, with observation and data collection through documentation. This research serves to report in-depth views obtained from various sources of information, namely, in accordance with the state of the field, as for the causes of the existence of GSE vehicles and equipment operating in the airside area not in accordance with the rules that have been set, it can be further followed up. Furthermore, further analysis is carried out based on KP 635 Year 2015.

Research Design

The research involved three main techniques: direct field observations, structured interviews, and document analysis. Observations were made during random checks and airside inspections. Interviews were conducted with personnel from the Apron Movement Control unit and Ground Handling personnel. Documentation reviewed included records of random check results, damage reports, and SOPs.

Research Variables

a. Independent Variable (X): requency of maintenance, quality of maintenance procedures, maintenance schedule system, and age and condition of GSE equipment, which are key factors in maintenance management theory [4].
b. Dependent Variable (Y): Number or potential of airside incidents, level of operational disruption due to GSE damage, effectiveness of aircraft servicing on the apron, and compliance with aviation safety standards [4].

Data Collection Techniques

a. Interviews: structured interviews using open-ended questions to assess current practices and perceptions of Apron Movement Control unit personnel, and Ground Handling personnel.
b. Observation: conducted at the airside location by observing and seeing directly the activities that occur in the field when implementing random checks and feasibility tests carried out by the Apron Movement Control unit.
c. Document: reviewing official documents to obtain the identity of equipment and vehicles that are not in accordance with applicable standards, such as GSE movement reports and damage records.

Instruments

Instruments used included:
a. An interview guide developed based on airport safety literature.
b. Observation checklist to record time, GSE damage and ground handling personnel violations.
c. Documentation matrix to classify random check activities, vehicles, personnel involved and level of damage.

Data Analysis Technique

Thematice analysis was used to process qualitative data following these stage:
a. Data Reduction: Selecting and simplifying relevant information.
b. Theme Coding: Grouping data by themes such as “maintenance” or “support flight.”
c. Interpretation: Comparing field data with prior research to derive conclusions.

A visual flow of the research process is presented below:
Field observation → Interviews → Document Review → Data Collection → Data Coding → Thematic Analysis → Validation (Triangulation) → Conclusion & Recommendation.

RESULT AND DISCUSSION

Sultan Thaha Jambi Airport currently serves domestic flights, and the daily movement of aircraft at Sultan Thaha Jambi Airport is increasing. In order to further improve the quality of the airport running smoothly, so as to avoid accidents, and ensure passenger satisfaction. Therefore, an optimal ground time is needed, a factor that can determine this is the movement and placement of GSE that is orderly and organized. In this case, one of the duties of an AMC is to supervise vehicles operating in the airside area, around the apron, and GSE vehicles in the Equipment Storage Area. In terms of field preparation, AMC personnel on duty routinely ensure that the apron is free from Foreign Object Debris

(FOD), as well as inspect the garbarata and apron cleanliness. The inspection results are then reported via Google Form.

The AMC unit has a role in ensuring security, safety, and smooth operations in the airside area, especially around the aircraft parking stand. As part of its responsibility, AMC personnel routinely conduct field inspections twice a day. In doing so, AMC personnel not only conduct visual checks but also detect any potential hazards that could interfere with flight safety. For example, if oil droplets or chemical spills are found in the parking stand area, AMC personnel have full authority to prohibit or move aircraft from occupying the parking stand to prevent the risk of fire or other operational accidents.

Actual Condition of Ground Support Vehicles and Equipment

Based on the results of observation and documentation at Sultan Thaha Jambi Airport during the implementation of On The Job Training (OJT), it was found that a number of GSE vehicles and equipment did not fully meet the eligibility standards according to the Director General of Civil Aviation Regulation Number KP 635 of 2015. Field findings include technical damage such as broken or non-functioning sign lights, blown brakes, oil leaks, bald tires, rusty vehicle bodies, and unfit for use Light Fire Extinguishers (APAR), which are low-pressure to empty.

Some vehicles that are no longer fit for use are still being used. This indicates that vehicle eligibility inspections have not been carried out regularly and thoroughly. Maintenance management carried out by Ground Handling Companies is still reactive and not based on a preventive system. In fact, in the context of flight operations that are highly dependent on time and safety, the reliability of supporting equipment is crucial. Lack of coordination between AMC units and GSE officers in ensuring eligibility and compliance with SOPs is one of the main factors in this problem.

In addition to equipment that does not meet the standards, ground handling personnel are still found to commit several violations, including placing GSE equipment on the access road. In random check activities that are not routine and also still carried out on a scheduled basis, ground handling personnel only increase their discipline when random check schedules and also Ground Support Equipment (GSE) that is not in accordance with procedures are minimized when the random check schedule is carried out. Based on the results of observations and interviews, it is known that ground handling companies such as PT Gapura Angkasa and PT Prathita Titian Nusantara carry out periodic maintenance procedures, including filling out logbooks and visual checks.

