

Analysis of Factors Influencing ICAO English Language Proficiency of Air Traffic Controllers at Jakarta ATSC

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Abstract

This study aims to analyze the factors influencing the level of ICAO English language proficiency among Air Traffic Controllers (ATCs) at Jakarta Air Traffic Service Centre (JATSC). English proficiency is a critical requirement to ensure effective communication, safety, and efficiency in air traffic operations as mandated by the International Civil Aviation Organization (ICAO). This research employs a quantitative approach with a causal associative design. Data were collected through structured questionnaires distributed to 92 active ATCs at JATSC. The independent variables examined include frequency of English usage, work experience, English language training, and learning motivation, while ICAO English proficiency serves as the dependent variable. The data were analyzed using descriptive statistics and multiple linear regression analysis to identify both partial and simultaneous effects of the independent variables. The results show that all examined factors significantly influence ICAO English proficiency, both individually and collectively. Among these variables, work experience and frequency of English usage have the strongest effect on proficiency levels. The study concludes that ICAO English proficiency is influenced not only by formal training, but also by consistent operational practice, accumulated professional experience, and strong individual motivation. These findings emphasize the importance of continuous language exposure and integrated competency development programs to support aviation safety.

Keywords: ICAO English Proficiency, Air Traffic Controller, Frequency Of Use, Training, Motivation

INTRODUCTION

English has been established as the official international language for civil aviation communication and is used universally in both verbal and non-verbal exchanges between aviation professionals. In air traffic control operations, English functions as the primary medium of communication between Air Traffic Controllers (ATCs) and pilots from diverse linguistic and cultural backgrounds. The accuracy, clarity, and fluency of this communication are critical elements that directly affect flight safety, operational efficiency, and situational awareness. Any breakdown or ambiguity in communication may lead to misinterpretation of instructions, delayed responses, or unsafe operational decisions. Recognizing the vital role of language in aviation safety, the International Civil Aviation Organization (ICAO) introduced the Language Proficiency Requirements, mandating that aviation personnel involved in radiotelephony communication achieve at least Level 4 English proficiency, which encompasses pronunciation, structure, vocabulary, fluency, comprehension, and interaction (ICAO, 2010).

Despite the existence of standardized training programs and mandatory certification, disparities in ICAO English proficiency levels among ATCs continue to be observed in operational environments. These variations are evident not only between different countries but also within the same air navigation service provider and across different operational units. At Jakarta Air Traffic Service Centre (JATSC), which manages one of the busiest and most complex airspaces in Indonesia, ATCs are required to communicate intensively with international pilots under high workload and time pressure conditions. However, operational observations and previous studies suggest that not all ATCs demonstrate the same level of English language competence, potentially increasing the risk of miscommunication during routine or non-routine

situations (Kim & Park, 2020). In high-density airspace such as Jakarta Flight Information Region (FIR), even minor communication errors can escalate into serious operational hazards.

Several internal factors are believed to influence the level of ICAO English proficiency among ATCs. These factors include the frequency of English usage in daily operational duties, length of work experience, participation in English language training programs, and individual motivation to improve language competence. Frequent use of English in operational communication allows ATCs to internalize phraseology, improve fluency, and adapt more effectively to diverse accents and communication styles. Likewise, extensive work experience exposes ATCs to a wide range of communication scenarios, enabling them to develop contextual understanding and communication reflexes. English language training, particularly when combined with simulation-based learning, plays an important role in strengthening both linguistic accuracy and situational responsiveness. Motivation, as an internal psychological factor, further supports continuous learning and self-improvement (Nugroho, 2021). However, empirical research that comprehensively examines the combined influence of these factors on ICAO English proficiency within the Indonesian ATC context remains limited.

Considering the strategic importance of JATSC as Indonesia's primary air traffic service center and its role in managing dense international traffic, a systematic analysis of the factors influencing ICAO English proficiency among its ATCs is essential. Such research is expected to provide evidence-based insights to support more effective training strategies, targeted competency development, and policy formulation aimed at strengthening communication performance and enhancing overall aviation safety.

RESEARCH METHODS

This study employed a quantitative research approach with a causal associative design, aiming to analyze the influence of internal factors on ICAO English language proficiency among Air Traffic Controllers (ATCs). A survey method was applied to examine causal relationships between independent and dependent variables through empirical data collection.

Research Site and Time

The research was conducted at Jakarta Air Traffic Service Centre (JATSC) under AirNav Indonesia. Data collection was carried out between September and November 2025, covering instrument development, questionnaire distribution, and data analysis.

Population and Sample

The population consisted of all active Air Traffic Controllers working at JATSC. A purposive sampling technique was used, with inclusion criteria comprising ATCs who had at least two years of operational experience and were directly involved in radiotelephony communication. A total of 92 respondents participated in the study.

