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Exploring the Influencing Factors of Safety Recommendations' Effectiveness in Indonesian General Aviation

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ABSTRACT: General aviation has been developed as one of the main methods of transportation in small rural aerodromes in Indonesia. Surrounded by mountainous terrain and limited equipment for flight operation, flying unpressurised aircraft with many restrictions is quite challenging and may have a high risk of accidents. The number of incidents involving general aviation has not decreased, despite the numerous safety recommendations that have been generated as a direct result of accident reports. This research aims to identify the factors affecting the effectiveness of safety recommendations related to accidents and serious incidents of general aviation in Indonesia. Ten participants from the investigation agency, safety authority, and airline operators participated in semi-structured interviews. The interviews were transcribed and analyzed using the Grounded Theory approach. The findings revealed that three main considerations used in formulating safety recommendations following an investigation in Indonesia; to improve safety, to ensure comprehension, and to be accepted and implemented by addressees. In addition, in accepting and implementing safety recommendations, recipients consider organizational internal processes, decent communication towards addressees, enforcement and penalties, investigation processes and results, and the characteristics of the safety recommendation itself. It is suggested that installation of a monitoring and follow-up system to analyze the measurability and applicability of proposed actions.

KEYWORDS: Aviation Safety, Safety Recommendations, Accidents Investigation

1. INTRODUCTION

Located between Asia and Australia, Indonesia is an archipelago country that makes air transportation one of the most common modes of transport. Challenging geography and landform, such as mountainous and coastal areas, create unique skill requirements for pilots who fly across Indonesia with small aeroplanes. Any commuter or charter air l report shows fluctuating figures, which in 2016 reached the highest number of 13 AOC Part 135 accident investigations (Ministry of Transportation, 2000). The top three most frequent investigations took place in Java (20 accidents, 45 serious incidents), Papua (25 accidents, 33 serious incidents), and Sumatera (10 accidents, 18 serious incidents). From the investigation agency's media release (KNKT, 2016), it was also noted that human factors were the major cause of these accidents, followed by technical issues and environmental issues.

Most of the safety recommendations developed during those investigations were addressed to operators (43.32%) and the authority (35.15%). The same pattern of addressing regulators for aircraft investigation safety recommendations was also found in Sweedler's (1995) research. However, the rate of accidents was still fluctuating during 2010 to 2017.

Based on the above phenomenon, this study is aimed to identify and analyze the processes and considerations used by investigators and addressees in developing and implementing the safety recommendations related to accidents and serious incidents involving aircraft operating under AOC Part 135 in Indonesia.

2. LITERATURE REVIEW

2.1 Safety recommendation process

Accident investigations are often seen as a process of discovering causes and fixing the most important ones; hence, other less contributing aspects receive less attention (Lundberg et al., 2012). For example, the later stages of the accident investigation process such as formulation, communication, and implementation of safety recommendations are often given less attention. There is limited research in the area of developing safety recommendations and Rollenhagen et al. (2010) found that little time and effort were invested in the process relative to data collection and analysis. Based on official reports from the Indonesian investigation agency, all investigation processes were conducted in accordance with ICAO Annex 13 – Aircraft accident and incident investigation (ICAO, 2010) in which it was stated that:

"A state conducting investigations of accidents or incidents shall address, when appropriate, any safety recommendations arising out of its investigations to the accident investigation authorities of other State(s) concerned […]"

However, it does not imply under what conditions and situations safety recommendations should be generated. Indonesia's investigation agency's official judgement also supported this statement:

"To prevent accidents or incidents recurrence, the NTSC develops and issues safety recommendations to other government agencies, the industry, and other organizations to improve transportation safety." (Presidential Decree, 2012).

There is no further explanation of how the safety recommendation should be created. The safety recommendation's objective, based on that sentence, is to improve transportation safety but the investigation agency does not have any authority to enforce other organizations to accept and implement the recommendations. Lack of clarity is also identified in the process of developing safety recommendations; whether or not there are prior discussions and communication between the addressee and the investigation agency, or any consideration taken in developing the recommendations.

2.2 Considerations in developing safety recommendations

In developing safety recommendations, several considerations have to be taken. These considerations are found in the literature review. Heirinch's (1931) research proposed that only immediate surroundings, such as line management, are considered in the accident models and, therefore, only the most proximate cause should be prevented. On the other hand, Leveson (2002) commented that efforts shall be devoted to identifying three things: firstly, factors that are the easiest to prevent; secondly, factors that may initiate wide-ranging accidents; and thirdly, factors which are feasible to be measured.

Consideration in addressing the recommendations is also mentioned in literature. The right recommendations proposed to the right recipient will trigger an effective implementation. Safety recommendations addressed to the blunt end (higher organizational level) is believed to have an intended impact (Reason, 1997; Strauch, 2002) in accordance with Reason's (1990) notion of a latent condition contributing to the error.

