

Effectiveness of Ramp Safety Awareness Training to Improve On-the-Job Training Students Safety Awareness

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Abstract—The high risk at airports, especially in the apron and ramp areas, required personnel awareness of safety in those areas. This study was conducted to evaluate the Ramp Safety Awareness (RSA) training program for On-The-Job Training (OJT) students, in order to enhance safety awareness in the ramp area. This study employed an evaluation model developed by Robert E. Stake, known as the Countenance Model. The Stake evaluation model comprises three stages: antecedent, transaction, and output. The evaluation results at the transaction and output stages demonstrated that the RSA training was effective. The training process proceeded smoothly and successfully met its learning objectives. Additionally, the RSA training was found to be extremely beneficial for OJT students in carrying out their duties during the program. Meanwhile, the evaluation results at the antecedent stage revealed that certain improvements were necessary. First, it was essential to revise the OJT guidelines to establish a solid legal foundation for RSA training. Second, program planning had to include RSA training for OJT students as part of the annual program planning at least one year prior to the training's implementation. Finally, there was a need to create a three-year internship program for instructors specializing in aviation safety.

Keywords— countenance evaluation model, ramp safety awareness, training effectiveness.

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I. INTRODUCTION

The Ministry of Transportation of the Republic of Indonesia oversees seven aviation educational institutions: the Indonesian Aviation Polytechnic, Surabaya Aviation Polytechnic, Medan Aviation Polytechnic, Palembang Aviation Polytechnic, Makassar Aviation Polytechnic, Jayapura Aviation Polytechnic, and Banyuwangi Pilot Academy. The Center for Human Resources Development on Civil Aviation (CHRDC) is responsible for guiding and evaluating these Polytechnics and the Academy under the Ministry of Transportation. These institutions offer a range of study programs, including 4-year and 3-year diploma programs, all of which incorporate an On-the-Job Training (OJT) program for students. OJT is a form of experiential learning that occurs in actual work settings and involves performing real job tasks [1]. This hands-on approach helps students develop job-related knowledge and skills essential for performing specific tasks effectively in their work environment [2]. OJT thus serves as a bridge to address training gaps that may exist within formal education [3].

Aviation represents a complex transportation system where safety is paramount, as aircraft malfunctions can lead to catastrophic outcomes. The number of reported incidents has been increasing, largely due to rapid

advancements in information technology and the growth of both commercial and private aviation [4]. Despite the International Civil Aviation Organization's (ICAO) implementation of safety management systems, numerous incidents and accidents involving airport surface traffic continue to occur [5]. In Indonesia, the rate of aviation mishaps exceeds the global average. Between 2007 and 2015, the Indonesian National Transportation Safety Committee documented 97 incident and accident investigations [6]. Contributing factors often stem from lower levels of the sociotechnical system, including human operators and environmental conditions [7].

The aviation industry has experienced rapid growth, leading to increased activity on airport ramps and aprons. Significant risks associated with ramp activities include exposure to noise, potential collisions with operational vehicles, and the risk of being crushed by Ground Support Equipment (GSE). Additionally, high-risk activities involve dealing with fatigue, exposure to dust, potential pinching injuries from hydraulics during preparation tasks, scratches from metal objects, improper body positioning while handling manual GSE, risks of being struck by objects, falls, and exposure to splashes from toilet water [8]. A ramp or apron is a designated area at an airport used for various aircraft-related activities, including passenger, mail, or cargo loading and unloading, refueling, parking, and maintenance operations [9]. Given the heightened risks in ramp areas, enhancing safety awareness among personnel working in this environment is imperative.

Human beings play a pivotal role in ensuring aviation safety. Notably, human error accounts for nearly 70–80% of both civil and military aviation accidents [10]. The impact of human factors in ground operations significantly affects the safety of both aircraft and

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personnel involved in these activities. An analysis of 87 accident and incident reports from 2000 to 2020, conducted using the Human Factor Model, reveals that a lack of situational awareness and failure to adhere to prescribed procedures are the primary causes and contributing factors in accidents and incidents related to ground operations [11]. Proactively identifying human factors issues is an effective approach for assessing potential risks before they result in adverse outcomes [12].

