

The Effect Of Aviation Security Personnel Rotation On Human Errors At Passenger Security Checkpoints At General Ahmad Yani Semarang Airport

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ABSTRACT

Objective: In airport environments, particularly at Passenger Security Checkpoints (PSCP), rotation of Aviation Security (AVSEC) personnel is crucial to prevent human error. However, suboptimal implementation of rotation in the field can lead to fatigue and decreased personnel performance. This research aimed to examine the effect of Aviation Security (AVSEC) personnel rotation on human error at the Passenger Security Checkpoint (PSCP) at General Ahmad Yani Airport in Semarang. The approach used in this research was quantitative, with data collected through questionnaires distributed to 38 Aviation Security (AVSEC) personnel with Basic, Junior, and Senior qualifications. Data were analyzed using validity, reliability, normality, and simple linear regression tests. The results showed that Aviation Security (AVSEC) personnel rotation had a negative and significant effect on human error, with a significance value < 0.001 and a coefficient of determination (R^2) of 0.850. This indicates that 85% of the variation in human error can be explained by personnel rotation. Meanwhile, the remaining influence comes from other variables or factors outside this research.

INTRODUCTION

Air transportation is one of the most efficient modes of transportation, playing a vital role in connecting various regions around the world. Currently, air transportation is the primary alternative for those who need to reach their destination quickly (Syafei & Said, 2022). An airport is a key facility supporting air transportation. General Ahmad Yani Airport is in Central Java, specifically in the city of Semarang. With the IATA code SRG and ICAO code WAHS, General Ahmad Yani Airport is part of PT Angkasa Pura Indonesia (In Journey Airports).

The increasing number of passengers using airport services naturally necessitates increased security at airports. To prevent various potential threats, officers with the necessary skills are needed. These officers or personnel are referred to as Aviation Security Officers (AVSEC). As the number of passengers increases, the workload of Aviation Security Officers (AVSEC) also increases. In carrying out their duties, Aviation Security Officers (AVSEC) are required to demonstrate excellent performance and service for the sake of flight safety and security (Yunika & Astutik, 2023). Every passenger boarding a plane is required to undergo a security check, both for themselves and their belongings in the cabin, by passing through the Passenger Security Checkpoint (PSCP). The Passenger Security Checkpoint (PSCP) has several areas that require inspection and regulation.

Based on observations at General Ahmad Yani Airport in Semarang, it was found that AVSEC personnel rotation has not been consistently implemented. Ideally, rotation should be carried out on a scheduled and systematic basis to maintain vigilance and prevent fatigue. However, in the field, some personnel still work for too long in one position without rotation, especially during peak passenger traffic periods. This often reduces concentration and alertness, leading to the risk of screening errors or human error.

One incident that reinforced the urgency of this research was the entry of prohibited items, such as scissors, into the waiting area, which should have been detected during screening at the Passenger Security Checkpoint (PSCP). This incident demonstrated weaknesses in the screening system, likely influenced by decreased officer alertness due to fatigue or boredom due to the lack of rotation. Ideally, implementing a job rotation system is necessary to maintain personnel performance and prevent burnout. However, the current implementation of rotation is not optimal. This creates a gap between the ideal conditions and the reality on the ground. This is why it is important to conduct research on the effect of AVSEC personnel rotation on the potential for human error at the Passenger Security Checkpoint (PSCP).

As outlined in the background section above, this research, entitled "The Effect of Aviation Personnel Rotation on Human Error at the Passenger Security Checkpoint at General Ahmad Yani Airport, Semarang," can be conducted.

RESEARCH METHOD

Research Design

A research method is defined as a systematic, scientific approach to achieving research objectives from the data obtained (Sugiyono, 2024). This research uses a quantitative method because it is appropriate for systematically measuring relationships between variables with the aid of numerical data. The quantitative approach is used to answer specific research questions, particularly in identifying the effect of Aviation Security personnel rotation on human error at the Passenger Security Checkpoint at General Ahmad Yani Airport, Semarang.

Research Variables

A variable is defined as an aspect that can be measured and modified and can be used to interpret phenomena in research (Marliana Susianti, 2024). Variables must be measurable so that the results of the research are objective and testable. The variables used in this research are the independent variable (X) is Aviation Security Personnel Rotation and the dependent variable (Y) is Human Error at the Passenger Security Checkpoint.

