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SAFETY RISK ASSESSMENT ON AIRCRAFT MARSHALING CASE STUDY AT INDONESIAN CIVIL PILOT ACADEMY OF BANYUWANGI

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Abstract: Aviation cannot be separated from the consequences or risks that arise from all activities in flight operations. The Indonesian Civil Pilot Academy Banyuwangi as an educational institution that participating in such activities, it is susceptible to various risks, ranging from minor to major risks. The marshaling activity is one of the crucial flight activities conducted by cadets of the Indonesian Civil Pilot Academy of Banyuwangi. This activity can be hazardous if not conducted properly and in compliance with the procedures. This research aims to determine the risks of marshaling activities at the Indonesian Civil Pilot Academy of Banyuwangi and propose effective mitigation strategies. The qualitative methodology was chosen in this research utilizing three stages of data collection techniques: observation, literature study, and interviews. The research results show that three primary risks occur in marshaling activities at the Indonesian Civil Pilot Academy of Banyuwangi, in particular, not using earplugs, not using safety vests and unclear parking markings. These three risks are attributed to a lack of accountability, the absence of standard operating procedures, and insufficient provision of necessary equipment by the organization.

Keywords: marshaling, safety, risk.

Introduction

Air transportation is now the most effective choice because it provides convenience, speed, efficiency, and economy in connecting remote areas or large islands both for transporting goods and transporting people or passengers (Ramadhan et al., 2020; Wicaksono, Sonhaji, & Mubarok, 2022a). Therefore, the world of aviation cannot be separated from the consequences or risks that arise from all activities in flight operations (Saputra, 2021). The aviation industry must meet standards to be able to carry out aviation activities. These standards have been set by the International Aviation Organization, namely ICAO (International Civil Aviation Organization) (Bhoka & Sutarwati, 2024).

Safety is the main thing that must be a concern for the government and related stakeholders (Kaspers et al., 2019; Patriarca et al., 2019). Aviation itself has implemented a safety management system (SMS) to be able to mitigate incidents and accidents (Adjekum & Tous, 2020; Robert Foster & Kwasi Adjekum, 2022). To improve flight safety, targets are needed to be achieved, which are called safety performance targets (ICAO, 2016). These targets are a tool for measuring flight safety performance (ICAO, 2018).

The Indonesian Civil Pilot Academy Banyuwangi As an educational institution that carries out flight operations, it is certainly not free from risks, starting from the smallest risks to the largest. Risk can generally be interpreted as a situation or condition faced by a person or company

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where there is the potential for loss or negative impact. (Vikaliana, 2017). One of the crucial aviation activities conducted by the Indonesian Civil Pilot Academy of Banyuwangi cadets is the marshaling activity. (Tonrariola et al., 2024). This activity has a risk of accidents if it is not conducted correctly and does not comply with the procedures. (Wicaksono, 2024).

The marshaling activity conducted by cadets, especially pilots, could be said to not meet applicable procedures or standards and could pose a risk if ignored (Riska & Maulana, 2022; Tonrariola et al., 2024). By international regulations in ANNEX 2 *rules of the air point* 3.4.5. "*The signalman shall wear a distinctive fluorescent identification vest to allow the flight crew to identify that he or she is the person responsible for the marshaling operation"*.

The following is an example of a marshaling activity that cadets who do not meet safety requirements like, not using safety equipment (earmuff, earplug), not wearing a safety vest/ *vest*, the cadet does not have competence (does not have a license), the aircraft not park at the according to the markings on apron, and not using wheel chock. This condition doesn't comply on the minimum safety requirements on every activity that involve on aircraft operation.

Figure 1. Marshaling activity by pilot student (Cadets).