All certified airports are mandated to establish and operate a Safety Management System (SMS) in accordance with ICAO regulations, a requirement in place since November 2005 [13]. The ICAO Global Aviation Safety Plan urges nations to implement robust policies and sustainable safety monitoring systems, with the goal of gradually advancing these into more sophisticated methods for managing safety performance. This directive aligns with ICAO requirements for states to implement State Safety Programs (SSP) and for service providers to establish Safety Management Systems [14]. A Safety Management System is a structured system used for the management and oversight of safety or specifically designed to address safety concerns [15]. It encompasses the complete set of procedures, documentation, knowledge systems, and processes applied within an organization to regulate and enhance safety performance [16].

The ICAO organizes the establishment and maintenance of the State Safety Program (SSP) into four key components: a) State safety policy, objectives, and resources; b) State safety risk management; c) State safety assurance; and d) State safety promotion [14]. Within this framework, safety promotion includes training and education efforts aimed at developing and maintaining programs that ensure personnel are competent in performing Safety Management System (SMS) tasks within their roles [16]. Promoting a just culture is essential for continually enhancing safety knowledge and awareness. Safety promotion should be conducted continuously and in an organized manner [17]. Providing safety training and education to all professionals within the aviation safety system is a critical component of any successful safety management strategy [18].

To enhance aviation safety in ramp areas and ensure the safety of Polytechnic and Academy students under CHRDCA guidance during their OJT, a policy requires all OJT students to complete Ramp Safety Awareness (RSA) training before starting their placements. This study will evaluate the RSA Training that has been given to students who will carry out OJT with the aim of finding out its effectiveness and providing input for improving the next training program. Effectiveness is achieved when a program's results align with its goals [19]. To determine a program's effectiveness, an evaluation is conducted. Program evaluation is the systematic gathering of information about program activities, characteristics, and outcomes to assess the program, enhance its effectiveness, and guide decisions about future programs [20]. Program evaluation plays a crucial role in continually enhancing the quality of a

program to meet its objectives [21]. It serves various purposes, such as a) program enhancement, b) accountability and decision-making, c) assessing benefits, value, and significance, and d) ultimately enhancing social welfare [22].

II. METHOD

The aim of this study is to evaluate the RSA training program for OJT students to enhance safety awareness in the ramp area. The evaluation model applied in this study is the Countenance Model, developed by Robert E. Stake. Initially a specialist in psychometrics and instructional research, Stake's focus evolved over time toward program evaluation, including naturalistic or ethnographic field studies, especially in classroom settings. His key contributions include the Countenance Model of educational evaluation, Responsive Evaluation, and The Art of Case Study Research [23]. The Countenance Evaluation Model is versatile and applicable to evaluating various types of programs [24].

The Stake evaluation model emphasizes two primary aspects: description and assessment. It categorizes program evaluation into three phases: antecedent (planning), transaction (implementation), and output (evaluation) [25]. The Countenance Model includes three stages: antecedents (context), transactions (process), and outcomes (results) [26]. Therefore, this study uses three stages namely antecedent, transaction, and output. The variables assessed and the data collection methods used in each phase are outlined in Table 1.

TABLE 1.
STAGES, VARIABLES AND DATA COLLECTION METHODS

Stage	Variable	Data Collection Method
Antecedent	Legal basis	Interview
	Program planning	Observation
	Training resources	Documentation
Transaction	Training materials	Interview
	Attendance of instructors and trainees	Observation Documentation
Output	Score of trainees	Survey
	Satisfaction of trainees	Observation
	OJT students' response	Documentation

This study employs mixed methods, combining elements of both qualitative and quantitative research approaches to achieve diverse objectives, including gaining a comprehensive understanding and obtaining substantial evidence [27]. Interviews are conducted with management representatives from each Polytechnics and Academy, as well as with the RSA training administrator. Additionally, data related to RSA training is obtained from the RSA training administrator. Furthermore, a survey is administered to the students to assess their experiences and perceptions of the training program.

II. RESULTS AND DISCUSSION

In 2024, only three out of the six Polytechnics and one Academy under the guidance of CHRDCA provide RSA training to students before they begin their On-the-Job Training (OJT). These institutions are the Indonesian Aviation Polytechnic, Surabaya Aviation Polytechnic,

and Medan Aviation Polytechnic. A total of 505 students participated in RSA training, as illustrated in Figure 1.

