

PSYCHOLOGICAL STRESS, COPING, AND PROFESSIONAL IDENTITY AMONG ATC CADETS IN INDONESIA

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Abstract: Air traffic control training requires rapid decision-making, precise communication, and continuous evaluation through simulation. This study explored stress experiences, coping strategies, and professional identity formation among cadets at an Indonesian aviation training institution. Ten cadets participated in semi-structured interviews and non-participant observations. Data were analysed using reflexive thematic analysis. Five themes were developed: simulation-induced evaluative stress; institutional hierarchy and emotional constriction; coping trajectories and peer-based regulation; gaps in psychological support; and fragile self-efficacy and professional identity. Stress arose from task complexity as well as surveillance, public evaluation, and social comparison. Adaptive coping included reframing, deliberate practice, breathing routines, and peer discussion. Learning-oriented instructor support strengthened confidence, whereas criticism without recovery opportunities reinforced self-doubt. ATC programmes should integrate psychologically safe debriefing, peer mentoring, coping-skills preparation, and confidential counselling pathways into technical training.

Keywords: air traffic control; coping strategies; professional identity; psychological stress; simulation training.

Introduction

Air traffic control (ATC) is a safety-critical field requiring sustained attention, rapid information processing, precise communication, and reliable decisions under time pressure. These demands begin during training, where cadets combine procedural knowledge with increasingly complex simulator scenarios. High-workload simulation is necessary for readiness, but it may also produce cognitive disruption and performance instability when task demands exceed available resources (Bernhardt et al., 2019; Hoika & Korecki, 2024). Recent studies have linked stress and fatigue with impaired radiotelephony, instruction timing, separation management, and situational awareness (Bai et al., 2024; Lu et al., 2026).

Fatigue may further intensify the psychological effects of demanding ATC tasks because it interacts with workload, situation awareness, and the strategies controllers use to manage traffic. Evidence from an operational tower context indicates that fatigue influences situational awareness and may alter control strategies, demonstrating that psychological strain is shaped by the interaction of task demands and the operator's functional state rather than by workload in isolation (Bongo & Seva, 2022).

Stress is not determined by workload alone. Recent evidence indicates that emotional context, team-based support, and the flexibility of organisational resources shape how demanding

ATC work is experienced and managed. Emotional distractions interact with workload at the cognitive level, while intra-functional flexibility and operational backup from colleagues can reduce the escalation of workload into job stress during high-demand operations (Alaydi et al., 2025a; Kuang et al., 2020; Lingelbach et al., 2023). Contemporary ATC studies similarly show that mindfulness, social support, role clarity, and structured occupational support can buffer workload and strengthen well-being or performance (Alaydi & Ng, 2024; Karagkouni et al., 2025). In training, however, resources are embedded within instructor relationships, peer networks, feedback practices, and norms concerning help-seeking.

The social context is particularly important because cadets are evaluated while still developing technical competence and a sense of professional belonging. Park (2025) found that anxiety among Korean military controllers was shaped by communication difficulty, skills hierarchy, informal coping, and institutional gaps. Research involving Indonesian aviation cadets has also connected anxiety, motivation, and self-efficacy with learning outcomes (Rochmawati et al., 2023). Nevertheless, ATC research remains dominated by licensed-controller workload, fatigue, and measurable performance, while qualitative evidence concerning how cadets interpret stress and incorporate it into an emerging professional identity remains limited (Papavasileiou et al., 2025).

This study addresses that gap by examining stress as a technical, evaluative, relational, and developmental experience among cadets trained in Indonesia. It asks: (1) How do cadets experience psychological stress during classroom, procedural, and simulator training? (2) What coping strategies do they use? and (3) How do training conditions and coping processes influence professional readiness and identity? The study does not advocate reducing the technical standards or performance demands of ATC training. Rather, it examines how a psychologically safe learning environment—where uncertainty can be reported, questions can be raised, and errors can be processed constructively as part of learning—may support the retention and application of training material, adaptive coping, and job readiness for safety-critical ATC practice.

Method

An exploratory qualitative design within an interpretivist orientation was used at a certified aviation training institution in Indonesia from May to June 2026. Purposive, open, and voluntary recruitment was conducted through a Google Form distributed by a research-team member to 48 eligible cadets. Seventeen volunteered, and recruitment closed after the tenth interview because the focused sample and detailed accounts provided sufficient information power for the study aim (Malterud et al., 2016). The final sample comprised six males and four females aged 18-22 years; seven were Indonesian and three were from Timor-Leste. Five participants had one semester of Aerodrome Control simulation exposure and five had four semesters of Approach Control exposure (Table 1).