The detail of the recommendation is another deliberation; although the high-level recommendations are often useful in addressing safety deficiencies, a more specific recommendation also benefits addressees in the implementation process (Johnson, 2003). Addressees can accomplish a meticulous action of proposed recommendations and achieve its intended objectives. Hence, a too detailed recommendation will lose its non-prescriptive characteristics and is likely to cause the recipient to adhere without further discussion.

It is also necessary to look at the relationship between collected evidence and analysis, since accident investigation reports can be argued publicly. The investigation agency should issue safety recommendations that derive from deeply analyzed evidence and have a logical connection between identified causes and suggested corrective actions (Götmar & Lundberg, 2007).

With regard to safety recommendation acceptance, a proposed recommendation must be carefully evaluated before release. Investigators must ensure the corrective actions are feasible, practical, and capable of being implemented (Sweedler, 1995). Therefore, in formulating safety recommendations, many authors believe that communication with targeted organizations is important. Communication can improve the successful implementation of recommendations (Cedergren, 2013; Dekker, 2002; Heinrich, 1931). It improves the chance of accepted safety recommendations as well as achieved safety goals and objectives.

Independency and credibility of the investigation agency may also affect the probability of accepted safety recommendations (Sweedler, 1995). This credibility is gained through a thorough investigation and analysis with logical and associated recommendations. On the other hand, to attain the adequate level of thorough investigation, investigators must have sufficient knowledge of how the daily operations were carried out (Cedergren, 2013). To identify the flaws of the system, it is necessary for the investigation agency to forge a connection with industry or professionals. This situation will then create other challenges regarding the independent status of the investigation agency. Roed-Larsen & Stoop (2012) argued that a fully independent investigation agency is nearly impossible and undesirable since it will disconnect investigation agencies from the current operational environment.

2.3 Considerations in accepting and implementing safety recommendations

In order to achieve the envisioned safety goals and objectives, safety recommendations must be accepted and implemented (Sweedler, 1995). Addressees of the safety recommendation also have considerations in accepting and implementing those recommendations. One of the considerations stated by Cedergren (2013) was responsibility for the suggested actions. Addressees see investigators as having too much of an outsider role and, therefore, do not acknowledge the addressees' authority. This was stated because the recommendations addressed are mostly not within addressees' responsibilities, and consequently no further action can be taken.

Resources to implement the recommendations are one of the considerations used in accepting proposed action (Götmar & Lundberg, 2007). Supporting the idea, Johnson (2003) states that some targeted organizations take cost and benefit issues into account when implementing the recommended action. They assess the output safety impact and effort in performing the recommended action. It is also important to communicate with addressees during the process of investigation and issuing of recommendation. Sufficient knowledge of the possible risks could be transferred by this discussion. Addressees are also more likely to accept and implement the recommendations if there is appropriate communication. Adequate information and new-found knowledge also increase the probability of acceptance. In medical and health environments, the need for information is considered as a motivator affecting in the approval of recommendations (Athearn et al., 2004).

When the incident or accident occurs, costs are incurred by operators through regulatory intervention (Johnson, 2003). In Indonesia, the Ministry of Transportation (2015) issued a decree in which operators who have been proven to violate the Indonesian Civil Aviation Safety Regulation will receive an administrative sanction, such as a warning, AOC suspension, AOC revocation, or administrative fine. The purpose of this action is to create an effective deterrent and prevent future accidents. At the same time, this condition enforces operators to accept all recommendations without further discussion to immediately cease the penalties as an act to prevent greater loss.

Insights accumulated in the field of the considerations used in developing, accepting, and implementing safety recommendations have provided a valuable basis for this research's analysis.

3. METHODOLOGY

3.1 Research approach

To achieve the research objectives, a qualitative method was chosen. Qualitative research is an approach for exploring social or human problems by collecting data through participants' settings, emerging questions, and procedures, and making interpretations based on the meaning of the data (Creswell, 2013). This type of research is selected because it is very useful in ascertaining people's experiences and difficulties encountered during operational processes (Brikci & Green, 2007). There are four basic types of qualitative research data collection: observation, interviews, documents, and audio-visual materials.

The research began initially by evaluating the relevant documents, such as official reports produced in the last seven years and official publications from the investigation agency. The researcher studied the safety issues found in existing reports. These reports were grouped and analyzed based on their types of accidents.

Semi-structured interviews were performed to seek and explore the process of developing safety recommendations and how the addressee can effectively implement them in daily operations.