However, implementation in the field shows that not all unfit equipment is immediately withdrawn from operation. This phenomenon indicates a gap between procedural standards and actual practices in the field [4]. States that maintenance must be carried out sequentially and consistently to maintain the quality and functionality of the facility. If maintenance activities are merely documented without any real action, safety risks increase significantly.

Periodic surveillance conducted by AMC officers usually includes checking the general condition of the apron and runway areas to ensure there are no obstacles or hazardous conditions that could affect aircraft operations. The lack of checks on GSE vehicles means that supervision of GSE vehicle activity and movement throughout the day is minimal.

Requirements of KP 635 Year 2015

From the results of the field and literature analysis, the main factors causing the GSE vehicles and equipment to fail are:

1. Old age of equipment (some manufactured before 2000)
2. Lack of personnel awareness and compliance with damage reporting
3. Lack of strict sanctions against SOP violations
4. Limited budget for equipment refurbishment
5. Lack of continuous supervision from the supervision unit (AMC)

This is reinforced by the findings [5]. Who stated that ineffective supervision and weak sanctions are the main triggers for GSE operational violations. The lack of direct supervision of GSE vehicles leads to unmonitored vehicle movements and undetected potential violations. Without

consistent supervision, necessary preventive actions cannot be taken immediately, and can increase the risk of accidents and incidents in the airside area.

Every GSE vehicle and equipment operating in the airside area must comply with the provisions listed in the regulation of the Director General of Civil Aviation Number KP 635 Year 2015, which regulates the service standards of GSE and operational vehicles operating on the airside. Technical standard specifications for such vehicles and equipment are included in the appendix of this regulation. With this regulation, existing GSE operational vehicles and equipment can continue to be operated. If there are equipment and vehicles that do not meet the specified standards, they must be adjusted within a maximum of six months after this regulation comes into force.

Regulation of the Minister of Transportation of the Republic of Indonesia Number PM 91 of 2016 regulates the Age Limitation of Aircraft Ground Support Equipment (GSE) and Operational Vehicles Operating on the Airside. According to PM 91/2016, age restrictions are grouped into 2 (two) categories, namely :

1. Operating age group of 10 (ten) years; and
2. Operating age group of 7 (seven) years.

Actions that violate obligations related to age restrictions by aircraft ground support equipment (GSE) certificate holders and vehicles used in airspace will be subject to sanctions in the form of:

1. Non-compliant equipment cannot be operated and
2. Revocation of equipment certificate.

Role of AMC Unit in GSE Eligibility Supervision

In terms of supervision, AMC has done its job to ensure safety in the airside area. The Apron Movement Control (AMC) unit has a strategic role in ensuring order and safety on the airside. Its main function is to conduct random checks, periodic inspections, and coordinate with ground handling operators. Based on observations in the field, the supervision carried out by the AMC unit still needs to be improved. Therefore, in carrying out supervisory duties, the AMC unit needs to comply with the established Standard Operating Procedures (SOPs), which cover various aspects such as monitoring the movement of Ground Support Equipment (GSE) vehicles, checking the operational feasibility of vehicles, and monitoring compliance with markings and signs in the apron area.

Field findings showed that 16 violations were recorded in a two-month period, reflecting the low frequency and firmness of supervision. Research by [6] showed that weak supervision from the AMC unit led to unfit GSE vehicles continuing to operate on the airside. In implementing surveillance activities, the AMC unit has Standard Operating Procedures (SOPs) that must be carried out and complied with.GSE vehicles and equipment operating at the airside are required to meet applicable technical requirements or SOPs. However, there are still violations by GSE officers in ensuring that the vehicles operated are fit for use.

These violations include:

1. All parts of the equipment on the vehicle are in good working condition.
2. There are no leaks in the fuel or oil reservoirs or lines.
3. Installation of a "No Smoking" sign in the vehicle that can be seen and read easily by all passengers, both in dark and light.
4. Installing a flame trap on the exhaust for vehicles fueled by anything other than diesel.