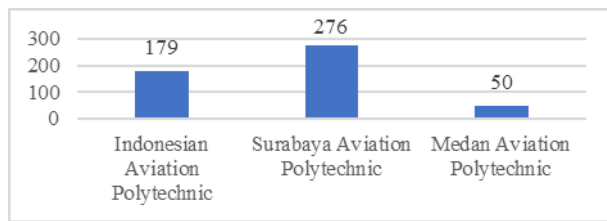


Figure 1. RSA training participants

The RSA training is one of the five ICAO-standardized training packages offered by CHRDC. The primary objectives of the RSA training are to provide participants with the knowledge, skills, and attitudes necessary to implement and maintain safety on the ramp in accordance with national regulations and ICAO standards. The learning objectives of this training include: 1) identifying the required safety equipment used in the ramp area, 2) identifying hazards and managing risks, 3) recognizing ramp area markings and signage, 4) applying radio telephony techniques, and 5) taking appropriate action for special handling and abnormal situations. The training program spans 21 hours, or 3 days, and accommodates a maximum of 16 participants per class.

A. Antecedent Evaluation

The variables evaluated at the antecedent stage include the legal basis, program planning, and resource availability. The first variable to be evaluated is legal basis of the RSA training program for the OJT students. The policy requiring all OJT students to complete RSA training before commencing their OJT is based on a letter from the Head of CHRDC to Directors of Polytechnics and Academy. The management of the Polytechnics and the Academy is aware of this legal basis. However, due to insufficient planning in the previous year, not all Polytechnics and the Academy were able to implement it in 2024. They suggest that if RSA training is to become mandatory for OJT students, it should be incorporated into the OJT guidelines for all study programs. The OJT guidelines are approved by CHRDC. Currently, CHRDC has approved ten OJT guidelines for the following programs: D4 Air Traffic Control, D3 Airport Mechanical Engineering, D4/D3 Airport Electrical Engineering, D3 Airport Rescue and Fire Fighting, D3 Airport Civil Engineering, D3 Aviation Communication, D4 Aircraft Engineering, D4/D3 Air Navigation Engineering, D3 Air Navigation Technology, and D3 Airport Technology. Meanwhile, eight OJT guidelines are still under discussion, including those for study programs such as D4 Pilot, D3 Aeronautical Information Services, D4/D3 Airport Electrical Engineering, D3 Airport Operation/Management, D3 Air Transportation Management, D3 Air Traffic Management, D3 Airport Maintenance Technology, D3 Airport Engineering Technology, D3 Pilot Fixed-Wing, and D3 Aircraft Operations.

The second variable to be evaluated is the program planning for RSA training for OJT students. Program planning at all Polytechnics and the Academy adheres to the planning system established by the Government of the Republic of Indonesia. Typically, program planning is developed for a five-year period, referred to as a strategic plan, which is then broken down into annual plans. Each annual plan is formulated in advance of program implementation. The outcome of this planning process is the allocation of a budget to support activities for the upcoming year. Interviews with the management of all Polytechnics and the Academy, along with document observations, revealed that RSA training for OJT students was not planned in the previous year. Poorly planned activities can lead to suboptimal execution or may even be impossible to implement. This aligns with previous research, which highlights the importance of program planning in ensuring that activities align with the strategic plan and in guiding faculty efforts to select and develop initiatives for the upcoming fiscal year [28].

The third variable to be evaluated is resource availability, which includes training facilities and instructors. The facilities necessary for RSA training consist of a clean and comfortable classroom equipped with tables, chairs, air conditioning, a projector, a flipchart or whiteboard, and internet access. RSA training does not require a specialized laboratory or simulator. According to interviews with the management of three Polytechnics that conduct RSA training, all classrooms are in good condition—clean and comfortable—and meet the requirements for implementing the training. Optimal classroom conditions have a positive impact on learning outcomes. This aligns with prior research that indicates a comfortable classroom environment is essential for effective teaching and learning, as it enhances the comfort, productivity, and engagement of both teachers and students [29].

There are three requirements to become an instructor based on ICAO methodology. First, instructors must have three years of work experience in the relevant field related to their teaching subject. To teach RSA training, this experience should involve work around airport ramp/apron areas and in aviation safety. Second, instructors should possess an ICAO Training Instructor Course (TIC) certificate. Third, instructors must have a training certificate in the subject they intend to teach. Based on document observations, a total of 18 instructors were assigned to teach RSA training. This group consisted of 4 instructors from the Indonesian Aviation Polytechnic, 6 from the Surabaya Aviation Polytechnic, 3 from the Medan Aviation Polytechnic, and 5 from CHRDC. Only 14 (78%) instructors fulfil the first requirement of having three years of relevant work experience in the field they will be teaching. While not all instructors hold an ICAO TIC certificate, they do possess similar qualifications, such as the General Instructor Course (GIC) and Training of Trainers (TOT). The ICAO TIC, GIC, and TOT all aim to equip instructors with the competencies necessary to deliver competency-based training material in the classroom. Therefore, 100% of instructors have fulfilled the second

requirement. Additionally, all instructors hold an RSA training certificate or an equivalent qualification, so 100% of them have met the third requirement. Work experience in the field to be taught is crucial for instructors. This aligns with previous research, which indicates that industry experience significantly influences educators' perceptions of competence and teaching strategies. This includes the use of industry-specific assignments to inspire class activities and shape course structures [30].

