

## Application Of Hazard Identification and Risk Assessment (Hira) On the Apron Area of Fatmawati Soekarno Airport

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| Article Info  | ABSTRACT   |
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| <p><b>Article History:</b><br/>Submitted: July 4, 2025<br/>Revised : July 11, 2025<br/>Accepted : July 21, 2025</p> | <p><i>Operational safety in the airside area of airports is a crucial aspect in ensuring smooth and secure flight operations. This study was conducted at Fatmawati Soekarno Airport in Bengkulu with the aim of identifying potential hazards in the apron area and assessing their risk levels using the Hazard Identification and Risk Assessment (HIRA) method. Through direct observation during the On the Job Training program, four safety-related findings were identified: non-compliance with PPE use by ground staff, presence of Foreign Object Debris (FOD), oil spillage on the apron, and aircraft refueling conducted simultaneously with passenger movement. The risk assessment revealed that three findings fell under the unacceptable risk category, while one required risk control. The study recommends mitigation measures based on the hierarchy of hazard control approach for each finding. These results highlight the importance of strengthening safety culture and continuous supervision in apron management to enhance the overall airport safety system.</i></p> |
| <p><b>Keywords:</b> HIRA, Apron, Risk Mitigation</p>  |  |

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## INTRODUCTION

The development of the industrial world is now becoming increasingly rapid. Air transportation that can provide services quickly and safely is the choice taken by most people. Because of the large number of users of air transportation modes, the development of the economic sector is used as a support for activities. So, in its operation, of course, pay attention to the safety and security of the air transportation mode[1].

The presence of the aviation sector, making all things can be connected with others easily. From this, it cannot be separated from the risks that may occur. Various aviation safety risks are either directly related to the aircraft (accident) or not directly connected (incident). Most of these risks are found on the airside. The airside is a very vulnerable place because it is directly related to aircraft operations. Therefore, in accordance with aviation regulations, each airport is required to implement a safety management system. With the aim that all activities in the airside area can be carried out properly and avoid factors that allow risks to aviation safety hazards [2].

Fatmawati Soekarno Airport Bengkulu is one of the airports managed by PT Angkasa Pura Indonesia with an average daily flight can reach 10 movements, namely 5 departing flights and 5 arriving flights. Fatmawati Soekarno Airport Bengkulu is a hub for pioneer airports in the vicinity, so the number of flights can certainly increase, especially in peak season. The following table presents data on the development of the number of aircraft arrivals and departures, and passengers.

**Tabel 1** Number of Arrivals and Departures of Aircraft and Passengers[3]

| Year | Aircraft |           |       | Passengers |           |         |
|------|----------|-----------|-------|------------|-----------|---------|
|      | Arrival  | Departure | Total | Arrival    | Departure | Total   |
| 2019 | 3.999    | 3.998     | 7.997 | 381.545    | 392.760   | 774.305 |
| 2020 | 2.081    | 2.079     | 4.160 | 158.017    | 181.107   | 339.124 |
| 2021 | 1.654    | 1.656     | 3.310 | 163.351    | 159.363   | 322.14  |
| 2022 | 2.220    | 2.220     | 4.440 | 255.930    | 277.379   | 533.309 |
| 2023 | 2.325    | 2.326     | 4.651 | 299.676    | 307.667   | 607.343 |

When viewed from the data on aircraft and passenger movements at Fatmawati Soekarno Airport Bengkulu, the number of aircraft and passenger movements continues to increase after the Covid-19 pandemic. With the increase in aircraft and passenger movements, of course the airport manager, and all related parties must continue to strive to ensure flight safety. Safety aspects on the air side are very important, so that nothing happens that can threaten flight safety.

After making observations during the On the Job Training activities at Fatmawati Bengkulu Airport, the author found problems related to activities that have the potential to become hazards and risks to flight safety that occur on the air side (apron), namely (1) Ground Handling Officers and Marshalls do not use complete personal protective equipment (PPE); (2) Foreign Object Debris (FOD) in the parking stand 1 area; (3) Oil spillage in the apron area; and (4) Refueling along with passenger movements.