The AMC unit also needs to supervise the inspection of the GSE equipment. These inspections should include checking the braking system, warning lights, absence of oil leaks, and other vital components. To enhance maximum supervision from the AMC unit, unannounced inspections should be conducted; these unannounced inspections will help detect violations that may be missed in scheduled inspections. Violations such as GSE drivers who do not meet the eligibility standards and the placement of GSE vehicles that do not comply with the rules. These conditions can lead to potential accident risks that can jeopardize flight safety. Periodic surveillance conducted by AMC officers usually includes checking the general condition of the apron and runway areas to ensure there are no obstacles or hazardous conditions that could interfere with aircraft operations. This activity is important to ensure the initial readiness of the area before flight activities begin; however, this supervision does not include checking GSE vehicles, which means that there is minimal supervision of GSE vehicle activity and

movement throughout the day. The lack of direct supervision of GSE vehicles means that many vehicle movements go unmonitored and potential violations go undetected. Non-compliance with GSE vehicle technical standards has direct implications for flight safety. Potential collisions, aircraft damage, or accidents can occur due to technical defects or operator ignorance. In the context of the Safety Management System (SMS), this negligence shows the weak implementation of the proactive safety principle, where preventive action should be the main focus. ICAO (2013) states that apron management has a great responsibility in organizing safe and orderly operations on the airside.

Improvement Strategies and Recommendations

Based on the findings and discussion in the research, there are still many GSE vehicles and equipment that do not meet the eligibility standards, such as broken brakes, dead sign lights, oil leaks, and expired fire extinguishers. Thus, an improvement strategy is needed so that flight safety is maintained.

There are several strategies that can be implemented:

1. **Increasing the intensity of inspections by AMC units**
   AMC units need to check more frequently, especially on GSE vehicle units that are at high risk or often experience damage. Not only visual checks, but also technical inspections so that damage can be quickly detected. So that violations can be minimized before they impact operations.
2. **Digitalization of logbooks and inspection reports**
   Recording of checks is still done manually, which can be left behind or not well documented. It is necessary to have a digital system to facilitate the reporting of inspection results. The digital system is more practical and also increases transparency and accountability.
3. **Procurement of a real-time monitoring system**
   So that each piece of equipment can be monitored in real-time, barcodes or RFIDs need to be installed. With this technology, GSE can be immediately detected if it has not conducted a fit and proper test or has passed its service life. This will make it easier for AMC to monitor GSE movements quickly and accurately.
4. **Administrative and operational sanctions**
   To improve discipline, operators who violate SOPs must be given strict sanctions. Such as a reprimand, suspension of operational license, or even temporary license revocation. Without clear sanctions, violations will continue to recur and jeopardize safety.
5. **Retraining and certification of personnel**
   In order for ground handling personnel to better understand the importance of maintenance and damage reporting, periodic retraining is necessary. In addition, recertification is also carried out so that their competence is maintained and in accordance with applicable standards.

These strategies are expected to strengthen the synergy between ground handling and AMC units and reduce the level of operational violations on the airside.

CONCLUSION

Based on the research findings discussed previously, it can be concluded that the majority of Ground Support Equipment (GSE) vehicles and equipment operating in the airside area do not fully meet the eligibility standards stipulated in KP 635 Year 2015. Various technical deficiencies were identified, including malfunctioning brakes, worn tires, oil leaks, expired fire extinguishers, and improper parking that potentially creates Foreign Object Debris (FOD) hazards. Although the Ground Handling company has established a maintenance schedule, its implementation remains suboptimal, as maintenance activities tend to be reactive rather than preventive. Furthermore, the role of the Apron Movement Control (AMC) Unit in supervising GSE operations has not yet been fully effective, as evidenced by the persistence of undetected violations. Contributing factors include the aging condition of vehicles, limited personnel awareness, weak enforcement of sanctions, budget constraints, and ineffective coordination among related units. Within a two-month period, 16 violations were recorded, such as oil leaks, inoperative lights, and uninstalled flame traps, indicating inconsistent supervision and inadequate monitoring of all GSE operating on the airside.

ACKNOWLEDGMENTS

All praise and gratitude to the author for the presence of God Almighty, who always bestows His Grace and Guidance so that the author can complete this journal with the title "Maintenance Study of Vehicles and Equipment Ground Support Equipment (GSE) To Support Flight Safety on The Side of Sultan Thaha Jambi Airport" at the specified time smoothly. This journal is one of the requirements to pass the Diploma III Airport Operations Program Batch 18 Bravo, Indonesian Aviation Polytechnic, Curug. This journal is also a concrete proof of the field practice activities that have been carried out, where I made direct observations to identify problems and implement the findings during the five months of On the Job Training (OJT) at Sultan Thaha Jambi Airport.

The main purpose of writing this journal is to provide input and suggestions to the Sultan Thaha Jambi Airport. It is hoped that these suggestions can help maintain Ground Support Equipment vehicles and equipment operated on the air side of Sultan Thaha Jambi Airport. During the process of preparing this journal, many parties have provided assistance, attention, and support, both morally and materially. Therefore, the author would like to express his deepest gratitude to all those who helped him in completing this journal.

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