B. Transaction Evaluation

The variables evaluated at the transaction stage is the training process such as training materials, attendance of instructors and trainees. Based on interviews with the RSA training administrator and document observations to the first variable, it was found that all of the ICAO standardized training package consists of administrator-instructor guidance forms, training materials, and exam materials, likewise with the RSA training. A standardized training package ensures the consistency of learning objectives regardless of when or where the training is conducted or who the instructor is. Nevertheless, the selection of instructors still adheres to the qualifications established by ICAO. This aligns with previous research, which highlights that standardized training is essential for maintaining consistent efficiency across different trainers [31].

TABLE 2.
LEARNING OBJECTIVES

Module	Learning Objectives
1	Conditions: In the classroom, given scenario of assignment notification and job aid required. Performance: Conduct Safety Preparation for Assignment. Standard: In accordance with ICAO Annex 14, CASR Part 139, and Standard Operating Procedures (SOPs).
2	Conditions: In the classroom, given case study of assignment and job aid required. Performance: Move to/vacate ramp area Standard: In accordance with ICAO Annex 14, CASR Part 139, and Standard Operating Procedures (SOPs).
3	Conditions: In the classroom, provide portable radio, given role playing scenario of communication, required job aids. Performance: Obtain pre-entry permission using ICAO standard R/T phraseology Standard: in accordance with ICAO Annex 10 vol. II, ICAO Doc 9137 part 8, and Standards Operation Procedures Manuals.
4	Conditions: In the classroom, given different scenarios of abnormal situations and job aid required. Performance: Apply appropriate procedure for special handling and abnormal situation. Standard: In accordance with ICAO Annexes 10 & 14, CASR Part 139, and Standard Operating Procedures (SOPs).

The administrator/instructor guide form includes the course description, course content, facilities and instructor materials, the instructor's timetable, module outline, and module plan. These form provides detailed guidance for instructors and training administrator regarding the requirements of training participants, equipment that needs to be prepared, training materials, descriptions of activities per minute that instructors must carry out in training, and various other information. The

training materials are available in the form of handouts and PowerPoint presentations, consisting of five modules: Module 0-Opening, Module 1-Safety Concept and Equipment, Module 2-Aerodrome and Safety Precautions, Module 3-Radio Telephony Techniques, and Module 4- Special Handling and Abnormal Situations. Module 0 contains information about the course introduction and administration that the instructor needs to convey to the training participants. Meanwhile, modules 1 to 4 have different learning objectives, as shown in Table 2.

The exam materials consist of exercises, post-tests, and mastery tests. In Module 1 and Module 4, there is one exercise, one post-test, and one mastery test. In Module 2, there is one exercise, two post-tests, and one mastery test. Meanwhile, in Module 3, there is one post-test and one mastery test. The post-test is administered in the middle of the module, while the mastery test is given at the end of the module. The second variable to be evaluated is the attendance of instructors and trainees during the training. Based on interviews with the RSA training administrator and document observations, all trainees attended the training. Likewise, the instructors attended and provided training according to the schedule outlined in the module plan.

The availability of high-quality and comprehensive training materials plays a significant role in achieving learning objectives. This aligns with previous research on the importance of standardized training and well-prepared training materials. To foster effective learning and enhance academic achievement, school management should ensure the availability of sufficient learning materials in schools, along with the efficient and effective management of teaching and learning resources to support students' academic success [32].

C. Output Evaluation

The variables evaluated at the output stage include score of the trainees, satisfaction of the trainees, and OJT student's response. The first variable to be evaluates is the scores of RSA trainees. These scores can be accessed by the RSA training administrator through the TRAINAIR PLUS Electronic Management System (TPEMS) portal at <https://igat.icao.int/portal>. The RSA training scores of trainees at the Indonesian Aviation Polytechnic, Surabaya Aviation Polytechnic, and Medan Aviation Polytechnic are shown in Table 3.