Table 1. Participant Profile

Code	Gender	Age (years)	Training Stage	Simulation Exposure
P1	Male	18	Aerodrome Control	1 semester
P2	Female	19	Aerodrome Control	1 semester
P3	Male	20	Approach Control	4 semesters
P4	Female	18	Aerodrome Control	1 semester
P5	Male	20	Aerodrome Control	1 semester
P6	Male	21	Approach Control	4 semesters
P7	Female	22	Approach Control	4 semesters
P8	Male	21	Approach Control	4 semesters
P9	Male	22	Approach Control	4 semesters
P10	Female	18	Aerodrome Control	1 semester

Ten face-to-face semi-structured interviews, one per participant, lasted 45-60 minutes. Seven were conducted in Bahasa Indonesia and three bilingually in Bahasa Indonesia and English. Questions addressed stressful episodes, cognitive and emotional responses, coping, instructor and peer relationships, support access, and professional confidence. Twelve non-participant observations were completed: one theoretical class, one procedural session, and one simulator session for each participant. Each observation lasted 30-45 minutes and documented task difficulty, feedback, hesitation, communication disruption, withdrawal, peer assistance, and recovery after errors.

The principal investigator conducted the interviews and had 25 years of experience as an ATC instructor, experience in qualitative interviewing, and a concurrent role as an English lecturer. Because this professional position carried institutional authority that could influence recruitment and participants' willingness to disclose critical or uncomfortable experiences, several procedural safeguards were used. Recruitment was conducted by another research-team member through an open and voluntary Google Form rather than through direct invitation by the principal investigator. Participants were explicitly informed that participation, refusal, or withdrawal would have no academic consequences, and the principal investigator did not teach the participating cadets during the data-collection period. These measures were intended to reduce perceived coercion and role-related pressure, although they could not completely remove the influence of institutional hierarchy.

The principal investigator's professional familiarity with ATC training facilitated interpretation of technical terminology, simulation routines, and institutional practices, but the same familiarity could shape interview questioning, participants' disclosure, and subsequent interpretation of the data. Researcher positionality was therefore treated as an ongoing methodological consideration rather than as a source of influence that could be eliminated. Reflexive notes and analytic memos were used throughout data generation and analysis to examine how professional assumptions, prior experience, and institutional authority might shape interpretations. Interview accounts were also considered alongside observational field notes and discrepant cases, while discussions within the six-member research team were used to critically examine codes, extracts, candidate themes, and the thematic map. These discussions supported reflexive scrutiny rather than inter-rater agreement; final interpretive responsibility remained with the principal investigator (Berger, 2015; Braun & Clarke, 2019, 2021).

Transcripts, field notes, and memos were organised in NVivo 12 and analysed using reflexive thematic analysis (Braun & Clarke, 2019, 2021). The six-member team reviewed codes, extracts, candidate themes, and the thematic map; final interpretive decisions rested with the principal investigator. Credibility was supported through interview-observation comparison, discrepant cases, an audit trail, and reflexive memoing (Nowell et al., 2017). Transcripts and themes were not returned for member checking. Reporting followed relevant COREQ items (Tong et al., 2007). Ethical approval was granted by Politeknik Penerbangan Surabaya (UM.002/3/8/Poltekbang.Sby-2026; 4 May 2026). Written consent covered interviews, recording, observation, and anonymous quotation. Data are stored in password-protected university cloud storage accessible only to the principal investigator for 15 years.

Discussion

Five interrelated themes were developed (Table 2). Their relationships indicate that simulation demands and institutional climate shaped stress appraisal, which influenced coping and developmental outcomes; formal support could redirect this process toward learning and professional readiness (Figure 1).

Table 2. Themes and Participant Representation

Theme	Core Meaning	Participants Represented (n/N)
Simulation-induced evaluative stress	Anticipatory anxiety, public failure, cognitive disruption under observation	10/10
Institutional hierarchy and emotional constriction	Instructor authority, reluctance to clarify, shutdown after criticism	8/10
Coping trajectories and peer-based regulation	Reframing, practice, peer support, suppression, and avoidance	10/10
Gaps in institutional psychological support	Technical-only debriefing, unclear support, stigma, informal dependence	9/10
Fragile self-efficacy and professional identity	Mastery, validation dependence, responsibility, non-linear growth	7/10