At first glance, the marshaling activities conducted at the Apron Indonesian Civil Pilot Academy of Banyuwangi may appear to involve minimal risk. According to the result of our initial check showed that none of the existing risk analyses at the Indonesian Civil Pilot Academy of Banyuwangi recorded risks from marshaling activities. If adequate analysis is not conducted on the risks that might occur, then the organization will not have a good response plan. (Riska & Maulana, 2022; Wijaya, 2022). Based on these facts and descriptions, the following research statement is prepared:

RQ 1. What are the possible risks and what are their values?

RQ 2. What risk mitigation steps are planned?

Risk management is essential to prevent aviation accidents (X. Zhang & Mahadevan, 2019). Steps and approaches to minimize risk must be taken to achieve organizational goals because risk is always present, permanent, full of possibilities, and uncertainty (Gurtu & Johny, 2021). The steps and approaches taken are part of risk management or risk management (Nastos et al., 2021).

This research aims to asses possible risk that maybe occur on marshalling activity on that condition, assessing the risk and find the best mitigation that may conduct to reduce risks. This research will reveal who has the responsible to conduct that activity, and why that activity run without meet minimal safety requirement on safety in aviation.

Method

This research adopted qualitative methodology, comprising three stages of data collection: observation, literature study, and interviews (Nina Adlini et al., 2022). The resource persons used were divided into 3 groups, namely pilot cadets as activity marshaling, those in charge of operations, and also those in charge of aircraft. A purposive technique employed to determine the sources (Hair et al., 2020; Timans et al., 2019).

The first data collection was conducted by observing marshaling activities at the apron of the Indonesian Civil Pilot Academy of Banyuwangi to identify potential risks which were conducted in May and June 2024. Observations are conducted by observing the marshalling activities conducted by cadets and recording any form of activity that does not comply with aviation safety standards. Data collected from observations was compared with explanations from references to reveal existing gaps (Rijal Fadli, 2021). Data from observations is also utilized in the risk assessment process. The results of these two processes serve as the foundation for formulating interview questions for the resource person.

The references used in the literature review, apart from using published risk-related articles, along with risk assessment references using the ICAO DOC 9859 Safety Management Manual and KP 339 of 2023 concerning Determination of Risk Policy for the Indonesian Civil Pilot Academy of Banyuwangi which is a derivative regulation from KM 69 of 2023 concerning Risk Management within the Ministry of Transportation. The following tables are the risk assessment models and maps for both.

Table 1. Risk Matrix and Risk Index Based on ICAO DOC 9859

Safety Risk	Risk Severity				
Risk Probability	Catastrophic A	Hazardous B	Major C	Minor D	Negligible E
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
Extreme Improbable (1)	1A	1B	1C	1D	1E

Risk Index	
5A, 5B, 5C, 4A, 4B, 3A	Intolerable
5D,5E,4C,4D,4E,3B,3C,3D,2A,2B,2C,1A	Tolerable
3E,2D,2E,1B,1C,1D,1E	Acceptable

Table 2. Risk Matrix and Risk Index Based on also KP 339 of 2023 and KM 69 of 2023

Risk Matrix		Risk Severity				
Risk Probability		Not Significant	Minor	Moderate	Significant	Most Significant
		1	2	3	4	5
Frequent	(5)	9	15	18	23	25
Occasional	(4)	6	12	16	19	24
Remote	(3)	4	10	14	17	22
Improbable	(2)	2	7	11	13	21
Extreme Improbable	(1)	1	3	5	8	20

Colors	Level	Risk Status
	Level 5	Very High
	Level 4	High
	Level 3	Moderate
	Level 2	Low
	Level 1	Very Low

The main informants for this study to be interviewed were cadets responsible for conducting aircraft marshalling operations, the head of the flight operations unit who was responsible for flight implementation, the head of the flight facilities unit who was responsible for aircraft maintenance, and the chief quality of flight assurance who was responsible for flight safety.