3.2 Semi-structured interview

A semi-structured interview allows in-depth conversation between the participant and the researcher, providing the opportunity to probe and expand the participant's response

while permitting the researcher to keep the interview within parameters traced out by the aim of the study (Berg, 2009). One of a key benefit of a semi-structured interview is its attention to lived experience while also addressing theoretically driven variables of interest (Galletta, 2013), which emerge with the coding process of the Grounded Theory approach.

3.3 Grounded Theory

Due to the limited literature regarding the process of developing safety recommendations in the Indonesian investigation agency, Grounded Theory was used to analyze the collected data from the semi-structured interviews. Grounded Theory, first proposed by Glaser & Strauss (1967), is a method for constant comparative analysis. Grounded Theory is a design of inquiry in sociology in which the researcher derives a general, abstract theory of a process, action, or interaction grounded in the views of participants. This process involves using multiple stages of data collection and the refinement and inter-relationship of categories of information (Charmaz, 2006; Corbin & Strauss, 2008). The Grounded Theory will also help the researcher to understand completely the investigation process according to the theory given and the iterative analysis. A further enhancement of this theory performed by Corbin & Strauss (Corbin & Strauss, 2008) focuses more on analytical techniques and provides guidance to novice researchers, for example, axial coding.

3.4 Samples and participants

For this research, official accident reports of aircraft with AOC Part 135 flights, participants from the investigation agency, and the addressees were required for the semi-structured interviews.

The qualitative research has no sample size requirements; nevertheless, the researcher decided to use 27 official reports gathered from 2010 to 2017 to analyze the trend of accident and safety recommendations. Ten participants were also selected to be interviewed, as follows:

- Investigators: four personnel
- Operators: three personnel
- Safety Authority: three personnel

The consideration for selecting the participants are their roles and experiences in safety recommendation development for investigators, and their experience in conducting and implementing safety action recommendations as addressees for safety authority and operators.

3.5 Coding

Coding is the process of organizing the data by bracketing chunks (or text or image segments) and writing a word representing a category in the margins (Rossman & Rallis, 2012). The process for coding the information gathered from interviews is undertaken using Microsoft Excel. The open coding process is the first step to begin to analyze the data. It examines interview responses line-by-line. Line-by-line coding prompts the grounded theorist not only to study the interviews, but to examine how well the codes capture participants' implied and explicit meanings (Gubrium & Holstein, 2001). The researcher categorized and grouped the information using Microsoft Excel based on identified themes of information and made connections between categories as a part of the axial coding process. Lastly, in selective or focused coding, the researcher adopted frequently reappearing initial codes to use in sorting and synthesizing large amounts of data. Selective or theoretical coding involves the selection of a core category and relates it to other core categories. These core categories are then integrated and refined into theoretical constructions (Strauss & Corbin, 1990).

3.6 Validation of process and results

To prevent biases which can influence the outcome of this research, the researcher is required to validate the result. Nine different procedures to validate qualitative research were proposed by Creswell & Miller (2000). Some validation methods performed for this research are reviews from subject matter experts (SME) and members checking with respondents. The result of the template analysis was sent to SME to be assessed and compared, while the results of interview coding were consulted with participants.

The result comparison of the SME revealed great similarities, with few notes that support the researcher to modify potential biases in the writings. Feedback from participants also validated the proposed theory, with minor changes to improve the diagram and precision of wording expression.

4. RESULT AND DISCUSSION

4.1 Safety issues found in accident reports

Out of 27 cases of AOC Part 135 aeroplanes in 2010 to 2017, the top five types of accidents identified are Controlled Flight into Terrain (CFIT), runway excursions, collisions, mechanical-related problems, and loss of control (Table 1). The analysis for this selection was carried out by examining the stated types of accidents of each case in the final investigation report and grouping them based on those factors. This analysis is validated by the safety investigation agency's (SIA) annual report in 2016. Looking at the operating area of AOC Part 135 aeroplanes in Indonesia, CFIT and runway excursions are the most common type of accidents investigated in 2016 (KNKT, 2016). Interview results of the 10 participants for this research also supported this argument. The mountainous flying area and limited supporting equipment installed on aircraft create hazardous conditions if flight crews do not apply the procedures correctly. Comparable hazards also exist for runway excursion, which, in most cases, were due to the non-sterile conditions of the runway.

Description	No. of Cases
CFIT	8
Runway Excursion	5
Collision	3
Mechanical-related	3
Loss of control	3
Others	5
Total	27

Table 1. The top five AOC Part 135 aeroplanes' accident or incident types from 2010 to 2017 in Indonesia.

4.2 Process from investigation to the issuance of safety recommendations

Figure 1 shows the investigation process from the notification of the event to the issuance of safety recommendations. From the coding results, there are 4 categories highlighted: accident investigation, investigation analysis, safety recommendation development, and communication with addressees. From the coding results, there are 4 categories highlighted: accident investigation, investigation analysis, safety recommendation development, and communication with addressees.