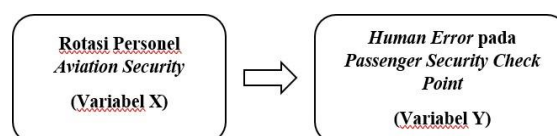


Figure 1. Research Variables

Population and Sample

A population is the entirety of the subjects or objects in research that possess specific characteristics that can be studied and conclusions drawn (Marliana Susianti, 2024). In this research, the population was drawn from 38 Aviation Security Screening (AVSEC) personnel at General Ahmad Yani Airport in Semarang. These personnel consisted of 10 Basic qualification personnel, 15 Junior qualification personnel, and 13 Senior qualification personnel.

A sample is defined as a part of a population taken to reflect the overall character of a research population. The research was conducted using a total sampling technique, so the research sample consisted of 38 personnel. This sample used a total sample because the population size was < 100 . This research was aimed at all Aviation Security (AVSEC) personnel assigned to the Passenger Screening Check Point (PSCP) area, without differentiating qualification levels because it aimed to describe the general perception regarding the influence of job rotation on the potential for human error in the PSCP.

Data Collection Techniques and Research Instruments

Data collection techniques are the methods used to obtain the desired data for research. Research instruments in quantitative research are tools used to collect numerical data that can then be analyzed using statistical methods (Salmia, 2023). In quantitative research, one of the main characteristics is that the researcher acts as both an instrument and an implementer of data collection, whether through interviews, observations, questionnaires, or other techniques (Sitompul et al., 2024).

Observation

Observation is defined as a technique for obtaining data by observing directly using human senses (Guntara et al., 2023). The implementation of research observations was carried out by directly observing the activities of Aviation Security (AVSEC) personnel at the Passenger Security Check Point (PSCP) at General Ahmad Yani Airport, Semarang, while carrying out On the Job Training (OJT) activities during January - February 2025.

Literature Research

Literature study is defined as a research method that includes the activities of reviewing, collecting, documenting, sorting and organizing various references that have been obtained (Sulung & Muspawi, 2024). The literature review included the collection, review, and analysis of literature from various sources relevant to this research. The sources used included regulations from the Ministry of Transportation, ICAO (International Civil Aviation Organization), and previous research related to Aviation Security (AVSEC).

Questionnaire

This research relied on a questionnaire as the primary instrument. The questionnaire was designed with questions formulated based on each research variable. A questionnaire is a list of questions prepared by researchers relating to research problems (Safitri et al., 2022). Before distributing the questionnaire, its validity was tested. In this research, the measurement scale used was a Likert Scale of 1–5.

Table 1. Likert Scale

No	Attitude	Symbol
1	Strongly Agree	SA
2	Agree	A
3	Slightly Disagree	SD
4	Disagree	D
5	Strongly Disagree	SDS

Interview

This research also included interviews to confirm the observations and questionnaires and to strengthen the information regarding the issues. Interviews were conducted directly with personnel responsible for operational oversight at the Passenger Security Checkpoint (PSCP) at General Ahmad Yani Airport in Semarang.

Data Analysis Techniques

In this research, the type of validity test used consists of two stages, content validity and construct validity. The content validity test used two subject matter expert respondents, one Aviation Security Lecturer at the Surabaya Aviation Polytechnic and one Aviation Security Supervisor at General Ahmad Yani Airport, Semarang.

Validity Test

In this research, the type of validity test used consists of two stages, content validity and construct validity. The content validity test used two subject matter expert respondents, one Aviation Security Lecturer at the Surabaya Aviation Polytechnic and one Aviation Security Supervisor at General Ahmad Yani Airport, Semarang.

Table 2. Content Validity Test Result Data

Assessment Criteria	Score Obtained		
	Lecturer	Supervisor	Max. Score
Content Suitability	15	13	15
Language	15	13	15
Total	30	26	30

Table 3. Data Processing of Content Validity Test Results

Assessment Criteria	Percentage of Scores Obtained (%)		
	Lecturer	Supervisor	Accumulation
Total	100	86,6	93,3

An instrument can be declared to have good content validity when two experts provide assessments that yield a score of $\geq 80\%$ (Puspitasari & Febrinita, 2021). The resulting score was 93.3%, and it was declared valid because 93.3% is $> 80\%$.

