ASSESSING RISK AND HAZARD IN FLIGHT OPERATION OF FLYING SCHOOL: CASE STUDY USING HAZARD IDENTIFICATION AND RISK ASSESSMENT METHOD

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Abstract

Safety is at utmost priority in aviation industry. The International Civil Aviation Organization even established a dedicated part of its regulation, The Annexes, to ensure and promote aviation safety. The state of establishing, assessing risk, assuring, and promoting safety is a holistic system stated as Safety Management System. This system ensures that risks and hazard are mitigated and reduced to an acceptable level. There are many procedures and checklists available to ensure flight safety, one of them is by assuring the conduct of safety procedure is based on its establishment standard or even revised and updated to follow the recent development in the operation of the industry. This research is qualitative-research using the Hazard Identification and Risk Assessment method. The output of this research will be a mitigation recommendation that corresponds with the result of hazard identification and assessment of the researched phenomenon so that the same incident would not happen again in the future. This research is conducted in the oldest aviation campus in Indonesia, Politeknik Penerbangan Indonesia Curug. The final result is that the operation of flight training still tends to have either hazard or risk. This research aims to encourage and promote mitigation act to reduce and prevent the aftereffect of the risk assessed.

Keywords: *Pre-Flight, Risk, Hazard, Safety, Management, Training.*

A. INTRODUCTION

Safety in flight is a condition in which all flight safety requirements have been met. All actors involved in flight operations, from pilots, cabin crew, engineers, air traffic controllers, even flight operations officers, have their role to play in supporting flight safety. In aviation safety concept, everyone is responsible as safety officer. Each of us are responsible in establishing, assuring, and promoting safety in aviation.

As one of the certified pilot schools in Indonesia, the Pilot School (PSC 141D-001) and flight training at the Indonesia Civil Aviation Polytechnic Curug (PPIC) also strongly emphasizes the importance of safety in conducting flight training activities, one of which is by requiring all flight cadets to always carry approved standard operating procedures and checklists. This is in accordance with what is stipulated in Civil Aviation Safety Regulation (CASR) Part 141: Certification and Operating Requirements for Pilot Schools Subpart E - Operating Rules Section 141.75, which states that no flight training unit is permitted to conduct flight training activities unless it has an approved checklist that includes, at a minimum, pre-engine start procedures, pre- takeoff procedures, pre-landing procedures, pre- test and post-engine shutdown procedures, and emergency procedures. Additionally, each student pilot (cadet pilot) must be equipped with an Aircraft Operating Manual or an equivalent document.

The regulation and procedures are set into the highest level of standard in order to ensure that by setting the high standard can promote higher compliance to safety standard. So, this is not about frightening the crew of the punishment, rather the system is established to promote people to be actively involved in complying to safety. However, humans make unintentional mistakes even if the standard is already set high. This is called error. The state of error is

different with the state of violation. The error is caused by unintentional act of human, while violation is caused by intentional act of doing mistake in spite of knowing the regulation and procedure.

Although humans make error, they are also part of the solution. Instead of being reactive to problem, ICAO Annex 19 on Safety Management System encourages the people in aviation to be predictive to risk and hazard that might appear. Hence, one of the pillars of safety, i.e. safety risk assessment functions as the method to identify hazard, assessing risk, and plan mitigation actions to reduce the risk to certain acceptable level. The cadet pilot as mentioned before, is also one of the actors in maintaining and assuring safety. Still, there is risk and error in flight training, but all the staffs and students are encouraged to plan mitigation act to reduce the risk in case the unintended event happens.

Based on the problems identified above, we are focusing this research on identifying hazards, analyzing safety risks, and determine the mitigation measures needed to reduce the possibility of incidents or accidents in pilot training program. This research is important to conduct in order to reduce safety risks and promote the safety as way of life for staffs and pilot cadets at the Indonesia Civil Aviation Polytechnic Curug (PPIC).