4.2.1 Accident investigation

When an event happens, the first thing the investigator receives is the notification of event. This notification consists of basic information of what has just happened in the field. If the event is categorized as a serious incident or accident,

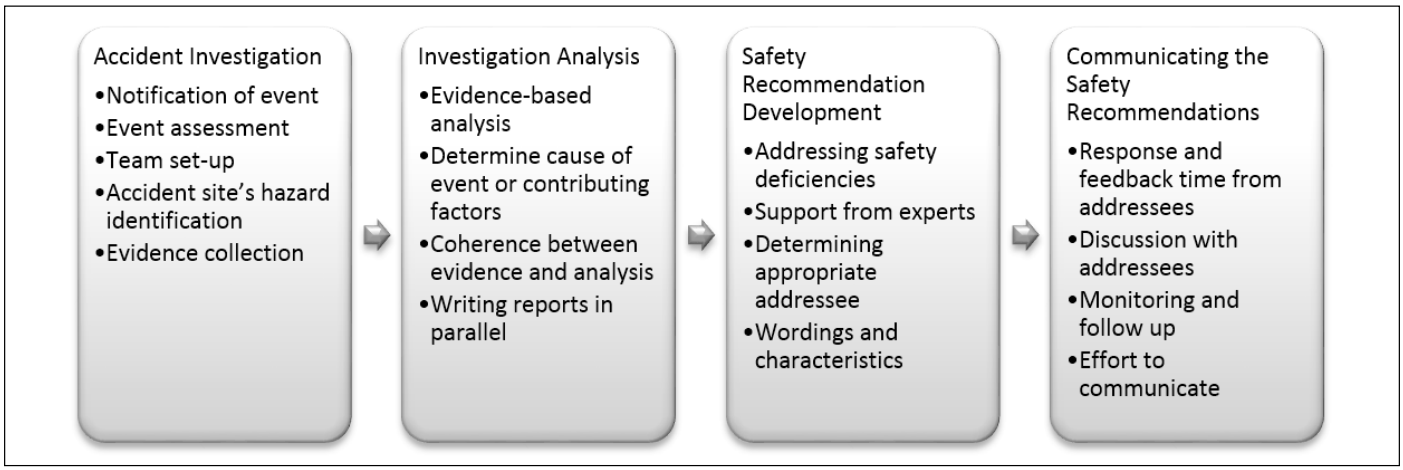

Figure 1. Current process of safety investigation agency in developing a safety recommendation.

it is the SIA's responsibility to investigate; otherwise, it is passed to the Directorate General of Civil Aviation (DGCA). The investigation team, as well as the investigator in charge (IIC), is formed and selected after event classification. Hazard identification is also performed prior to departing for the accident site to determine the required support equipment. Arriving at the accident site, the investigation team will collect evidence, including perishable and vulnerable evidence. Based on the interviews, one of the difficulties encountered when performing evidence collection was the accident site itself.

"The difficulties found in AOC Part 135 are the limited information gathered due to the inaccessible accident site. Last time I was assigned to Oksibil, the crash site was located 7000 meters above sea level and people had to stand on the trees because the incline was so steep."

To overcome this issue, investigators would ask for help to take photographs of the evidence from Search and Rescue (SAR) teams, who are trained to reach isolated areas. This method raises another issue: whether the information gathered from the SAR team is adequate to begin an analysis.

4.2.2 Investigation analysis

After all evidence and necessary information is collected, the investigation team can begin the analysis. Several analysis methods were mentioned in the interview, such as organisation, risk control, local condition, individual action, and occurrence (ORLIO), and hazard identification and risk assessment (HIRA). The analysis carried out is to determine the cause of the event or contributing factors. It should also prove eyewitness' testimony and provide logical connection between evidence and the cause of events. The quality of analysis depends on the information gathered. Compared to AOC Part 121 aeroplanes, these cases have more restricted information; no flight data recorder is installed on the aeroplane, for instance. Inaccurate evidence and insufficient equipment installed on aircraft limit the analysis to some extent. Consequently, assumptions are made to complete the analysis. In parallel with conducting the analysis, preliminary and final report drafts are also executed. A preliminary report must be issued within one month of the event.

4.2.3 Safety recommendation development

There are some foundations in developing safety recommendations. In proposing, each recommendation shall be based on safety deficiencies found and potential hazards existing in the current operations. These deficiencies and hazards are obtained from evidence and information gathered.

"Those recommendations were based on evidence, analyzed to find the root cause, discussed, and communicated with the experts or professionals. These were done to ensure that the safety recommendations proposed in the report are implementable and aim to give solutions to the safety deficiencies and predecessor to the event."

