STRESS MANAGEMENT EVALUATION OF DIPLOMA 3 AIR TRAFFIC CADETS IN AIR TRAFFIC CONTROL SIMULATION AT SURABAYA AVIATION POLYTECHNIC

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Abstract

The Air Traffic Controller (ATC) profession is known for its high-stress environment due to the demands of making quick and accurate decisions under pressure. Diploma 3 Air Traffic Management students at Politeknik Penerbangan Surabaya, although still in training, experience similar conditions during complex and high-pressure ATC simulations. Poorly managed stress can affect concentration, decision-making, and overall learning effectiveness. Therefore, this study aims to evaluate the stress management of students during ATC simulations and provide recommendations for improving the training program.
This study employed a qualitative descriptive method with data collected through observation, semi-structured interviews, and documentation. The research subjects were active students participating in ATC simulations, while the research objects included stress symptoms, coping strategies used, and the effectiveness of stress management. Data analysis followed the stages of reduction, presentation, and conclusion drawing, with source and method triangulation to ensure data validity.
The findings indicate that the primary sources of stress are time pressure, air traffic complexity, and fear of making mistakes in front of instructors. Students employed stress management strategies such as deep breathing techniques, positive affirmations, short breaks, and seeking support from instructors and peers. However, stress management was not yet optimal under high-pressure simulation conditions. It is recommended to integrate systematic stress management training and gradually increase simulation scenario difficulty to strengthen students' mental readiness.
Keywords: *stress management, Air Traffic Controller, Diploma 3 Air Traffic Management, simulation, Politeknik Penerbangan Surabaya.*

INTRODUCTION

Stress is a change in the body's reaction when faced with a threat, pressure, or new situation. Stress itself can take various forms depending on the individual's characteristics. Stress isn't always interpreted as something negative. Under certain circumstances, stress can be beneficial, such as encouraging tasks to be completed more quickly and before deadlines. However, if left unchecked, high and sustained stress levels can disrupt daily life. Prolonged stress can trigger health problems. When stressed, the body releases

the hormones cortisol and adrenaline, which increase the heart rate (infokes, 2024).

In the aviation sector, success in maintaining the safety and smooth flow of air traffic is largely determined by the performance and mental toughness of an Air Traffic Controller (ATC). This profession is known to be highly stressful, requiring full focus, quick decision-making, and the ability to process complex information in a limited time. If stress is not optimally managed, the risk of human error increases, which can undoubtedly threaten flight safety.

The D3 Air Traffic cadets at the Surabaya Aviation Polytechnic are prospective air traffic controllers who must be equipped with adequate technical and psychological skills. The profession of Air Traffic Controller (ATC) is known to be highly stressful due to the significant responsibility of maintaining flight safety. Although cadets are still in the learning and simulation phase, the mental stress they experience is no less severe than that of professional ATC officers, especially when faced with complex simulation scenarios that require high concentration.

At the Surabaya Aviation Polytechnic, D3 Air Traffic cadets receive both theoretical and practical training, including through Air Traffic Controller simulations. These simulations are designed to mimic real-life situations in an air traffic control room and play a crucial role in honing not only technical skills but also the cadets' mental readiness. Often, the complexity of the simulation scenarios and the pressure of direct evaluation from instructors are a source of stress.

Based on personal experience and that of colleagues participating in laboratory simulations, the time pressure approaching the On-the-Job Training (OJT) period, along with the pressure from instructors during the simulations, places a significant psychological burden on the cadets. This pressure creates a sense of pressure and a preoccupation with thoughts, leading to stress among the cadets. This stressful situation impacts the behavior of some cadets, who choose to copy and paste problem solutions from their peers rather than working independently based on their own understanding. This results in the ineffectiveness of the simulation practice learning process, as the primary purpose of the simulation, as a means of developing cadets' skills and mental readiness, is suboptimal.

However, to date, few studies have specifically examined cadets' stress management skills in the context of ATC simulations. In fact, this information is crucial for assessing their psychological readiness to face the challenges of the real world of work. This evaluation can serve as the basis for developing a more comprehensive, needs-based curriculum and training strategies.