B. METHOD

The first reference used in research is to conduct a thorough literature-studies which is called literature review, theoretical review, theoretical basis, literature analysis (literature review), and theoretical review (Melfianora, 2019). Meanwhile, according to Sugiyono, a literature study is related to theoretical studies and other references related to values, culture, and norms that develop in the social situation being studied (Sugiyono, 2015). Therefore, researchers use various related references that can support the resolution of the phenomenon being studied and can be used as a fundamental theoretical basis. Data analysis will then be carried out after all necessary data has been collected.

The first step that we take is to begin the first step, namely hazard identification, which focuses on hardware components. In this stage, we identify the hazards of conducting a flight training at the PPI Curug Pilot School (PSC-141D-001). After identifying the hazards, a risk assessment will be carried out to assess the risks arising from the identified hazards. This assessment is carried out by measuring the level of probability and severity of a safety risk based on a severity and a probability matrix. The results of the assessment will then be categorized based on a risk matrix table. If the phenomenon falls into the moderate or high category, mitigation measures must be taken to reduce the severity and probability of the safety risk.

Safety risks with moderate to high values will be subject to mitigation acts. According to ICAO Doc. 9859 - Safety Management Manual, there are three types of mitigation measures (ICAO, 2013):

1. Avoidance
   The activity or operation is cancelled or avoided because the risk outweighs the benefits of the operation.
2. Reduction
   The frequency of the operation or activity is reduced, or measures are taken to reduce the severity of the consequences of the risk.
3. Segregation
   Measures are taken to isolate the effects of the existing risk.

The values assigned to the Probability Table above are categorized into five levels using a scale of 1 to 5. The severity ratings in the table above are categorized into five levels using letters from A to E. The results of the assessment of probability and severity are then classified based on the risk matrix table. The risk matrix is the result of combining the probability value

with the severity.

Table 1. Risk Probability Table

Category	Description	Score
Frequent	Likely to occur repeatedly	5
Occasional	Occurs occasionally	4
Remote	Unlikely to occur	3
Improbable	Very unlikely to occur	2
Extremely Improbable	The event is almost unimaginable to happen	1

Table 2. Risk Severity Table

Category	Description	Score
Catastrophic	Equipment or aircraft may be destroyed Cause multiple fatalities	A
Hazardous	Significant reduction in safety margins, physical stress, or workload, rendering the company unable to perform its duties accurately or completely Serious injury occurs Damage to major equipment	B
Major	A significant reduction in safety margins, a decrease in the company's ability to cope with adverse conditions as a result of increased workload or as a result of conditions that interfere with their efficiency Serious incidents occur Injuries to people occur	C
Minor	Disruptions occur Operational restrictions occur	D

Table 3. Risk Matrix

Risk Probability	Risk Severity				
	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
Extremely Improbable (1)	1A	1B	1C	1D	1E

C. RESULTS AND DISCUSSION

Hazard identification was carried out by means observation and literature study. In this occasion, we identify potential hazards or latent conditions that appear. After doing the identification, we determine potential hazards and risks that did not meet the standards published by the PPIC. The results of hazard identification that can be caused from flight training conduct which is not in accordance with the standards owned by the PPIC training standard (documentation attached in Appendix A) can be seen in the following table:

Table 4. Hazard Identification and Risk Assessment

No	Hazard	Possible Unsafe Event	Risk	Probability	Severity	Score
1	Open environment with trees as bird habitat	Bird Strike	Engine damage, Emergency landing	4	A	4A
2	Pilot error	Runway Excursion	Possible aircraft structural damage	3	B	3B
3	Strong wind velocity	Runway Excursion	Possible aircraft structural damage	3	B	3B
4	Congested airspace in	Near Miss Collision	Injury Total loss	2	A	2A

	northern and eastern area due to the use of nearest airports					
5	Fatigue among flight instructors or students	Incapacitation	Decreased performance	3	C	3C
6	Flight Instructors are not familiar with newest area or training procedure	Unsafe decision making	Operation Rules Violation	3	D	3D
7	System Malfunction	Faulty software	System error Unsafe Operation	4	B	4B
8	Unroutine engine maintenance	Engine failure	Forced landing	2	A	2A
9	Kite Flying	Engine failure	Forced Landing Return to Airport	3	A	3A

After conducting Risk Assessment, the accident risks that have moderate to high categories will be given mitigation actions, with the hope of reducing the severity and possibility of these safety risks.