One of the causes of the above problems is the safety culture that is often sidelined so that it can cause safety-related risks. Even though the airport has implemented a safety campaign program in which there is a planting of safety culture and is supported by supervision from the Apron Movement Control unit, which carries out a supervisory function to prevent hazards and safety risks that can occur.

Based on the description above, the author is interested in assessing the findings that the author obtained during the observation at Fatmawati Soekarno Airport Bengkulu using the Hazard Identification and Risk Assessment (HIRA) method as an effort to prevent hazards and safety risks on the airside.

HIRA is a method or technique to identify potential hazards that may occur and evaluate the risks that occur through an assessment of the frequency and level of risk that can be caused [4]. With the results of the assessment that can be the basis for preventive or mitigation actions and actions to deal with potential hazards that can threaten safety and disrupt operations [5].

## METHODS

In this study the authors used a qualitative research design. Qualitative research is descriptive research and tends to use analysis as research [6]. In this study conducted by conducting observations where there were 4 findings identified as hazards. Based on the safety management system, the four findings will be analyzed using the HIRA method as stated in SKEP/223/X/2009.

Hazard identification and risk assessment management is a method to identify potential hazards by defining them to evaluate the possibility of occurrence. This method is an effort to prevent and reduce the potential for work accidents, avoid and minimize the risks that occur appropriately and control them in order to carry out the activity process so that the process becomes safe.

Based on SKEP 223 / X / 2009 concerning Guidelines and Procedures for Implementing the Safety Management System, there are assessment criteria for the probability of occurrence, and risk consequences.

**Tabel 2** Probability of Occurrence Values [4], [7]

| Definition           | Meaning   | Value |
|----------------------|---|-------|
| Frequent             | Likely to occur many times (has occurred frequently)  | 5     |
| Occasional           | Likely to occur sometimes (has occurred infrequently) | 4     |
| Remote               | Unlikely to occur, but possible (has occurred rarely) | 3     |
| Improbable           | Very unlikely to occur (not known to have occurred)   | 2     |
| Extremely improbable | Almost inconceivable that the event will occur        | 1     |

The table above is used to measure the probability of occurrence or how often the event occurs. The table above can be used to classify each finding based on whether or not it occurs frequently.

**Tabel 3** Risk Consequence Value [4], [7]

| Definition          | Meaning  | Value |
|---------------------|--|-------|
| <i>Catastrophic</i> | <ul style="list-style-type: none"> <li>Aircraft/equipment destroyed</li> <li>Multiple deaths</li> </ul>  | A     |
| <i>Hazardous</i>    | <ul style="list-style-type: none"> <li>A large reduction in safety margins, physical distress or a workload such that operational personnel cannot be relied upon to perform their tasks accurately or completely</li> <li>Serious injury</li> <li>Major equipment damage</li> </ul>   | B     |
| <i>Major</i>        | <ul style="list-style-type: none"> <li>A significant reduction in safety margins, a reduction in the ability of operational personnel to cope with adverse operating conditions as a result of an increase in workload or as a result of conditions impairing their efficiency</li> <li>Serious incident</li> <li>Injury to persons</li> </ul> | C     |
| <i>Minor</i>        | <ul style="list-style-type: none"> <li>Nuisance</li> <li>Operating limitations</li> <li>Use of emergency procedures</li> <li>Minor incident</li> </ul>   | D     |
| <i>Neglible</i>     | <ul style="list-style-type: none"> <li>Few consequences</li> </ul>   | E     |

The table above is used to measure the consequences or consequences that will be caused if things happen that are not in accordance with the safety elements. The table above consists of 5 criteria. Which in each criterion contains a definition, the meaning / consequences that will be caused, and the value obtained which uses letters for the assessment. Later to make an assessment can be seen from the meaning criteria then the value can be found.