TABLE 3.
SCORE OF TRAINEES

Training Institution	N	Mean	Min	Max
Indonesia Aviation Polytechnic	179	87.04	82	92
Surabaya Aviation Polytechnic	276	85.98	81	91
Medan Aviation Polytechnic	50	91.50	88	96
Total	505	86.90	81	96

The minimum score is 81, the maximum score is 96, and the mean is 86.90. The minimum passing grade for RSA training is set at 80, and all trainees met this requirement, thereby successfully pass the training. It means that the learning objectives have been effectively

met. This aligns with the previous research, which highlight that learning outcomes and objectives refer to the theoretical or practical knowledge and abilities students attain by the time they are graduated from the course [33].

The second variable evaluated is the satisfaction of RSA trainees, which serves as a key indicator of a training program's success. Satisfied participants are generally more motivated to engage with the material, and their interest, focus, and motivation are crucial to the program's effectiveness [34]. As part of the ICAO Standard Training Packages, participant satisfaction for RSA training is measured using a methodology developed by ICAO, accessible via the TPEMS. Satisfaction is evaluated across three main areas: the module opinion questionnaire, integral course evaluation, and instructor evaluation questionnaire. Each area consists of multiple aspects, with several questions for each. Responses are rated on a 5-point scale, where 5 means "strongly agree," 4 means "agree," 3 means "neutral," 2 means "disagree," and 1 means "strongly disagree."

The average score of the satisfaction of RSA trainees in the module opinion questionnaire at Indonesia Aviation Polytechnic, Surabaya Aviation Polytechnic, and Medan Aviation Polytechnic is shown in Figure 2. The average score for all aspects at the three polytechnics is more than 4, so it can be concluded that the RSA trainees are satisfied with the module structure & mastery test, training activities, and training materials.

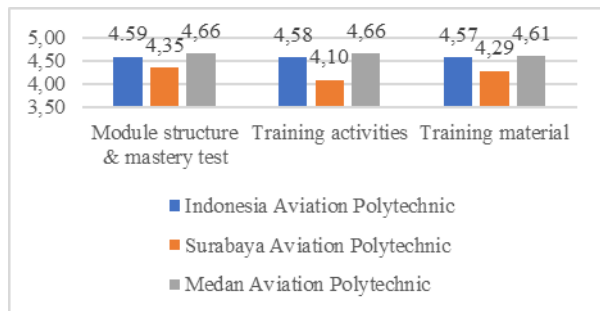


Figure 2. Module opinion questionnaire result

The average score of the satisfaction of RSA trainees in the integral course evaluation at the Indonesian Aviation Polytechnic, Surabaya Aviation Polytechnic, and Medan Aviation Polytechnic is shown in Figure 3. The average score for all aspects at the three polytechnics is more than 4, so it can be concluded that RSA trainees are satisfied with the environment and training activities. Apart from that, the results of the training met the RSA trainee's expectations.

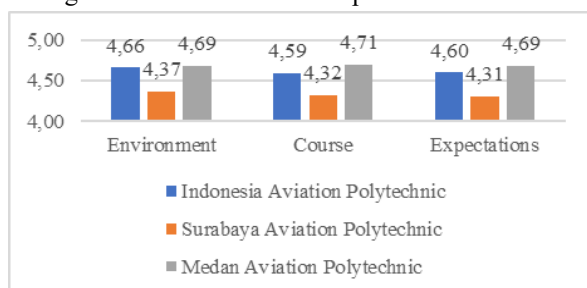


Figure 3. Integral course evaluation result

The average score of the satisfaction of RSA trainees in the instructor evaluation questionnaire at the Indonesian Aviation Polytechnic, Surabaya Aviation Polytechnic, and Medan Aviation Polytechnic is shown in Figure 4. The average score for all aspects at the three polytechnics is more than 4, so it can be concluded that RSA trainees are satisfied with the instructor classroom management, course delivery, and expertise.