Therefore, through this study, the author aims to assess the extent to which cadets are able to manage stress during ATC simulations. The results are expected to provide recommendations for improving stress management training programs, thereby maintaining cadets' mental readiness and supporting future flight safety.

This study is expected to provide D3 Air Traffic cadets with a better understanding of the factors causing stress during Air Traffic Controller simulations and effective stress management strategies. This will enable cadets to manage stress more optimally, thereby improving their mental readiness and performance during training and on-the-job. The results of this study can serve as evaluation material and input for developing appropriate training and support programs to reduce stress levels and improve the quality of learning, resulting in graduates who are more psychologically prepared to face the demands of the ATC profession. Effective stress management in cadets as prospective Air Traffic Controllers contributes to improved flight safety. This research helps identify aspects that need to be considered to minimize the risk of human error due to work stress, thereby supporting safe and optimal air navigation services.

METHOD

This research uses a qualitative approach with a qualitative descriptive method, which is based on the philosophy of postpositivity and is carried out in natural object conditions without variable manipulation(1). The researcher was present at the research location as the primary instrument, supported by additional instruments in the form of interview guides, observation sheets, a voice recorder, a camera, and field notes. The study population was all cadets in the D3 Air Traffic Study Program at the Surabaya Aviation Polytechnic. The sample was determined using purposive sampling: three cadets from the 13th intake who actively participated in the Air Traffic Controller (ATC) simulation and two instructors who were directly involved. The researcher's presence in the field aimed to directly observe the simulation, understand the context of the situation, and build relationships with respondents to obtain more in-depth and accurate information.

Data collection was conducted using triangulation techniques, including observation, semi-structured interviews, and documentation. Observations were conducted to identify indicators of stress such as restless behavior, difficulty concentrating, changes in tone of voice, and reactions in decision-making. Semi-structured interviews were used to explore the cadets' experiences, coping strategies, support received, and the impact of stress on their performance. Documentation in the form of cadet evaluation sheets, instructor notes, photos of

simulation activities, and supporting archives were used to strengthen the research findings. To maintain data validity, source and method triangulation techniques were used, comparing data from various data collection techniques and reconfirming findings with respondents through member checks.

Data analysis refers to the Miles & Huberman model, which includes three stages: data reduction, data presentation, and conclusion drawing(2). Data reduction is the process of selecting, simplifying, and grouping data obtained from the field. Documentation is a record of past events, which can be in the form of videos, images, audio, or written text, used to support research. Data reduction is carried out from the initial data collection through the preparation of the final report, by systematically selecting, summarizing, and classifying data.

Data presentation aims to facilitate researchers' understanding and mastery of the collected information. The compiled data is then described and summarized, thus facilitating researchers in narrowing the research focus and drawing more focused conclusions. Through these conclusions, the research results will be known through data obtained through interviews, observations, and documentation regarding stress management experienced by D3 Air Traffic cadets in the Air Traffic Controller simulation at the Surabaya Aviation Polytechnic.

In this study, conclusions were drawn by first grouping and organizing the data, then checking its validity and appropriateness, so that clear conclusions can be drawn that align with the research objectives. Through this process, research results will be obtained based on data collected through interviews, observations, and documentation. This research was conducted at the Surabaya Aviation Polytechnic, specifically in the ATC simulation room, during the period from October 2024 to July 2025, coinciding with the implementation of On The Job Training (OJT) for the two researchers.