In developing safety recommendations, the SIA is also supported by specialists and professionals. As stated by the participant, this was to ensure the recommendations are implementable and feasible. Support from experts is also needed to detect flaws and gaps in the recommendations and analysis. Specific guidelines for developing recommendations have not yet been established. Participants confessed it was quite difficult to determine the best addressee for proposed recommendations. Therefore, examining the stakeholder's contribution in the event is also necessary to highlight the deficiencies present in the organizations and address the actions to the stakeholders with the highest responsibility and impact. A non-prescriptive statement is constructed when writing safety recommendations. The methods on how implementation is performed will be left to the addressee, but it is the SIA's responsibility to clarify the objective of proposed corrective actions. One of the efforts to communicate the aim unambiguously is through prologue or introductory sentences before suggested actions. More considerations taken during safety recommendation development will be elaborated in section 4.3.

4.2.4 Communication with addressees

Communication with addressees is important to create a comprehensive relationship between stakeholders and the SIA. Safety recommendations must be responded to within 90 days. There is also a 60-day limit to give feedback from an investigation's final draft report and findings. This is where addressees are given time to discuss and communicate with the SIA. Ensuring safety actions taken are aligned with the objectives, SIA considered some of the safety actions taken exceeded their expectations. Addressed operators sometimes performed irrelevant and unrelated safety action to avert penalties being applied by the authority. The addressed regulator, on the other hand, has an important role in safety recommendation implementation; authority to demand other operators to complete safety recommendation as requested. But occasionally, the SIA receives a late and unsatisfactory response from the regulator. This is one of biggest issues identified in communicating safety recommendations to addressees. In an effort to tackle this, the SIA holds discussion forums inviting all addressees, including the regulator, to openly discuss and share information about current safety issues and trends. This monthly discussion is considered effective to build an addressee's safety awareness. Meeting invitations through emails and by telephone

are also sent to addressees if the SIA believes they need to consult the responses.

Once safety recommendations are communicated and accepted by addressees, they can be implemented to achieve the safety goals. Yet, the SIA has no method to monitor and follow up the implementation.

"Recommendations proposed are right on target; however, we do not have a special team to monitor the implementation of those recommendations."

No monitoring or follow up system in the implementation creates another drawback; the goal of action cannot be measured. Investigators are still hesitant to perform monitoring and follow up, since it was not stated as a SIA authority; investigators are not inspectors or auditors. Besides these issues, the researcher also identifies staff-shortage conditions in the SIA; finishing all accident reports is their priority, and they have no human resource left to monitor safety recommendation implementation.

Figure 2. Three main considerations used by safety investigation agency in developing safety recommendations.

4.3 Considerations in formulating safety recommendations

In developing safety recommendations, the participants interviewed mentioned several contributory factors. There are three main considerations and one other that are taken in the formulation of safety recommendations; to improve safety, to be understood by addressees, to be accepted and implemented by addressees, and other factors. Figure 2 represents the coding result of the three main considerations used in developing safety recommendations.

4.3.1 To improve safety

Before safety recommendations are formulated, investigators first identify safety issues or deficiencies. The evidence collected is assessed and analyzed; investigators will also study similar cases prior to the event. Ensuring all possible safety deficiencies have been identified, recommended action can be proposed to abate those issues.

"Safety deficiencies identified during the event can also be used to develop a safety recommendation, regardless of the stakeholders."

Any hazards that may contribute to the event in the future are assessed. Evaluation of the stakeholder's operation associated with the accident is also performed to ensure that all potential hazards are recognized. As well as reducing existing safety issues, safety recommendations aim to prevent similar accidents occurring in related organizations.

If stakeholders have acted before recommendations are issued, investigators will evaluate and review the action as to whether they have met the intended outcome or similar objective. Actions considered insufficient will still be addressed in the safety recommendations' section.

4.3.2 To ensure comprehension by addressees

Safety recommendations proposed are considered appropriate to fix the deficiencies found, but incorrect discernment by stakeholders will cause improper implementation. Therefore, the comprehensiveness of safety recommendations is a significant factor to attain safety objectives. In formulating the actions, investigators noticed that the reading culture in Indonesia is still low; most of addressees will skip the analysis and read the recommendations directly. Consequently, stakeholders will not acknowledge the background and connection between the evidence collected and the recommended actions. To address the issue of comprehensiveness, the SIA created an introduction paragraph before stated each action. It is hoped this will enhance a stakeholder's comprehension of the intended objectives and expected safety actions. Safety recommendations will be understandable, by giving a prologue and choosing the right term and sentence in their formulation. Thus, as stated by Kelly et al. (2010), comprehension of stated messages will advance if it is supported by gesture and mutual speech interaction.