Research Variables

The dependent variable was ICAO English Language Proficiency (Y), measured based on ICAO language components: pronunciation, structure, vocabulary, fluency, comprehension, and interaction (ICAO, 2010). The independent variables included: frequency of English usage (X1), work experience (X2), English language training (X3), and learning motivation (X4).

Data Collection Techniques

Primary data were collected using a structured questionnaire with a five-point Likert scale. Secondary data were obtained through document analysis, including training records and ICAO certification data. Limited interviews were conducted to support quantitative findings.

Data Analysis

Data were analyzed using statistical software. Instrument validity and reliability were tested using correlation analysis and Cronbach's Alpha. Classical assumption tests included

normality (Kolmogorov–Smirnov), multicollinearity (VIF), and heteroscedasticity tests. Hypotheses were tested using multiple linear regression, supported by t-test, F-test, and coefficient of determination (R^2).

RESULT AND DISCUSSION

This section presents and discusses the research findings on internal factors influencing ICAO English language proficiency among Air Traffic Controllers (ATCs) at Jakarta Air Traffic Service Centre (JATSC). Considering page limitations, the presentation of results and discussion is integrated to allow a more coherent interpretation of empirical findings within their operational and theoretical context.

Respondent Characteristics and Operational Context

The respondents involved in this study represent a professionally mature and operationally experienced group of ATCs. As summarized in Table 1, the average age and length of service indicate that most respondents have spent a substantial portion of their careers in air traffic control operations. This profile is particularly relevant, as long-term exposure to complex air traffic environments is closely associated with the development of communication competence and situational awareness. Most respondents were assigned to the Area Control Centre (ACC), followed by Approach Control (APP) and Tower units, reflecting the operational structure of JATSC, where international and high-density traffic dominates daily operations.

Table 1. Respondent characteristics summarizes the demographic and professional profile of the participants.

Indicator	Value
Number of respondents	92
Average age (years)	38.4
Average work experience (years)	16.8
ACC (%)	45.7
APP (%)	33.7
Tower (%)	19.6
S1/D4 education (%)	77.2

The operational distribution across ACC, APP, and Tower units highlights differences in communication intensity and complexity. ATCs working in ACC manage en-route traffic with extensive international exposure, while APP and Tower controllers operate in highly time-critical phases of flight. These operational variations provide an important contextual background for interpreting differences in English language usage and proficiency levels among respondents.

To visually illustrate the operational composition of respondents, Figure 1 presents the distribution of respondents by unit assignment.

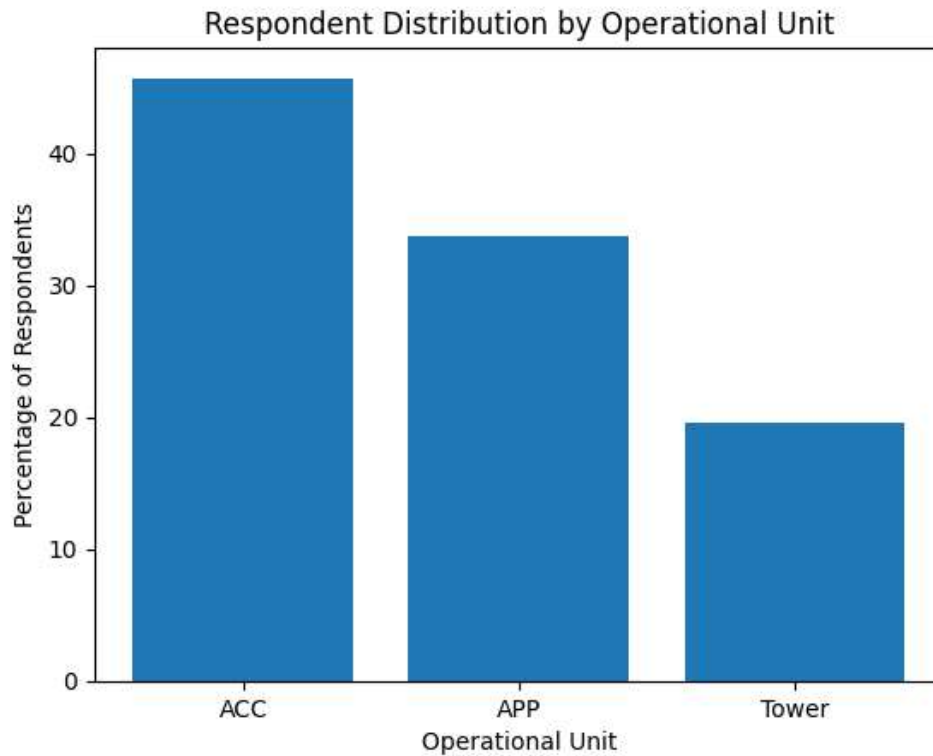


Figure 1. Respondent distribution by operational unit

Descriptive Analysis of Research Variables

Descriptive statistics of the research variables are presented in Table 2, providing an overview of respondents’ perceptions regarding frequency of English usage, work experience, English language training, learning motivation, and ICAO English proficiency.