RESULTS AND DISCUSSION

Research result

Observations of five D3 Air Traffic cadets undergoing an Air Traffic Controller (ATC) simulation at the Surabaya Aviation Polytechnic's Manual ADC Laboratory revealed a clear picture of stress symptoms and the coping strategies they employed. This activity focused on identifying signs of stress based on physical and psychological indicators, as well as responses to pressure that emerged during their simulated air traffic management. During the observations, it was observed that high operational pressure elicited bodily responses such as trembling hands, cold sweats, a pounding heart, changes in voice tone, and tense facial expressions. This is in accordance with the view of Lazarus and Folkman (1984) who stated that

stress can trigger physiological reactions in response to environmental pressure. For example, during the observation on July 16, 2025, at 14:00 WIB, cadet B appeared to lose focus while controlling the PK-OCP aircraft due to instructor distraction, resulting in incorrect instructions and showing signs of panic. Cadet A experienced a similar situation at 2:16 PM WIB on the same day, where confusion due to incorrect taxiway instructions was evident in his tense face and stuttering voice, triggered by heavy traffic and fear of making a mistake in front of the instructor. On a different occasion, Cadet C, at 10:30 AM WIB on July 15, 2025, displayed clear anxiety when a near-accident occurred between SQS 7124 and PK-ATC due to forgetting to provide traffic information. Cadet D, at 11:30 AM WIB on the same day, appeared restless, frequently moving his chair, and was reprimanded for forgetting to spot the helipad during clearance. Meanwhile, Cadet E, at 2:15 PM WIB on July 14, 2025, experienced trembling hands while holding his radio in heavy traffic.

In addition to physical symptoms, observations also revealed significant psychological symptoms. Several cadets appeared confused, lost focus, and exhibited nervous behavior such as pacing, prolonged silence, or heavy breathing. These findings align with research showing that psychological stress in air traffic controllers can disrupt concentration and increase the risk of operational errors. The coping strategies used by the cadets appear to reflect two approaches by Lazarus and Folkman: problem-focused coping and emotion-focused coping(3). Problem-focused coping was evident when cadets attempted to immediately correct errors or refocus their attention on work priorities after an instructor's reprimand. Meanwhile, emotion-focused coping was evident when they attempted to calm themselves through deep breathing techniques, paused before continuing instructions, or attempted to maintain a stable tone of voice. For example, on July 16, 2025, at 2:20 PM WIB (Western Indonesian Time), after incorrectly issuing a "continue approach report right downwind" clearance and receiving a reprimand, cadet A chose to pause and take a deep breath before speaking again. Cadet D, at 11:40 AM WIB (Western Indonesian Time), also frequently took deep breaths whenever he felt confused or after receiving a reprimand. Cadet E exhibited pacing behavior before the simulation began as a way to reduce tension.

Overall, the observations indicated that the stress experienced by cadets during the ATC simulation was triggered by a combination of internal factors such as material and skill readiness, as well as external factors such as time pressure, traffic complexity, and instructor intervention. The physiological and psychological responses that emerged align with Lazarus & Folkman's

stress-coping model, in which the body and mind react to stress in a variety of ways, both adaptive and maladaptive. While simple coping strategies such as deep breathing or pausing can help reduce tension momentarily, their effectiveness is still limited in low- to medium-complexity simulation scenarios. In more complex situations, these strategies are not able to completely eliminate the impact of stress, so more structured stress management training is needed, such as multi-level simulations, focus-under-pressure exercises, and strengthening communication skills in critical situations. These findings are important for aviation educational institutions to design training curricula that not only hone technical skills but also equip cadets with adequate psychological capabilities to cope with the high pressures of air traffic control duties.

Interviews with several 14th-year Air Traffic (LLU) D3 cadets at the Surabaya Aviation Polytechnic revealed that they experienced significant levels of stress during the Air Traffic Controller simulation. This stress stemmed primarily from time constraints, the complexity of air traffic control, and the fear of errors being immediately assessed by the instructor. The three respondents Group GF, Group AP, and Group AL consistently reported that feelings of nervousness and trepidation often arose at the beginning of the simulation, but gradually diminished as the training intensity increased and they became more adaptable to the situation. Group GF cited time pressure, dense air traffic, and the fear of making mistakes in front of the instructor as the main stress triggers. Group AP echoed this sentiment, emphasizing that time constraints, dense aircraft movement, and the fear of negative evaluation were sources of stress. Group AL even added, more casually, that he often felt "uncomfortable" when time was tight, there were many aircraft contacting, and there was a certain fear of "rechecking" if an error occurred.