Results and Discussion

According to the findings of the researchers after conducting observations for 7 days or a week with a duration of 1 to 2 hours each day, the researchers found dangers to marshalling activities and identified hazards to marshalling activities conducted by cadets. The researchers also found the fact that cadets were frequently observed without wearing personal protective equipment, especially the use of earmuffs / earplugs. During the observation, the researcher only had the opportunity to find cadets using ear protection devices 4 times while the rest did not use ear protection devices. During the observation, the researcher also never saw cadets wearing vests, installing wheel chocks on the aircraft when parking and parking the aircraft according to the markings.

As a result of in-depth observations conducted extensively in May 2024, it was found that the provision of marshaling services during flight operations at the Indonesian Civil Pilot Academy of Banyuwangi was performed by pilot cadets. In the process of providing this service, it was found that the cadets were observed not using adequate tools or attributes as they should for marshaling personnel operating in the apron areas. See Figure 2.

Figure 2. Marshaling activity by student pilot

Based on the results of these observations, several hazards were also found that could become potential risks as shown in the table below.

Table 3. Hazard and Potential Risks

No	Hazard	Potential Risks
1	Don't use earplugs	Noise and hearing loss
2	Not using a safety vest	Work accident due to unidentified presence
3	Unclear parking markings	Wrong parking and Wing tip Crash

According to the findings from these observations, a risk assessment was made to identify the potential risks that are likely to be associated in the implementation of marshaling at the Indonesian Pilot Academy Banyuwangi utilizing ICAO DOC 9859 Safety Management Manual and also KP 339 of 2023 concerning Determination of Risk Policy for the Indonesian Pilot Academy Banyuwangi which is a derivative regulation from KM 69 of 2023 concerning Risk Management within the Ministry of Transportation. Based on the criteria of possible risk and risk severity for each identified methods, the following results were obtained:

Table 4. Risk Assessment

No	Hazard	Potential Risks	ICAO DOC 9859				KP. 339 / KM 69			
			RP	RS	RI	Desc	RP	RS	RI	Desc
1	Don't use earplugs	Noise and hearing loss	5	C	5C	Intolerable	5	4	23	Very High
2	Not using a safety vest	Work accident due to unidentified presence	5	D	5D	Tolerable	5	3	18	Very High
3	Unclear parking markings	Wrong parking and Wing tip Crash	5	A	5A	Intolerable	5	5	25	Very High

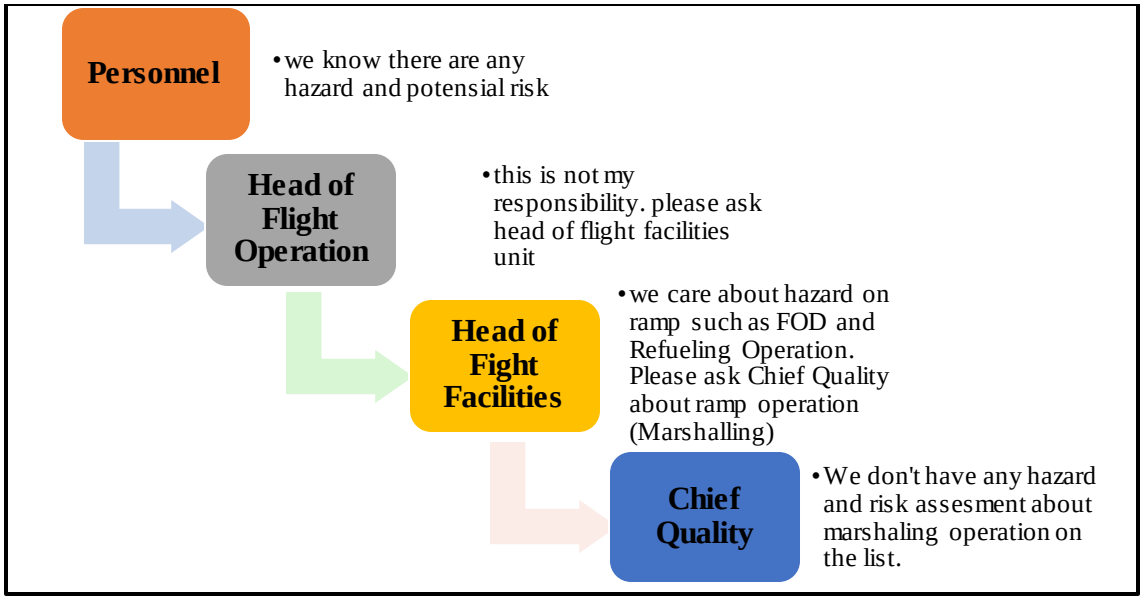
RP: Risk Probability, RS: Risk Severity, RI: Risk Index, Desc: Description.