**Tabel 4** Risk Probability and Consequence Assessment [4], [7]

| Risk Probability         | The severity of the risk of an event |           |        |        |            |
|--------------------------|--------------------------------------|-----------|--------|--------|------------|
|                          | Catastrophic                         | Hazardous | MajorC | MinorD | Neglible E |
|                          | A                                    | B         |        |        |            |
| Frequent (5)             | 5A                                   | 5B        | 5C     | 5D     | 5E         |
| Occasional (4)           | 4A                                   | 4B        | 4C     | 4D     | 4E         |
| Remote (3)               | 3A                                   | 3B        | 3C     | 3D     | 3E         |
| Improbable (2)           | 2A                                   | 2B        | 2C     | 2D     | 2E         |
| Extremely improbable (1) | 1A                                   | 1B        | 1C     | 1D     | 1E         |

The table above shows the results that will be obtained if hazard identification and risk assessment management have been carried out. The way to get these results is by means of:

$$\text{Probability} \times \text{Risk Consequence}$$

For example, if it is known that an event has a remote risk probability or is worth 3 and the severity is hazardous or B. Then the letters and numbers that have been obtained will be multiplied. So that the value that will be obtained is 3B, and so on according to the results that have been obtained previously.

**Tabel 5** Risk Assessment Criteria [4], [7]

| Risk Assessment Index                      | Safety Risk Description | Work Proposal  |
|--|-------------------------|--|
| 5A, 5B, 5C, 4A, 4B, 3A                     | Intolerable             | Take immediate action to mitigate the risk or stop the activity. Perform priority safety risk mitigation to ensure additional or enhanced preventative controls are in place to bring down the safety risk index to tolerable. |
| 5D, 5E, 4C, 4D, 4E, 3D, 3C, 3B, 2C, 1B, 1A | Tolerable               | Can be tolerated based on the safety risk mitigation. It may require management decision to accept the risk.   |
| 3E, 2D, 1C, 1D, 1E                         | Acceptable              | Acceptable as is. No further safety risk mitigation required.  |

The table above serves to establish risk assessment criteria. The table also classifies the values obtained from the assessment of the level of risk consequence and risk probability. Thus, appropriate mitigation measures can be determined if problems are found that threaten safety. Mitigation handling must be adjusted and cannot be generalized to achieve an optimal level of air transportation safety.

After the risk assessment, then the direct handling or mitigation is made to reduce the impact on the safety of aircraft operations, especially on the apron at Fatmawati Soekarno Airport Bengkulu.

## RESULT AND DISCUSSION

After finding the problem above, the author then conducted an assessment using the Hazard Identification and Risk Assessment (HIRA) method. The assessment includes the level of probability of occurrence and risk consequences. The assessment is guided by SKEP 223 / X / 2009 concerning instructions and procedures for implementing a safety management system.

In the assessment process, the author conducted interviews with Verry Riski Permana as PGS General Manager of Angkasa Pura Indonesia KC Fatmawati Soekarno Airport Bengkulu and Bani Aras as AMC unit supervisor in order to obtain objective assessment results. The following are the results of the assessment that the author conducted:

**Tabel 6** Assessment Results

| No | Negative Findings  | Probability | Consequence | Result (Probability x Consequence) |
|----|--|-------------|-------------|------------------------------------|
| 1  | Ground Handling Officers and Marshalls do not use complete PPE (Ear muffs) | 5           | C           | 5C                                 |
| 2  | FOD in Parking Stand 1   | 5           | B           | 5B                                 |
| 3  | Oil spillage in apron  | 2           | C           | 2C                                 |
| 4  | Refueling along with passenger movement                                    | 5           | A           | 5A                                 |

Based on SKEP 223/X/2009 criteria, three findings (5A, 5B, 5C) are classified as unacceptable, while one finding (2C) requires risk control by management decision. In order to reduce the level of consequences of some of the above findings, the author recommends several mitigation measures that can be considered by airport operators.

### Mitigation Recommendation

1. Ground Handling Officers and Marshalls do not use complete PPE (ear muffs);



**Figure 1** Ground Handling Officers and Marshalls do not use ear muffs

During activities in the apron area, officers are required to use complete Personal Protective Equipment (PPE). This provision is stated in Law of the Republic of Indonesia Number 1 of 1970 concerning Occupational Safety Chapter VII, Article 12 [8] which states that every worker is required to use personal protective equipment.

In Regulation of the Minister of Manpower and Transmigration of the Republic of Indonesia Number Per.08/MEN/VII/2010 concerning Personal Protective Equipment that one of the personal protective equipment in question is ear protection [9]. For officers who are active in the apron area, ear protective equipment is ear muffs in order to reduce the impact of noise in the long term.