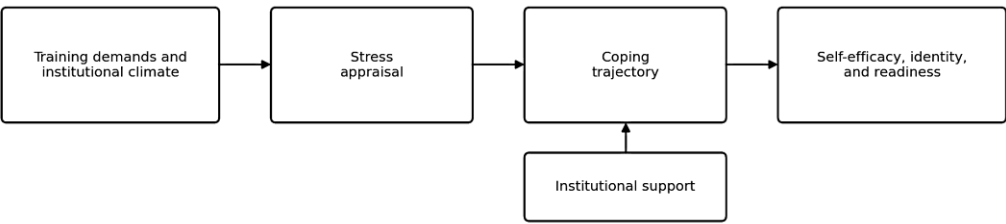


Figure 1. Interpretive Model Linking Training Demands, Coping, Support, and Professional Development

Simulation-Induced Evaluative Stress

All participants described simulation as the most demanding training context. Anxiety began before the headset was worn and intensified when traffic complexity, time pressure, instructor surveillance, and peer visibility converged. One senior cadet explained, “*I start monitoring myself instead of the aircraft. That is usually when I miss something simple.*” This pattern extends workload research by showing that technical demand was amplified by evaluative exposure. High-fidelity ATC studies have demonstrated performance degradation as workload and divided attention rise (Bernhardt et al., 2019), while simulator design deliberately increases pressure to prepare controllers for operational peaks (Hoika & Korecki, 2024). The present findings add that stress was appraised as more manageable when the learning purpose was explicit and a repeat attempt was available, consistent with the distinction between threat and challenge appraisal (Lazarus & Folkman, 1984).

Institutional Hierarchy and Emotional Constriction

Eight participants linked stress to a disciplined and hierarchical communication climate. Cadets accepted strict standards but hesitated to seek clarification when questions could be interpreted as incompetence. A junior cadet stated, “*Asking again felt like admitting I did not belong.*” Observations recorded delayed responses, silence, and reduced eye contact after some feedback episodes. The issue was not firmness itself: participants responded constructively when feedback was specific, behaviour-focused, and linked to improvement. The interaction between instructor and cadet should also be understood as a dyadic training process rather than as two independent experiences. Research in simulated and real flight training shows that student and instructor workload can vary together and that their interpersonal coordination changes as task demands increase. This suggests that instructor feedback, timing, and responsiveness may influence not only cadet emotions but also the coordination required for effective learning under pressure (van Weelden et al., 2025). Park (2025) similarly identified skills hierarchy, informal coping, and institutional gaps in a military ATC context. For high-reliability organisations, open

reporting and sensitivity to weak signals are central to safe performance (Biedermann et al., 2024); training cultures that suppress uncertainty may therefore conflict with the communication behaviours required in operational ATC.

Coping Trajectories and Peer-Based Regulation

Cadets combined adaptive and avoidant coping. Adaptive strategies included cognitive reframing, deliberate practice, breathing routines, journaling, and post-session reconstruction with peers. *"We replay the scenario together after class,"* one participant explained. Less experienced cadets more often described withdrawal, emotional suppression, and avoidance of voluntary practice. Experience supported change, but time alone was insufficient; mastery, peer modelling, and recoverable feedback helped transform coping. This socially distributed pattern aligns with evidence that mindfulness and workplace support buffer the negative effects of mental workload (Alaydi & Ng, 2024) and that social support contributes to lower stress and stronger performance in ATC settings (Alaydi et al., 2025b). Informal peer support was valuable but uneven, indicating the need for structured rather than accidental access to coping resources.

Gaps in Institutional Psychological Support

Nine participants perceived psychological preparation as less developed than technical instruction. Debriefing typically identified errors but did not consistently address emotional triggers, attentional recovery, or coping plans. A junior cadet reported, *"I leave knowing what was wrong, but not how to stop freezing when it happens again."* Participants were also uncertain about confidential counselling and described a norm of enduring pressure privately. Structured occupational systems, supervisor support, role clarity, and accessible resources are associated with stronger safety and well-being perceptions among controllers (Karagkouni et al., 2025). Organisational factors such as workload and workplace relationships also influence ATC performance (Hoika et al., 2025). Psychological support should therefore be integrated into routine readiness practices rather than presented as remediation for weak cadets.

Fragile Self-Efficacy and Professional Identity

Seven participants described a transition from merely passing assessments toward understanding responsibility for real aircraft and lives. Successfully managing a difficult scenario strengthened self-efficacy and professional belonging: *"At first, I thought this was just about passing tests. But now, I feel like I am becoming someone who actually has to manage real flights and lives."* However, confidence remained vulnerable when it depended heavily on instructor praise or peer comparison. This distinction is important: self-efficacy concerns perceived capability, whereas professional identity concerns an emerging sense of who one is becoming. ATC evidence links self-efficacy and psychological comfort with the effects of stress (Makara-Studzińska et al., 2021), while Indonesian aviation-cadet research shows that anxiety and self-efficacy are closely related to learning (Rochmawati et al., 2023). The findings suggest that identity develops non-linearly through mastery, reflection, feedback, and supported recovery from failure.