To gain deeper insights into this implementation, interviews were conducted in 2 stages, first with the personnel (flight student/cadet), and also with the key person deemed most responsible for overseeing ramp/marshaling operations. The purpose of these interviews was to determine whether the hazard had been identified and whether the potential risks had been assessed.

The results of the first interview conducted with 3 marshaling officers who were pilots from various batches, gave the same opinion that the activities possessed to dangers and potential risks. They acknowledged about the equipment must be used when performing marshaling services; however, it was noted that the Indonesian Civil Pilot Academy of Banyuwangi does not provide this equipment. Another finding obtained from this interview is that the personnel undertaking marshaling activities are junior cadets who have not yet received risk management lessons.

The second source to be interviewed was the head of the flying operations unit which is responsible for the running of flying operations at Indonesian Civil Pilot Academy of Banyuwangi. However, after conducting an initial interview, the person stated that the head of the flying operations unit was not responsible for the marshaling services performed by the cadets. The head of the flying operations unit recommended interviewing the head of the flying facilities unit.

Correspondingly, an interview was successfully conducted with the head of the aviation facilities unit, and he stated that the dangers and potential risks at the Apron had been identified, especially related to FOD (Foreign Object / Debris) and also related to the refueling process while marshaling activities should fall under the supervision of the Chief Quality Assurance 141 as listed in Hazard Identification and Risk Assessment (HIRA). Based on the results of the interview, the researcher initiated an interview with Chief Quality Assurance 141. The results of the interview provided information that the dangers of marshaling activities at the Indonesian Civil Pilot Academy of Banyuwangi Apron had not yet been identified and the potential risks had never been assessed. The flow and results of the interviews in this research can be seen in the following picture.



Based on the findings above, it was found that activities conducted by Indonesian Civil Pilot Academy of Banyuwangi pilot cadets had large potential risks but had never been identified and no one even directly stated their responsibility for these activities. Every danger in the activity must be identified so that the potential risks in the activity can be reduced (Almer et al., 2023; Prasetyo, 2023; Wicaksono et al., 2024).

Indonesian Civil Pilot Academy of Banyuwangi, as a high-risk educational institution, has conducted good risk management, both by ministerial instructions (KM 69 of 2023) and by ICAO guidelines in document 9859. However, in marshaling activities, the existing risks have not been mapped, identified, and assessed, and this is not by risk management principles and the potential for existing dangers will become wild (Simanjuntak & Sutarwati, 2023; Vikaliana, 2017; Widodo et al., 2022).

Risk management is also an activity that requires responsibility from leaders (Alidrisi & Mohamed, 2018; Atikasari et al., 2022; Wicaksono, Sonhaji, & Sembiring, 2022). Every activity in flight operations must be identified and a delegation of authority must be appointed, so that there are personnel who are responsible for implementing the activity (Schopf et al., 2021; Stiles et al., 2018; Wicaksono et al., 2022). Carrying out activities that have danger and potential risks must be equipped with adequate equipment to maintain safety performance (Kaspers et al., 2019; Qayoom & H.W. Hadikusumo, 2019). From the finding above, researchers develop theories from the factual data found to find the root of the problem and also appropriate mitigation steps which can be seen in the following table:

Table 4. The Root of Problem and Mitigation

No	Hazard	Potential Risks	Root of the Problem	Mitigation
1	Don't use earplugs	Noise and hearing loss	1. No one is responsible; 2. There are no standard operating procedures; and 3. equipment not provided by the organization	1. appoint appropriate personnel to be responsible 2. publish standard operating procedures 3. complete the necessary equipment.
2	Not using a safety vest	Work accident due to unidentified presence		

No	Hazard	Potential Risks	Root of the Problem	Mitigation
3	Unclear parking markings	Wrong parking and Wing tip Crash	No one is responsible;	Appoint responsible personnel and re-paint the parking stand.

According to the results of existing research, there are at least 3 deficiencies that have been identified in the implementation of marshaling activities at the Indonesian Pilot Academy Banyuwangi, namely 1. The personnel performing the activity are not provided with adequate equipment such as earmuffs and safety vests, 2. No unit head is responsible, and 3). Existing hazards and risks have not been identified and assessments have not been conducted.

These 3 deficiencies will reduce the level of safety of the organization, and require special attention from top management (Kalteh et al., 2021). These deficiencies can have fatal consequences on flight operations, such as the absence of risk assessment (Stroeve et al., 2022), or responsible management (Adjekum & Tous, 2020; Robert Foster & Kwasi Adjekum, 2022). This deficiency is not in accordance with the concept of flight safety which is one of the main concerns for the implementation of flight operations (ICAO, 2018). This deficiency will reduce the level of safety and has the potential to cause accidents or serious incidents which are the failure of the organization in ensuring safety (Wicaksono et al., 2024).

The results of this research reveal that the root causes of these large risks are trivial and require little attention from existing management functions (Majid et al., 2022; Patriarca et al., 2019). Because no one is responsible, there are no mitigation steps, because the potential risks have never been identified before (Chen et al., 2021; Gaweesh et al., 2021).

The safety performance at the Indonesian Pilot Academy Banyuwangi must be further improved by building awareness of every potential risk that exists (B. Wang, 2021; Z. Wang et al., 2021). Awareness of these dangers will increase the ability to think about safety and will make organizations more aware of risks (Adjekum, 2017; Ingesson, 2022). The most important thing in implementing risk management is the role of top management (Alidrisi & Mohamed, 2018; Atikasari et al., 2022; Schopf et al., 2021). The leadership's role is to decide safety policies and ensure that every activity, especially those with potential risks, is given to the right personnel (Alidrisi & Mohamed, 2018; Grill & Nielsen, 2019; J. Zhang et al., 2020).

Conclusion

Marshaling activities at the Indonesian Civil Pilot Academy of Banyuwangi play a crucial role in supporting flying activities and operations. The research results show that the dangers and potential risks of this marshaling activity have not yet been identified, mapped, and assessed. Three types of hazards were identified with their respective potential risks, i.e. marshaling activities without using earplugs which has the potential for hearing loss, not using safety vests which have the potential for work accidents and unclear parking stands which have the potential for wrong parking or wingtip crashes. This deficiency is not in accordance with the concept of flight safety which is one of the main concerns for the implementation of flight operations and will reduce the level of safety and has the potential to cause accidents or serious incidents which are the failure of the organization in ensuring safety.

The results of further investigation showed that this happened because of three root causes which are The marshaling personnel (flight student/cadet) lack of proper equipment such as earmuffs and safety vests, the absence of a designated unit head responsible for oversight, and the existing dangers and risks had not been identified and an assessment had not been performed. To increase the level of safety at the Indonesian Civil Pilot Academy of Banyuwangi, this marshaling

activity must be addressed by appointing a responsible personnel, developing appropriate procedures, and also completing standard equipment requirements. Enhancement of safety standards depends on leadership involvement and the establishment of supportive policies are critical in the development of safety performance.

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