This non-compliance can be caused by various factors that affect officers' awareness of the importance of using PPE. Lack of awareness of the use of personal protective equipment (PPE) is influenced by comfort factors, lack of socialization, and weak ongoing supervision. These factors cause some officers to prefer to ignore the use of PPE, even though the risk to occupational health and safety is very high, especially in apron environments that have extreme noise levels.

During the observation, the author still found several ground handling officers and marshallers who did not use complete PPE, one of which was an ear muff [10].

Some mitigation recommendations that the author can provide include: (1) Providing a safety campaign to marshalling officers on the importance of using Personal Protective Equipment (PPE) as required when parking aircraft is a crucial step. This campaign should also explain the long-term dangers of prolonged noise exposure to their health; (2) Supervision by the AMC unit needs to be improved to ensure that all officers who are active in the apron area use PPE completely. Accompanied by sanctions for violators, in order to build a safety culture in the apron area.

## 2. FOD in Parking Stand 1;



**Figure 2** FOD in Parking Stand 1

Parking stand cleanliness is needed to ensure that aircraft movement is safe from possible safety hazards, one of which has the potential to jeopardize the safety and smooth movement of aircraft is Foreign Object Debris (FOD). This is stated in Decree of the Director General of Civil Aviation Number PR 21 of 2023 concerning Technical and Operational Standards of Civil Aviation Safety Regulations Part 139 (Manual of Standard CASR Part 139 Volume I Aerodrome Land ) in Chapter 9, which states that one of the things that need to be considered is the presence of FOD that can enter the aircraft engine and cause damage [11].

The airport should reduce the parking stand declare, because parking stand 1 cannot be used with the consideration of FOD sourced from the damaged apron; (2) The airport organizer must carry out repairs to parking stand 1 so that it is suitable for reuse.

However, the recommendations given have not been explicitly linked to the hierarchy of hazard control as a systematic approach to hazard control. In the context of FOD (Foreign Object Debris), controls should be categorized based on the hierarchy levels. For engineering control, apron infrastructure improvement is a technical measure that needs to be prioritized to permanently eliminate the source of FOD. Meanwhile, at the administrative control level, setting a routine and consistent apron sweeping schedule is a supporting measure to minimize the potential for FOD. By referring to the hierarchy of control principle, FOD risk management can be done in a more structured and effective manner.

### 3. Oil Spillage in Apron;



**Figure 3** Oil Spillage in Apron

The apron needs to be kept clean to ensure that the apron is safe from possible safety hazards, one of which needs to be considered is the cleanliness of the apron from oil spills because oil spills have the potential to endanger the safety and smooth movement of aircraft. This is stated in Decree of the Director General of Civil Aviation Number PR 21 of 2023 concerning Technical and Operational Standards of Civil Aviation Safety Regulations Part 139 (Manual of Standard CASR Part 139 Volume I Aerodrome Mainland ) in Chapter 9, which states that all apron pavement must be clean from clean from oil/fuel spills [11].

During the observation, the author found oil spills in the apron area, which could potentially pose a hazard to flight operations. These spills not only increase the risk of equipment and vehicle derailment, but can also damage the apron surface if not addressed immediately.

Some mitigation recommendations that the author can provide are as follows: (1) Immediate cleaning by the operator or airport; (2) Periodic inspection of apron conditions; (3) The operator provides oil spill collection containers.

### 4. Refueling in Conjunction with Passenger Movement.



**Figure 4** FOD in Parking Stand 1

According to Decree of the Director General of Civil Aviation Number: PR 30 Year 2022 About Technical and Operating Standards of Civil Aviation Safety Regulations Part 139 (Manual

Of Standard CASR Part 139) Volume IV Aviation Accident Relief and Fire Fighting Services (PKP-PK) the refueling process must avoid activities that can ignite the formation of a fire.

During the movement of passengers along with the aircraft refueling process, it is possible that some passengers carry electronic devices that are not in optimal condition, which have the potential to cause sparks if a short circuit occurs. One electronic component that is prone to sparks is the battery. This condition can pose a serious hazard, especially in crowded apron areas and close to flammable materials.