The construct validity test was distributed to respondents other than the primary respondents. These respondents were 30 Aviation Security (AVSEC) personnel at Adi

Soemarmo Solo Airport who work at the Passenger Security Check Point (PSCP). These respondents were selected because they were considered relevant to the primary respondents.

Table 4. Construct Validity Test of Variable X

No	r count	r table	Decision
X.1	0,643	0,361	Valid
X.2	0,842	0,361	Valid
X.3	0,813	0,361	Valid
X.4	0,624	0,361	Valid
X.5	0,748	0,361	Valid
X.6	0,705	0,361	Valid
X.7	0,768	0,361	Valid
X.8	0,773	0,361	Valid
X.9	0,450	0,361	Valid
X.10	0,509	0,361	Valid

Table 5. Construct Validity Test of Variable Y

No	r count	r table	Decision
X.1	0,643	0,361	Valid
X.2	0,842	0,361	Valid
X.3	0,813	0,361	Valid
X.4	0,624	0,361	Valid
X.5	0,748	0,361	Valid
X.6	0,705	0,361	Valid
X.7	0,768	0,361	Valid
X.8	0,773	0,361	Valid
X.9	0,450	0,361	Valid
X.10	0,509	0,361	Valid

The results of the construct validity test show that 10 items from Variable X and 10 items from Variable Y show valid results with the calculated r value for each item > r table at a significant value of 5% (0.361). Therefore, all items of the research statement instrument have been declared valid.

Reliability Test

In this research, the reliability test used the Cronbach's Alpha method, which is a very common method for measuring the consistency of a research instrument. A questionnaire is considered reliable when the Cronbach's Alpha value is > 0.7.

Reliability Statistics	
Cronbach's Alpha	N of Items
.876	10

Figure 2. Reliability Test Results of Variable X

Reliability Statistics	
Cronbach's Alpha	N of Items
.866	10

Figure 3. Reliability Test Results of Variable Y

The results of the reliability test show that the Cronbach's Alpha value for Variable X is 0.876 > 0.7 and the Cronbach's Alpha value for Variable Y is 0.866 > 0.7. Therefore, all questionnaire items for Variable X and Variable Y of the research have been declared reliable with a very good level of reliability.

Normality Test

The normality test in this research was used to determine whether the data obtained had a normal distribution. This test is crucial because in linear regression analysis, one of the assumptions that must be met is that the residual data is normally distributed. The normality test was conducted using the Shapiro-Wilk method.

Linearity Test

Headings The linearity test is a prerequisite in linear regression analysis to determine whether there is a linear relationship between the independent and dependent variables. This test aims to ensure that the relationship between Variable X and Variable Y can be explained linearly. The linearity test is performed using ANOVA.

Simple Linear Regression Analysis

This simple linear regression method is used to explain the relationship between two variables. This analysis is conducted using a T tests (partial) to determine the effect of the independent variable on the dependent variable individually. Then, a coefficient of determination (R^2) test is used to determine how much the independent variable influences the dependent variable.

Research Location and Time

The research was conducted at the Aviation Security (AVSEC) unit, specifically the Passenger Security Check Point (PSCP) area at General Ahmad Yani Airport in Semarang. This location was chosen as the research object because the author was conducting On-the-Job Training activities at the airport. The research was conducted during On the Job Training (OJT) activities from January to February 2025.

RESULTS AND DISCUSSION

Research Findings

This research conducted validity tests, reliability tests, normality tests, and simple linear regression analysis in the form of T tests (partial) and coefficient of determination (R^2) tests using IBM SPSS Statistics 27 software. The research also conducted interviews with AVSEC personnel on duty at PSCP at General Ahmad Yani Airport, Semarang.

The Effect of Aviation Security Personnel Rotation on Human Error

Based on the research results, there is an effect between Aviation Security personnel rotation and human error. Several tests were conducted to demonstrate this effect using IBM SPSS Statistics 27 software. The testing was carried out using validity tests, reliability tests, normality tests, and simple linear regression analysis in the form of T tests (partial) and coefficient of determination (R^2) tests.

Normality Test

This normality test used the Shapiro-Wilk method with 38 primary respondents. Data can be considered normally distributed when the Sig. (p-value) is > 0.05 .