To cope with this pressure, the cadets developed relatively simple yet effective stress management strategies. The techniques they used included regulating their breathing by taking slow, deep breaths, reciting positive affirmations before the simulation session, systematically dividing their focus and prioritizing their work to avoid panic, and taking a short break before entering the simulation room. GF admitted to regularly practicing deep breathing techniques and positive affirmations to calm herself. AP preferred to sit quietly, take deep breaths, and reassure herself that she was capable of facing the challenge. Meanwhile, AL revealed that she often "told myself" that she had practiced and could do it, which she found quite helpful in calming her mind.

In addition to individual techniques, environmental support was also a crucial factor in helping them cope with stress. All

three cadets agreed that the support of their peers, who encouraged each other, and the instructors' motivating guidance before the exercise, significantly reduced stress. GF found that the instructors' guidance and encouragement from their peers boosted her confidence. AP noted the discussions and mutual encouragement among her peers, while the instructors provided calming guidance and motivation. AL also stated that the instructors' advice before the simulation often helped her feel more mentally prepared.

Despite this, the stress experienced still impacted cognitive performance. The cadets reported difficulty maintaining focus, making poor decisions, and sometimes going "blank" when situations required quick responses amidst heavy aircraft traffic. GF admitted that stress made it difficult to focus, sometimes delaying instructions or making incorrect decisions. AP added that when stress levels were high, he became less thorough even though he understood procedures. AL also admitted that stress could cause him to lose focus, even on things he already knew.

From these interviews, the cadets also provided suggestions for improvements to better manage stress in training. They suggested that simulations be conducted in stages, starting with simple scenarios and moving to more complex ones, and include stress management briefing sessions and mental training before the simulations begin. They also suggested that training sessions be more varied, more frequent, and include experience-sharing sessions with instructors to strengthen mental readiness. According to them, balancing technical and psychological readiness is key to optimally completing Air Traffic Controller simulations.

Instructors observed that stress or nervousness often arose in cadets who had not yet mastered the material, especially when facing dense air traffic and tight time constraints. According to Instructor HF, this condition typically occurred in cadets who proceeded without thorough preparation, resulting in them feeling pressured during the simulation. Instructor KS added that he often referred to this condition as nervousness, which arose from a lack of preparation for the material and communication skills as an ATC. Symptoms included asking numerous questions to assistants or colleagues. To address this, instructors provided guidance, motivation before the simulation, and evaluations afterward to help cadets manage stress and improve their preparedness.

Documentation of the ATC simulation in the ADC Manual laboratory showed cadets working in a stressful atmosphere from the beginning, with serious expressions and focused on following procedures. During the simulation, instructors provided technical instructions and reprimands that sometimes disrupted concentration, causing some cadets to appear

nervous, agitated, or ask colleagues for help. The pressure increased as air traffic became denser, triggering confusion and the need for social coping. After the simulation, a briefing session was held to provide evaluation, feedback, and motivation to better prepare cadets for the next simulation.

Based on documentation through the Daily Evaluation Sheet, each cadet's performance demonstrated varying abilities and challenges. Cadet A received a weak score of 1 out of 5 in traffic separation and conflict resolution, and was specifically noted for paying more attention to instructions and listening carefully. In traffic capacity management, this cadet was also assessed as being inaccurate in giving directional instructions, indicating pressure during the scenario. However, his communication skills were deemed adequate, although still affected by pressure, as evidenced by his hurried tone of voice and minor errors in data verification. Cadet B received fairly high scores in communication and situational understanding.