"If addressees do not implement safety recommendations, it may be due to communication issues; do recipients and the investigation agency have the same understanding of what they want to achieve?"

Communication is important because none of the stakeholders want to face a similar accident again. To deliver the safety goals, the SIA and stakeholders must have a mutual understanding on what and how to achieve those goals. Justifications behind proposed actions must be shared and discussed clearly to avoid dispute during implementation.

4.3.3 To be accepted and implemented by addressees

After suggested recommended actions have been understood by stakeholders, they will then assess whether to accept or reject the actions. This latter consideration is significant, since safety objectives will not be obtained if stakeholders refuse to perform the suggested actions. Therefore, a degree of flexibility in implementing safety recommendations is required; it will not be prescriptive. Addressees will be given the liberty to choose the most suitable methods in implementing the recommendations, as long as the intended objectives are well understood and achieved.

In this area, support from experts with adequate experience in a related industry may determine the applicability and measurability of the actions recommended. Experts can project the flaws and gaps that may exist if actions do not fit the conditions when implemented.

The SIA also feels responsible to invite stakeholders to discuss the implementation of safety recommendations, ensuring all stakeholders have acquired common safety awareness and perform the safety actions based on their own cognizance. Implementation of safety recommendations is also influenced by the safety awareness development within an organization's departments. Each stakeholder's safety departments will communicate the importance of safety awareness to others to boost the safety performance.

4.3.4 Other considerations

Other considerations taken during safety recommendation development are time pressures for urgent matters, existing regulations and law, public judgement, and actions performed prior to the incidents or accidents. Most stakeholders want to avoid penalties and public judgement that may affect their financial health and credibility.

4.4 Difficulties in safety recommendations' development

Based on interviews conducted with investigators, participants confessed that guidance for formulating safety recommendations has not yet been developed. Currently, they rely on their own analysis and support from experts to determine the feasibility and applicability of the proposed actions. One of many drawbacks of this method is the SIA cannot measure the success of the implementation of safety recommendations.

Another issue is to decide the best addressee to receive the recommendations. One event can be attributed to many unsafe acts in various organizations. Therefore, the SIA needs to investigate and analyze in-depth who has the biggest authority and impact in performing the safety recommendations. Often the recommendations are sent to a regulator in order to have other airlines perform the preventive actions, as the SIA has no authority to request other airlines to complete the recommendations.

Figure 3. Considerations in accepting safety recommendations.

4.5 Factors influencing acceptance and implementation of safety recommendations

Addressees also have factors to be considered before deciding whether to accept and implement the recommended actions. Those considerations are summarized in Figure 3 and explained later this section.

4.5.1 Internal processes

Prior to accepting safety recommendations proposed by the SIA, stakeholders usually conduct an internal meeting. At the meeting, factual findings and analysis of the investigation are studied. Evidence and analysis provided through the final report will be compared to the addressee's own internal investigations and database.

"The consideration taken behind accepting those recommendations is that airline A's internal investigation also produces similar and aligned analysis with the SIA investigation report."

The coherence and correlation between the SIA's investigation results with internal investigations are critical. Internal investigation may detect more detailed potential hazards, whereas the SIA's investigation results may discover hazards overlooked by stakeholders. At the meeting, stakeholders will also consider the effort and impact required when implementing recommendations.

4.5.2 Communication between addressee and SIA

The addressee also considers the communication existing in the investigation process and recommendations' proposal. The justification behind safety recommendations is important to avert miscommunication. Effective communication also increases the possibility of addressees accepting the recommendations. Through this communication, the SIA can transfer their knowledge and analysis, which can improve stakeholders' comprehension and awareness.

It is also better to involve addressees when composing safety recommendations, as addressees are acquainted with daily operations. Although the SIA is an independent body, the involvement of addressees when composing safety recommendations can enhance the quality of analysis and produce more accurate recommendations.

4.5.3 Enforcement and penalties

Three operators interviewed mentioned penalties and enforcement as considerations when accepting safety recommendations. Based on Ministerial Decree, operators involved in a serious incident or accident are subject to penalties, such as warnings, suspension, revocations, or fines. Airlines generally want to avoid such penalties and, hence, opt to accept the proposed recommendations, despite the potentially costly corrective actions.

"Communication with the SIA is good and effective, but we feel 'terrified' because of the enforcement and penalties given to us by the regulator. We are not brave enough to reject the SIA's recommendation, even if we have financial issues."

These penalties are created as a deterrent to related organizations and concurrently constrain airlines to accept the recommendations without further considerations. As proposed by Parker et al. (2006), this condition shows a reactive-calculative level of safety culture maturity existing in Indonesia's aviation industry. At this level of maturity, several systems are provided to manage hazards, yet organizations still need to do more every time an accident occurs. There are no rewards for good safety performance, but disincentives exist for poor safety records. Furthermore, it raises another issue; whether the implementation of safety recommendations is purely based on the safety awareness of an organization or is an effect created by the penalties.