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Rotasi Personel AVSEC	.174	38	.005	.948	38	.074
Human Error Pada PSCP	.166	38	.010	.962	38	.213

a. Lilliefors Significance Correction

Figure 4. Normality Test Results

The results of the normality test with Shapiro-Wilk show that the Sig. (p-value) of AVSEC Personnel Rotation (Variable X) is $0.074 > 0.05$ and the Sig. (p-value) of Human Error in PSCP (Variable Y) is $0.213 > 0.05$. From this description, it can be concluded that all data have been normally distributed.

Linearity Test

Variables are said to have a linear relationship when the Sig. (p-value) > 0.05 and calculated f value $< f$ table.

			Sum of Squares	df	Mean Square	F	Sig.
Rotasi Personel AVSEC * Human Error Pada PSCP	Between Groups	(Combined)	175.199	11	15.927	19.610	<.001
		Linearity	166.902	1	166.902	205.499	<.001
		Deviation from Linearity	8.297	10	.830	1.022	.453
Within Groups			21.117	26	.812		
Total			196.316	37			

Figure 5. Linearity Test Results

The results of the linearity test show that the Sig. (p-value) is $0.453 > 0.05$. In addition, the calculated f value obtained is 1.022. While the f table value for $df = 10; 26$ with a significance of 0.05 is 2.22. The calculated f value is $1.022 < 2.22$ f table. From this description, it can be concluded that there is a significant linear relationship between AVSEC Personnel Rotation (Variable X), with Human Error in PSCP (Variable Y).

Simple Linear Regression

1. Simple Linear Regression Test

Model	Unstandardized Coefficients		Standardized Coefficients		t	Sig.
	B	Std. Error	Beta			
1 (Constant)	60.352	2.133			28.290	<.001
Rotasi Personel AVSEC	-1.006	.070	-.922		-14.292	<.001

a. Dependent Variable: Human Error Pada PSCP

Figure 6. Simple Linear Regression Test Results

The results of the simple linear regression test obtained a regression equation with a constant number (a) of 60.352 and a regression coefficient (b) of -1.006. So, the regression

equation obtained is $Y = 60.352 - 1.006 X$. From this description, it can be concluded that AVSEC Personnel Rotation (Variable X) has a negative effect on Human Error in PSCP (Variable Y), meaning that the better the implementation of AVSEC Personnel Rotation, the lower the level of Human Error in PSCP.

2. T-Test (Partial)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1	(Constant)	60.352	2.133	28.290	<.001
	Rotasi Personel AVSEC	-1.006	.070	-.922	<.001

a. Dependent Variable: Human Error Pada PSCP

Figure 7. Simple Linear Regression Test Results

The results of the t-test show a Sig. (p-value) value < 0.001 , meaning this value is < 0.05 . From this description, it can be concluded that H_0 is rejected and H_a is accepted, meaning "There is an Influence of AVSEC Personnel Rotation (Variable X) individually (partially) that has a significant effect on Human Error in PSCP (Variable Y)".

Hypothesis testing with this t-test can also be seen from the calculated t-value. The results of the t-test show a calculated t-value of -14.292. While the t-table value for $df = 36$ and $\alpha/2 = 0.025$ is 2.028. The calculated t-value $|-14.292| > 2.028$ t-table value. From this description, it can be concluded that H_0 is rejected and H_a is accepted, meaning "There is an Effect of AVSEC Personnel Rotation (Variable X) on Human Error in PSCP (Variable Y)".

3. Test of the Coefficient of Determination (R^2)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1	(Constant)	60.352	2.133	28.290	<.001
	Rotasi Personel AVSEC	-1.006	.070	-.922	<.001

a. Dependent Variable: Human Error Pada PSCP

Figure 8. Results of the Coefficient of Determination (R^2) Test

The results of the coefficient of determination test show an R Square value of 0.850. This value means that the influence of AVSEC Personnel Rotation (Variable X) on Human Error in PSCP (Variable Y) is 85%. While the remaining 15% is other factors. From this description, it can be concluded that AVSEC Personnel Rotation (Variable X) has a very strong influence on Human Error in PSCP (Variable Y) with an influence of 85%.