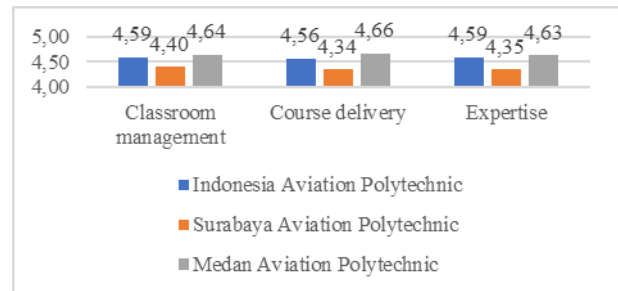


Figure 4. Instructor evaluation questionnaire result

The third variable to be evaluated is the response of OJT students who participate in RSA training. The data collection method used is a survey, which is sent to the students' emails. The number of students who fill out the survey is 106. Of the 106 students, 104 students have completed or are currently completing OJT, while 2 students have not yet started their OJT. Of the 104 students who have completed or are currently completing OJT, 86 students (82.7%) have entered the ramp/apron area during their OJT, while 18 students (17.3%) have not. Furthermore, a survey is also conducted to determine the responses of OJT students regarding the RSA training they have participated in. Of the 104 students, 63 (60.6%) indicated that the RSA training was very useful for their OJT, while 39 (37.5%) found the training useful. Only 2 students (1.9%) felt that the RSA training was not useful for their OJT.

D. Discussion

Based on the evaluation results across the three stages—antecedent, transaction, and output—each comprising multiple variables, a comparison with the standards is conducted to determine whether each evaluated variable meets the standard (effective) or requires improvement. The results and conclusions are shown in Table 4.

TABLE 4.
EVALUATION RESULTS

Stage	Variable	Result	Conclusion
Antecedent	Legal basis	The OJT guidelines require revision.	Need improvement
	Program planning	RSA training for OJT students was not planned from the previous year.	Need improvement
	Training resources	The training facilities have met the requirements. Only 78% instructors fulfil the first requirement of having three years of relevant work experience in the field they will be teaching.	Effective Need improvement

CONTINUED - TABLE 4.
 EVALUATION RESULTS

Stage	Variable	Result	Conclusion
Transaction	Training materials	Training package consists of administrator-instructor guidance forms, training materials, and exam materials.	Effective
	Attendance of instructors and trainees	All instructors attended and provided training according to the schedule outlined in the module plan. Similarly, all trainees participated in the training.	Effective
Output	Score of trainees	The scores of all trainees exceeded the passing grade and pass the training.	Effective
	Satisfaction of trainees	The average score of trainee satisfaction is above 4, indicating that trainees are satisfied with the RSA training.	Effective
	OJT students' response	Out of 104 OJT students, 102 indicated that the RSA training they attended was beneficial for their work during OJT.	Effective

The three variables evaluated at the antecedent stage need improvements. First, the legal basis for implementing RSA training for students who will undertake OJT must be included in the OJT guidelines. This means that the guidelines, whether already approved or still under discussion, need to be revised. Second, all polytechnics and academies are required to incorporate RSA training for OJT students into their annual program planning. Third, regarding training resources such as facilities and instructors: while the training facilities meet the requirements, they must be properly maintained to ensure they remain in good condition. Additionally, instructors need to enhance their work experience in the field. Therefore, it is necessary to establish a three-year internship program focused on aviation safety.

The two variables evaluated at the transaction stage indicates that the RSA training implementation process is effective. The training materials for RSA training are comprehensive and align well with the learning objectives. Furthermore, all instructors attended the training sessions and delivered their instruction as scheduled in the module plan. Likewise, all trainees actively participated in the training.

The three variables evaluated in the output stage indicate that the RSA training successfully achieves its intended outcomes. First, all trainees pass the training, demonstrating that the RSA training effectively enhances their awareness of safety in the ramp area. Second, all participants express satisfaction with the RSA training, appreciating the training materials, activities, instructors,

and the comfort of the training environment. Lastly, the knowledge acquired from RSA training is invaluable for OJT students as they perform their responsibilities during their OJT. This aligns with previous research, which highlights that the effectiveness of a training program is measured by the increase in participants' knowledge, skills, and behaviours, indicating whether the program has achieved its goals and objectives [35].

IV. CONCLUSION

Evaluation of RSA training for OJT students using the Stake evaluation model consists of three stages, namely antecedent, transaction, and output. The antecedent stage consists of three variables: the legal basis, program planning, and resource availability. The transaction stage evaluates the training process, including the training materials and the attendance of instructors and trainees. Lastly, the output stage consists of three variables: score of the trainees, satisfaction of the trainees, and OJT student's response.

The evaluation results at the antecedent stage indicate that improvements are needed. First, the legal basis requires revising the OJT guidelines. Second, program planning needs to incorporate RSA training for OJT students into the annual program planning a year before the training implementation. Lastly, there is a need to establish a three-year internship program for instructors in aviation safety. The evaluation results at the transaction and output stages indicate that the RSA training is effective. The training process runs smoothly and successfully achieves its learning outcomes. Moreover, the RSA training proves to be highly beneficial for OJT students in fulfilling their responsibilities during the program.

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