The instructor noted that the cadet was able to identify aircraft in the vicinity and attempted to formulate instructions despite the high traffic pressure. However, weaknesses were noted in the speed of information delivery and data verification, requiring increased concentration when the pressure increased. Cadet C generally performed quite well with a score of 3.8 out of 5, despite minor errors such as delayed coordination and errors in delivering landing instructions. This cadet's strengths were his ability to recognize aircraft well and maintain clear communication under pressure. Cadet D struggled with timely planning and coordination, as reflected in low scores on management of non-routine situations and coordination. The instructor noted that the cadet lacked adequate planning and action during conflict, despite attempts to address the stress through communication adjustments and instruction verification. Meanwhile, Cadet E was rated as performing well in traffic management and communication, with an average score of 3–4 across each competency. Records indicated that the cadet was able to provide clarification and instructions effectively, despite minor errors such as delayed call-outs and inappropriate clearances. He also demonstrated good situational awareness and a steadily improving mastery of communication techniques.

Pembahasan

Based on observations, interviews, and documentation, the stress experienced by D3 Air Traffic cadets during ATC simulations is caused by a combination of factors, namely time pressure, traffic complexity, and the fear of making mistakes under the instructor's supervision. These findings align with research that identifies high workloads, time pressure, and demands of responsibility as the

dominant factors causing stress in air traffic controllers(4).

Observed stress symptoms can be categorized into three aspects. First, physical symptoms such as trembling hands, cold sweats, a pounding heart, and difficulty speaking fluently are the body's physiological reactions to stress. Second, psychological symptoms such as nervousness, confusion, loss of focus, and behaviors such as silence, deep breathing, and repeating instructions are consistent with findings that psychological stress in ATCs can affect concentration and decision-making(5). Third, the coping strategies used, such as deep breathing techniques, positive affirmations, or taking a moment to calm down.

According to Lazarus and Folkman's (1984) theory, stress responses can be managed through two main approaches. Problem-focused coping is seen when cadets attempt to control the situation by focusing on instructions and work priorities. Emotion-focused coping is used when cadets calm themselves through deep breathing and positive affirmations. These results align with research showing that training in coping techniques can improve stress management skills in ATC(6).

Instructors also identified that stress occurs more frequently in cadets who are not materially prepared or lack training, as revealed by the lack of mastery of material and experience which can increase stress levels in air traffic control(7). Instructor reprimands or interventions, while intended to guide, can potentially increase stress when given during a simulation. Conversely, social support from peers and post-simulation briefings act as protective factors.

CLOSING

Conclusion

Based on observations, interviews, and documentation of five D3 Air Traffic cadets during the Air Traffic Control (ATC) simulation at the Surabaya Aviation Polytechnic, it can be concluded that cadets and instructors have their own ways of dealing with and managing stress that arises during the simulation. Cadets generally experience stress due to time pressure, the complexity of air traffic, and the fear of making mistakes under the supervision of instructors. Symptoms of stress that appear include physical signs (such as trembling hands and stuttering), psychological symptoms (nervousness and loss of focus), and coping behaviors (such as deep breathing, pauses, and positive affirmations). Instructors also play a role in helping cadets manage stress by providing technical guidance, motivation, and post-simulation evaluations. Although instructor intervention can sometimes increase stress during the simulation, their role remains crucial in the process of coaching and strengthening cadets' mental health. Support from colleagues is also

a contributing factor in reducing stress levels. Thus, stress management of cadets in ATC simulations at the Surabaya Aviation Polytechnic is carried out through a combination of personal strategies from cadets and coaching approaches from instructors, which need to be continuously developed systematically to support the performance and mental readiness of cadets in the real world of work.

Suggestions

Based on the conclusions, it is recommended that the Air Traffic Diploma 3 Study Program add stress management training to the Human Factors course, covering symptom recognition, coping techniques, breathing exercises, mindfulness, and simulations before cadets take the ATC simulation course. ATC simulation instructors are expected to provide material briefings, insert short breaks in busy scenarios, and conduct motivational debriefings without over-stressing, especially before the practical exam. Cadets are expected to apply stress management techniques such as deep breathing, positive affirmations, short breaks, group exercises, and utilize counseling services, both during the ATC simulation and in preparation for OJT. Furthermore, the Guidance and Counseling Unit needs to provide counseling services and stress management training, both individually and in groups, and conduct psychological assessments at least once per semester, with additional sessions before the practical exam.

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