On the other hand, the regulator sees this point as an approach to reinforce safety in Indonesia. When receiving safety recommendations, the regulator will review the existing regulation and determine whether the proposed actions align with the objective of those regulations. The alignment will increase the probability of accepting the safety recommendation.

4.5.4 Investigation process and results

Apart from internal investigation results, communication, and penalties, the investigation process and results presented in the final report could adversely influence the addressee's acceptance if it is explained inadequately. Therefore, it is important to provide a logical connection and relationship between the evidence provided, analysis, and recommended actions. Identification of safety issues contributing to the event is the essence of the analysis and safety recommendations. It is also better if the SIA can spot other potential hazards surrounding the addressee's operations that may be overlooked by stakeholders.

The SIA desires to identify safety deficiencies; not only at the sharp end but also at the blunt end. Investigators' backgrounds influence the analysis of investigations as it will give them more insights and deeper examination. Nevertheless, if the analysis is only limited to sharp end factors, it will miss other important factors, such as organizational issues (Leveson, 2011).

4.5.5 Characteristics of safety recommendations

As mentioned in the previous section, safety recommendations proposed by the SIA are considered as non-prescrip-

tive. Conversely, four participants believed the recommendations are still too general as the SIA did not identify the root causes accurately. For any unidentified causes, no suitable recommendations are substantial because it is based on assumptions.

"In my opinion, it would be easier for them to compose non-prescriptive recommendations if the root cause is identified. If the root cause is too general and has too many contributing factors, the recommendation would be too general as well."

This misperception between addressees and the SIA builds another communication issue. The SIA attempts to create a non-prescriptive sentence, on the other hand, it is considered as too general by stakeholders. Consequently, direct communication between the SIA and stakeholders is required. Involving addressees in the safety recommendations' formulation can address the issue, since both the SIA and stakeholders will share common objectives and goals. It is also necessary for addressees to give feedback to the SIA regarding safety recommendations to detect this insufficient information as soon as possible.

4.6 Potential barriers in implementing the recommended actions

Participants realized that although safety recommendations have been accepted, they will face some issues in the implementation. Most of those issues existed in their own organizations.

4.6.1 Management and roles

The airline's safety department must ensure that related departments are aware of accepted corrective actions. Management commitment is required in implementing proposed actions, since more corrective actions mean more tasks to be performed besides operational tasks. Management commitment also determines the success of implementation. As in the Safety Management System (SMS) theory, accountable managers shall hold the company's desired safety goal first before directing other levels to do the same (Civil Aviation Authority, 2015). Stakeholders acknowledge that bigger loss and penalties await if they refuse to carry out corrective action. All addressees interviewed agreed that operators are likely to have the biggest loss in an accident.

Different issues existed in the regulatory body. Currently, the regulator has no specific procedures on how to manage implementation of recommendations. A long bureaucratic line existed, from the distribution of the draft investigation report to the approval of safety recommendations. A safety department did not exist in the regulatory body; thus no one felt responsible for handling the reports and performing corrective actions. This is also the reason behind delayed responses and feedback from the regulator.

4.6.2 Communicating the implementation

When stakeholders agree to perform proposed corrective actions, internal communication with related departments is also necessary. Contributing departments must share the same knowledge as the safety department on how to prevent similar accidents. Frequently, the recommendations accepted by stakeholders do not run smoothly in implementation due to different levels of safety awareness in different departments. Operation departments might consider time, cost, and workload constraints in performing such actions, while public relations departments consider the company's image in the public eye. One safety recommendation entails many elements to consider before it is implemented; facilities arrangement, projected workload, human interfaces, new roles and procedures, the company's credibility and reputation. The safety department in the stakeholder's organization has the role to educate, communicate and build the same level of safety awareness in other departments, in order to facilitate effective implementation.

4.7 Preventing recurrence in the future

Recurrence is a situation where similar accidents and root causes appear. Interviews with investigators and addressees regarding recurrence and prevention of this are explained in the following section.

4.7.1 Cause of recurrence

In section 4.1, the template analysis based on 27 investigation reports showed the two most common recurrence cases were CFIT and runway excursion. This statement is supported by the SIA annual report and interviews with investigators. Many factors contributed to CFIT or runway excursions, such as environmental conditions, ineffective implementation of safety recommendations, or human decision at the event.

"I feel that conditional circumstances were the main factor of recurrence. It stimulates humans in making decisions. Humans are unique and unpredictable; they will act differently to different situations."