Some mitigation recommendations that the author can provide are as follows: (1) Provision of officers and fire extinguishers; (2) Appeal to passengers to avoid activities that risk causing sparks during refueling; (3) all parties on the move during aircraft turn around must coordinate with each other during refueling.

However, the recommendations presented have not been directly linked to the hierarchy of hazard control principle in aviation safety risk management. In the context of refueling activities, this approach can be used to strengthen the effectiveness of mitigation. At the administrative control level, there is a need for an integrated SOP that regulates coordination between officers during the refueling process so that all activities run according to procedures and risks can be minimized. Meanwhile, in the aspect of personal protective equipment (PPE) and safety equipment, the presence of fire extinguishers on standby is an important element as a form of direct control in the event of a fire incident. By referring to the hazard control hierarchy, the refueling process can be managed more systematically and safely.

### Risk Assessment

In assessing and determining mitigation measures, the author is guided by applicable regulations (SKEP 223 / X / 2009) and the results of interviews with the PGS General Manager of Angkasa Pura Indonesia KC Fatmawati Soekarno Airport Bengkulu and AMC unit Supervisor.

From the results of the assessment and recommendations for mitigation measures from the existing findings, the expected conditions are as follows:

**Tabel 7** Negative findings

| No | Negative Findings  | Result | Expected Conditions After Mitigation Act |
|----|--|--------|--|
| 1  | Ground Handling Officers and Marshallers do not use complete PPE (Ear muffs) | 5C     | 1C                                       |
| 2  | FOD in Parking Stand 1   | 5B     | 1B                                       |
| 3  | Oil spillage in apron  | 2C     | 1C                                       |
| 4  | Refueling along with passenger movement                                      | 5A     | 1A                                       |

It is expected that from the results estimated after carrying out the mitigation steps that have been recommended by the author, airport organizers can carry out risk control effectively, where the level of consequence may remain the same, but the probability of occurrence is expected to decrease.

### CONCLUSION

Based on the results of the description above and the results of the assessment that has been carried out, during the author's On the Job Training activities. Then the following conclusions can be drawn: (1) At apron area of Fatmawati Soekarno Airport Bengkulu there are 4 negative findings related to safety, which can pose a safety risk. Among them, non-compliance with the use of PPE, the presence of FOD in the parking stand 1 area, oil spills in the apron area, and refueling along with passenger movement; (2) After an assessment using Hazard Identification and Risk Assessment (HIRA) there are 1 finding that requires risk control/mitigation and 3 findings that are not acceptable; (3) From the above assessment, all negative findings require appropriate mitigation measures in order to minimize the risks that can be caused; (4) Risk control is expected to reduce safety risks that may be caused, while still paying attention to the risk tolerance threshold, so that airport administrators can carry out effective risk control.

Based on the results of the description above and the assessments that have been carried out during the On the Job Training activities, the following conclusions can be drawn: (1) In the apron area

of Fatmawati Soekarno Airport Bengkulu there are four negative findings related to safety that have the potential to cause serious risks, namely non-compliance with the use of PPE, the presence of FOD in the parking stand 1 area, oil spills in the apron area, and refueling activities that take place simultaneously with passenger movement; (2) After an assessment using the Hazard Identification and Risk Assessment (HIRA) method, there is one finding that requires risk control/mitigation, and three other findings are categorized as unacceptable; (3) All of these findings require appropriate mitigation measures to minimize potential hazards that may arise; (4) Risk control is expected to reduce the level of existing safety risks, as long as it remains within acceptable risk tolerance limits, so that airport managers can carry out effective control.

These findings demonstrate the importance of strengthening the safety culture in the apron area, which is often overlooked despite its high level of risk to the smoothness and safety of flight operations. This study makes an important contribution to apron management practices at similar airports, especially in integrating a HIRA-based risk assessment approach to produce mitigation decisions that are systematic, data-driven and relevant to actual operational conditions. Thus, the results of this study are not only a form of local evaluation, but also a reflective foundation for the development of an overall airport safety system.

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Hopefully this journal can provide benefits and positive contributions to the development of work safety in the airport environment.

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