Implications for ATC Training

Technical rigour and psychological safety should be treated as complementary rather than competing priorities in ATC training. The findings suggest that psychological support can be embedded within existing training routines rather than introduced as a separate reduction in performance expectations. At the instructional level, structured pre-briefing can clarify scenario demands and available recovery opportunities, while learning-oriented debriefing can combine behaviour-specific technical feedback with reflection and action planning. At the programme level, explicit norms for reporting uncertainty, structured peer mentoring, accessible coping-skills

preparation, and clearly defined confidential support pathways can reduce reliance on informal or uneven sources of support. Table 3 translates these findings into an implementation-oriented framework by identifying the training problem, recommended intervention, responsible actor, implementation mechanism, and anticipated benefit. These recommendations should be interpreted as practice-informed implications derived from the qualitative findings rather than as interventions whose effectiveness was directly tested in this study.

Table 3. Implementation-Oriented Training Recommendations Derived from the Findings

Observed Problem	Recommended Intervention	Responsible Actor	Implementation Mechanism	Anticipated Benefit
Anticipatory anxiety before simulation	Structured pre-briefing	Simulator instructor	Before each simulator session, clarify learning objectives, expected difficulty, available support, and opportunities for recovery or repeat practice	Greater perceived control and more adaptive challenge appraisal
Shutdown after criticism or errors	Learning-oriented debriefing	Simulator instructor	After simulation, provide behaviour-specific technical feedback, allow brief reflection, invite the cadet's interpretation, and agree on a concrete improvement plan	Better processing of corrective feedback and recovery after errors
Reluctance to seek clarification	Explicit uncertainty-reporting norm	Instructors and programme coordinator	Consistently invite questions, normalise clarification, and reinforce early reporting of uncertainty during classroom, procedural, and simulator activities	Earlier identification of misunderstanding and reduced hesitation to clarify
Unequal access to peer support	Structured peer mentoring and reflection	Programme coordinator / designated faculty mentor	Pair or group cadets for scheduled post-session reflection and peer-supported reconstruction of challenging scenarios	More equitable access to coping resources and peer learning
Stigma or uncertainty regarding psychological support	Clearly defined confidential support pathway	Programme management and counselling/support unit	Provide a visible referral pathway, explain confidentiality procedures and applicable limits, and separate routine help-seeking from ordinary academic performance evaluation where institutionally and legally appropriate	Earlier and more acceptable help-seeking
Confidence dependent on instructor validation or peer comparison	Reflective professional-development portfolio	Cadet with academic adviser or designated instructor	Periodically document mastery experiences, feedback, coping responses, areas for development, and emerging professional values	More stable self-efficacy and reflective professional identity

The study is limited by its single-institution, cross-sectional design, voluntary participation, the authority associated with the principal investigator's instructor role, and the absence of participant checking. Observation and translation were also researcher-mediated. Findings therefore support contextual transferability rather than statistical generalisation. Longitudinal and multi-institution studies should test whether structured debriefing, peer mentoring, and psychological-readiness interventions improve coping, self-efficacy, and training performance.

Conclusion

ATC cadets experienced psychological stress through the interaction of simulator complexity, evaluative pressure, institutional hierarchy, peer visibility, and access to support. Coping appeared to develop from suppression and avoidance toward reframing, deliberate practice, and peer-based regulation when cadets experienced mastery, constructive feedback, and opportunities to recover from errors. Successfully managed pressure supported self-efficacy and an emerging professional identity, whereas criticism without adequate recovery opportunities could reinforce self-doubt. These findings indicate that psychological readiness should be integrated into, rather than separated from, technically rigorous ATC education. Programme administrators should establish clearly defined and confidential psychological-support pathways that are administratively separated from routine academic performance evaluation where institutionally and legally appropriate, with confidentiality procedures and applicable limits communicated transparently to cadets. Simulator instructors should also receive preparation in learning-oriented debriefing so that technically corrective feedback remains behaviour-specific while providing opportunities for reflection, attentional recovery, and concrete improvement planning. Together with structured pre-briefing, peer mentoring, and coping-skills preparation, these measures may strengthen the conditions under which cadets retain and apply training, develop more adaptive coping, and prepare for safety-critical professional practice without lowering technical performance standards.

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