Implementation of Aviation Security Rotation Can Minimize Personnel Fatigue and Burnout

Based on the impact of Aviation Security personnel rotation on human error, the implementation of Aviation Security rotation can minimize personnel fatigue and burnout. Interviews were conducted with the AVSEC PSCP supervisor at General Ahmad Yani Airport in Semarang. The resource person was Mr. Ari Budi Wibowo, the Aviation Supervisor assigned to the PSCP area.

The first question, "Can the implementation of rotation between posts in the PSCP area help reduce personnel fatigue while on duty?" According to Mr. Ari, rotation between posts helps maintain personnel stamina and focus. Shifting tasks every 20 minutes,

especially for positions such as X-ray operators, is effective in reducing fatigue, particularly during peak hours.

The second question, "To what extent do you feel job rotation is effective in reducing personnel burnout or boredom while performing duties at the PSCP?" According to Mr. Ari, rotation provides task variety, which can reduce burnout. Position changes prevent boredom from repetitive tasks and help maintain concentration and work motivation in the dynamic and high risk PSCP environment.

Discussion

According to data from January 2025, the Aviation Security (AVSEC) personnel assigned to the Passenger Security Check Point (PSCP) area totalled 38. These personnel comprised 10 Basic personnel, 15 Junior personnel, and 13 Senior personnel.

SECTION	ORGANIK			NON ORGANIK		
AVIATION SECURITY SCREENING	BASIC	SENIOR		BASIC	JUNIOR	
1	1. JARI YOGA SATIRI	1. JARI YOGA SATIRI		1. JOKO SEPTIAN H.	1. YOKO PUJITASARI	
2	2. JANDI AGUS NUR M.	2. JANDI AGUS NUR M.		2. JANGGIAN RIZKI DMR	2. BIRHANTO	
3	3. SALEH SURIPANA	3. SALEH SURIPANA		3. YOGA MURITA D. W.	3. JOHORELLI ANANI	
4	4. SYAFKIR ALI	4. SYAFKIR ALI		4. ARIYU PURNAMA	4. JABOULRAHMAN	
5	5. SUDHAN ANDIKASOEND	5. SUDHAN ANDIKASOEND		5. YETI RAHMATI N.	5. SYAFKIR M. FURBANTI	
6	6. NUR KHODIM	6. NUR KHODIM		6. OKTAVIA NUR H.	6. RAGANA PRASETYO	
7	7. AVIN NADYNATA	7. AVIN NADYNATA		7. NACHA NAZLA	7. DITA SEPTIAN	
8	8. JANDI AGUS NUR M.	8. JANDI AGUS NUR M.		8. ADITYA SAMBIRA G.	8. JANDI AGUS NUR M.	
9	9. RINDU ROHMANS	9. RINDU ROHMANS		9. JANDI AGUS NUR M.	9. JANDI AGUS NUR M.	
10	10. MUHAMMAD	10. MUHAMMAD		10. JANDI AGUS NUR M.	10. JANDI AGUS NUR M.	
11	11. YOKO YOGANTO	11. YOKO YOGANTO		11. JANDI AGUS NUR M.	11. JANDI AGUS NUR M.	
12	12. TAN DITA SAKRA	12. TAN DITA SAKRA		12. JANDI AGUS NUR M.	12. JANDI AGUS NUR M.	
13	13. ALIP ADITYA N.	13. ALIP ADITYA N.		13. JANDI AGUS NUR M.	13. JANDI AGUS NUR M.	
				14. JANDI AGUS NUR M.	14. JANDI AGUS NUR M.	
				15. JANDI AGUS NUR M.	15. JANDI AGUS NUR M.	

Figure 9. Aviation Security Screening Personnel

There are three shifts, each divided into morning, afternoon, and evening shifts, each with an eight-hour workweek. Each shift has 10 personnel on duty, one in the AVSEC Working Room, two in the Hold Baggage Screening Checkpoint (HBSCP), and seven in the Passenger Security Checkpoint (PSCP).

The duties are divided into four active positions:

1. Passenger and cargo flow controller (Flow)
2. Passenger screener (manually or using HHMD)
3. X-ray machine operator (junior personnel only)
4. Post-X-ray baggage screener

A rotation system for Junior qualified X-Ray operators applies, with 20 minutes of work as an operator followed by 40 minutes of rotation to other tasks, such as passenger screening using a Hand-Held Metal Detector (HHMD) or flow control. Basic qualified personnel also rotate between positions, but do not serve as X-Ray operators.