From the addressee's point of view, recurrence might happen because of specific conditions at the time of operation that make humans take actions that lead to incidents. Although regulations, procedures, and guidelines are available and mandatory to be followed, it is still a human decision to obey the rules. Management cannot do anything other than train humans to develop safety awareness.

On the other hand, investigators pointed out ineffective implementation as the reason behind recurrence. They believed the recommendations have rightly addressed safety deficiencies and issues, but the implementation within internal organizations is not the SIA's responsibility. Both investigators and addressees agreed that humans play a significant role in the event of recurrence; whether as organizations or as the actors at the sharp end.

4.7.2 Addressee's action towards safety improvement

Preventing recurrence should be undertaken as early as possible by both addressees and investigators. Addressees' preventive actions and early detection of safety deficiencies are acknowledged as a pertinent approach to reduce recurrence. To prevent recurrence and improve safety, different airlines have different strategies. Several methods are mentioned by participants, such as training, sharing sessions, and internal reporting networks. Other airlines mentioned the Safety Management System (SMS) and reporting of unsafe acts as necessary to minimize recurrences. Additional smart work is also required in planning preventive action to achieve safety goals that are timely and not cost consuming.

The regulator has other ways to achieve safety improvement. Having a role to ensure the safety of all passengers, the regulator implements eight critical elements from the ICAO. One of the critical elements is resolution of safety concerns, which was translated to four acts; standardized certification, standardized supervision, action and follow-up, and enforcement to operators. The regulator also issues safety notices and safety circulars addressed to airlines to build safety awareness. These acts are considered relevant to improve safety levels and minimise recurrence in Indonesia.

4.7.3 Monitoring and follow up

Recurrence incidents prove that there is still a gap between proposed actions and the implementations; whether it is individuals or organizations. Comprehensive procedures and regulations will not be successful if individuals do not obey them. Contrarily, obedient individuals will be futile if there is no existing system to ensure safety. Recurrence also indicates

a weakness in monitoring and follow up systems for safety recommendations. Interviews have revealed that currently none of the investigators or addressees has an effective system to monitor and follow up the corrective actions.

"No substantial monitoring and follow up from SIA. Might be because of their authority and responsibility as investigator, not as auditor, to inspect; or, maybe, because of the lack of manpower in their organization."

Recommendations will be followed immediately after the event, but the continuity of safety improvement is still dubious. It raises another critical question whether the safety recommendations implemented are based on safety awareness and improvement towards safety or just a gut reaction.

From the interviews, it is known that no monitoring and follow up system is in place at the moment. A monitoring and follow up system are important to measure the effectiveness of proposed safety actions. For instance, the NTSB has a safety recommendation follow up programme that helps them to achieve a high rate of acceptance and works towards implementations (Sweedler, 1995). They also hold follow up meetings to clarify the exact intent of recommendations that should result from safety improvements. This was done to avoid misunderstanding and miscommunications between addressees and investigators.

Furthermore, the non-existence of a safety department in the regulatory body influences the process of safety recommendation implementation. Comparative studies performed show that the Federal Aviation Administration (FAA), the European Aviation Safety Agency (EASA), and the Civil Aviation Safety Authority (CASA) in Australia have their own safety departments, which enable them to directly communicate with investigators and promptly process all safety recommendations proposed. Indonesia's extensive bureaucratic line in civil aviation authority delays the movement of safety recommendations, thus monitoring the effectiveness of those remedial actions is also deferred.

It is bizarre to issue recommendations without further consideration of the measurability and applicability of proposed actions. It is extraordinary to find that a system to monitor implementation is also absent. No methods are employed to measure the effectiveness of safety recommendations, therefore no parameters of the success of safety recommendations are examined. Both investigators and addressees perform their responsibilities after the accident without synchronizing with experience. This state might create hazardous situations in which organizations think they have improved their safety level by performing suggested actions and, at the same time, investigators think they have proposed a suitable remedy based on identified contributing factors while the root cause is not addressed.

5. CONCLUSION

This research concludes there are three main considerations used in formulating safety recommendations following an investigation in Indonesia; to improve safety, to ensure comprehension, and to be accepted and implemented by addressees. Fulfilled achievement of those considerations will enhance the effectiveness of accepted remedial actions. In addition, recipients also have sets of considerations in accepting and implementing safety recommendations. These include organizational internal processes, decent communication towards addressees, enforcement and penalties, investigation processes and results, and the characteristics of the safety recommendation itself. However, despite well-developed safety recommendations, implementation may meet various challenges, such as organizational and communication concerns within internal or external parties. To avoid events recurrence, these challenges shall be removed. The installation of a monitoring and follow-up system is recommended in this study to analyze the measurability and applicability of proposed measures. This study also suggests further research to investigate each of the considerations used in developing, accepting, and implementing safety recommendations to better prevent the recurring accidents and incidents.

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