Table 5. Mitigation Acts

No	Hazard	Risk	Existing Mitigation	Existing Risk Matrix	Mitigation Plan	Expected Risk Matrix	Mitigation Type
1	Open environment with trees as bird habitat	Engine damage, emergency landing	Pre-flight briefing Literature Study	4A	Conduct special briefing and simulated training dedicated to bird strike prevention and its flight recovery technique Conduct routine airport inspection for identifying bird spots around aerodrome Concept a procedure of emergency response plan for this bird strike scenario	2E	Avoidance Reduction Preparedness
2	Pilot error	Possible aircraft structural damage	Pre-flight briefing Literature Study	3B	Conduct safety briefing about Aeronautical Decision Making and Human Factor Formulate a procedure of emergency response plan if runway excursion happens	2D	Preparedness Reduction
3	Strong wind velocity	Possible aircraft structural damage	Pre flight briefing Reactive act as lesson learned	3B	Conduct safety briefing about Aeronautical Decision Making and Cross Wind Landing Technique	2D	Reduction Preparedness

					Conduct training and simulation of the situation dedicated to supervise the landing technique of students Conduct briefing to encourage students about stabilized approach and go around		
4	Congested airspace in northern and eastern area due to the use of nearest airports	Injury Total loss	Area Procedure Briefing about avoiding Final Area	2A	Conduct safety briefing about local area procedure Set a procedure that explicitly instructs area allowed for final area avoidance	1B	Reduction Preparedness
5	Fatigue among flight instructors or students	Decreased performance	Briefing about human performance and limitations	3C	Conduct medical check in the morning before flight Conduct briefing about personal safety performance checklist, e.g.; PAVE, IMSAFE	1B	Reduction
6	Flight Instructors are not familiar with newest area or training procedure	Operation Rules Violation	Indoctrination about new procedure Refresher flight	3D	Conduct safety briefing and indoctrination on every revision on Local Area Procedure Conduct refresher flight	1D	Reduction
7	System Malfunction	System error Unsafe Operation	Schedule regular maintenance based on engine hour and propeller hour Reactive act by system complaint after flight	4B	Check the systems on every before flight Add standby engineer by shifting work system	2D	Reduction Preparedness
8	Unroutine engine maintenance	Forced landing	Engine maintenance every 50 hours and 100 hours of engine	2A	Conduct research to formulate recommendation action by collecting data from recent troubles in engine. Add standby engineer by shifting work system	2D	Reduction

9	Kite Flying	Forced Landing Return to Airport	Regulation from Airport Authority	3A	Conduct socialization about the regulation and consequences of kite flying to the local people Spot the kite flying area in the airports Conduct patrol during the peak hour of kite flying	1C	Avoidance Reduction

D. CONCLUSION

Based on the results of the Hazard Identification and Risk Assessment in Flight Training at PPIC, the risks that can result vary from the moderate to hazardous category where the safety risk affects safety of the operation. Hence, it requires mitigation measures based on the results of the assessment through the research instrument. The recommendation is based on the results of focus group discussion with safety experts and safety officers after the hazard identification and risk assessment have been done.

The score of risk matrix is reduced from hazardous and moderate level to acceptable level of green matrix. The mitigation acts in this research are mostly recommendations on training and safety briefings rather than doing reactive act after an event occurs. The trainings and briefings are aimed to prevent the risk by emphasizing safety and safe decision making by both pilots and flight instructors. These also encourage student pilots and instructors to make safe decision making and safe operation as their way of life rather than focusing themselves on the punishment from the regulation if the events happened.

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