Based on test results using IBM SPSS Statistics 27 software, AVSEC personnel rotation was shown to have a significant impact on human error. Normality tests indicated that the data were normally distributed, while linearity tests indicated a linear relationship between variables.

A simple linear regression test yielded the equation $Y = 60.352 - 1.006 X$. The t-test significance value was < 0.05 , and the calculated t-count was $> t$ -table, thus accepting the alternative hypothesis.

The coefficient of determination (R^2) of 0.850 indicates that 85% of the human error variable can be explained by personnel rotation, with the remaining 15% influenced by other factors. These results confirm that structured rotation can reduce fatigue, boredom, and work errors, thereby increasing personnel effectiveness in the field.

Implementation of Aviation Security Rotation Can Minimize Personnel Fatigue and Burnout

The results of the Variable X questionnaire indicate that rotation generally has a positive impact on reducing fatigue and work burnout. Furthermore, respondents also perceived the benefits of varying positions in rotation to maintain work morale. However, implementation challenges remain. Some respondents felt rotations were implemented without clear instructions from their superiors, and others felt that rotations were performed too frequently, disrupting concentration.

The furthermore, based on the results of the interviews conducted, the following are:

1. 1.Effectiveness of rotation on physical fatigue.
Rotation between posts every 20 minutes, especially in positions that require high concentration, such as X-ray operators, is considered effective in reducing fatigue.
2. The effect of rotation on psychological burnout.
Task variation through rotation helps reduce burnout and maintain personnel focus.
3. Limitations of rotation implementation.
Rotation implementation has not been fully optimized due to individual personnel awareness and dynamic field conditions.
4. The need for SOP and monitoring.
SOP for rotation are needed that regulate schedules, task recording, and personnel responsibilities.

CONCLUSION

Based on the results obtained from the implementation of research related to the Effect of Aviation Security Personnel Rotation on Human Error at Passenger Security Check Points at General Ahmad Yani Airport, Semarang, it can be concluded. First, Aviation Security Personnel Rotation has a significant effect on Human Error at Passenger Security Check Points at General Ahmad Yani Airport, Semarang. The results of the t-test show that H_0 is rejected and H_a is accepted. In addition, the results of the linear regression test show a negative relationship (-) with an R^2 value of 0.850 (85%). Therefore, Aviation Security Personnel Rotation has a very strong and significant effect on Human Error at Passenger Security Check Points at General Ahmad Yani Airport, Semarang.

Second, the implementation of job rotation between posts in the PSCP area has been proven to minimize physical fatigue and psychological burnout among personnel. Implementing rotations every 20 minutes, especially in high-intensity positions such as X-ray machine operators, helps maintain personnel stamina and concentration while on duty. Furthermore, the variety of tasks assigned through rotation is also effective in reducing burnout. However, the implementation of rotations in the field still faces several obstacles, such as the lack of written SOP and a consistent monitoring system. Therefore, strengthening implementation is necessary through the development of rotation SOP and the implementation of logbooks at each post.

Based on the conclusions, some suggestions and input for improvement and development are provided. First, General Ahmad Yani Airport, Semarang, specifically the Aviation Security unit, is advised to implement post rotations at the Passenger Security Check Point (PSCP) consistently according to schedule. Each post should be equipped with a logbook that records the rotation time, personnel names, and

assignments, and be signed by a supervisor as a form of accountability. It is also recommended that a rotation SOP be developed and implemented no later than one month after the results of this study are received. The SOP should include the rotation schedule, logbook records, supervisor responsibilities, and periodic evaluations at least once every two months to support the safety and quality of security services at the PSCP. For Second, Aviation Security personnel are advised to actively support the implementation of duty rotation by maintaining discipline and professionalism at each checkpoint. To foster understanding of the importance of rotation, it is recommended that brief information sessions or materials be provided every three months, discussing the benefits of rotation, implementation procedures, and case studies related to human error. These activities can be packaged through special briefings, internal training, or informal discussion forums among personnel. Furthermore, personnel are expected to report their physical and psychological condition regularly, at least every two months.

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