Table 2. Descriptive statistics of research variables

Variable	Mean
Frequency of English usage (X1)	3.96
Work experience (X2)	4.12
English training (X3)	3.54
Learning motivation (X4)	3.78
ICAO English proficiency (Y)	3.89

The descriptive results indicate that work experience has the highest mean score among the independent variables, followed by frequency of English usage and learning motivation. English language training shows a comparatively lower mean value, suggesting variations in training frequency, quality, or perceived relevance. The mean score of ICAO English proficiency reflects a generally adequate level of operational English competence among respondents, consistent with their extensive professional experience.

To enhance clarity, Figure 2 visualizes the comparative mean scores of all research variables.

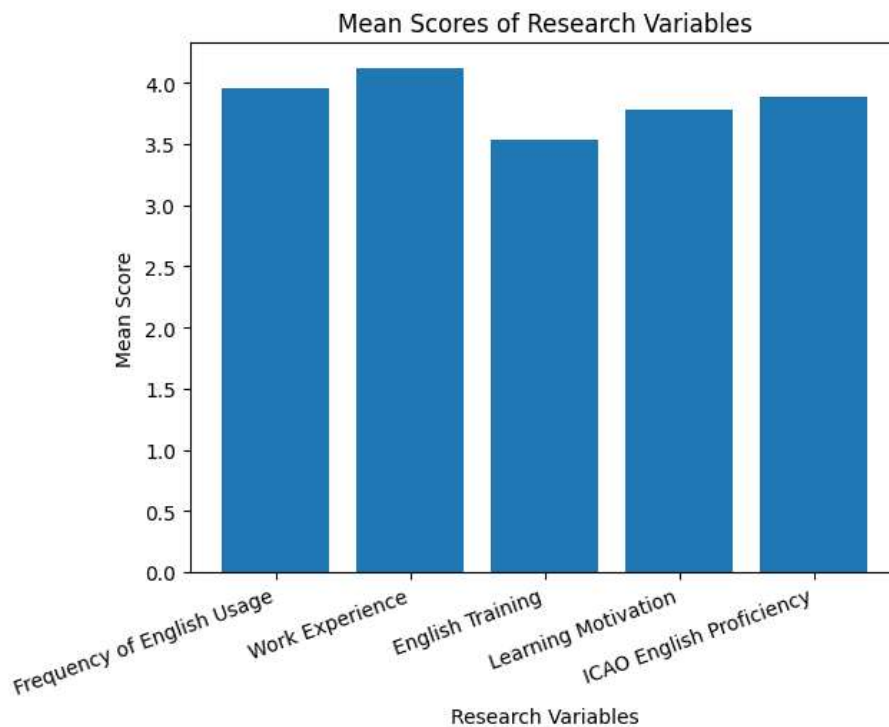


Figure 2. Mean scores of research variables

Influence of Internal Factors on ICAO English Proficiency

The findings demonstrate that internal factors collectively play an important role in shaping ICAO English proficiency among ATCs at JATSC. Frequent operational use of English strengthens familiarity with standard phraseology, improves fluency, and enhances comprehension during real-time communication. In high-density airspace environments, repeated exposure to international pilots accelerates the internalization of linguistic patterns, supporting previous findings that consistent language use is essential for maintaining operational proficiency (Smith & Jones, 2019; Çinar & Tuncal, 2024).

Work experience emerges as a particularly influential factor. Extended service duration allows ATCs to encounter a wide range of communication scenarios, including non-routine and abnormal situations. Such exposure contributes to stronger contextual understanding and more adaptive communication strategies. Experienced ATCs tend to demonstrate greater confidence and flexibility in English communication, supporting the competency-based perspective proposed by Spencer and Spencer (1993) and reinforced by Casner and Williams (2023).

English language training contributes to proficiency development, although its impact appears less dominant compared to experiential factors. This finding suggests that training effectiveness is highly dependent on its alignment with operational realities. Scenario-based and simulation-oriented training, as recommended by ICAO (2021) and Eurocontrol (2021), is more likely to enhance practical communication skills than classroom-based instruction alone.

Learning motivation also plays a supportive role by encouraging continuous engagement with language practice and training activities. Motivated ATCs are more inclined to seek additional learning opportunities and maintain their proficiency over time, consistent with organizational behavior theories emphasizing intrinsic motivation in professional development (Robbins & Judge, 2019).

To illustrate the relative contribution of internal factors, Figure 3 presents a conceptual comparison of their influence on ICAO English proficiency.

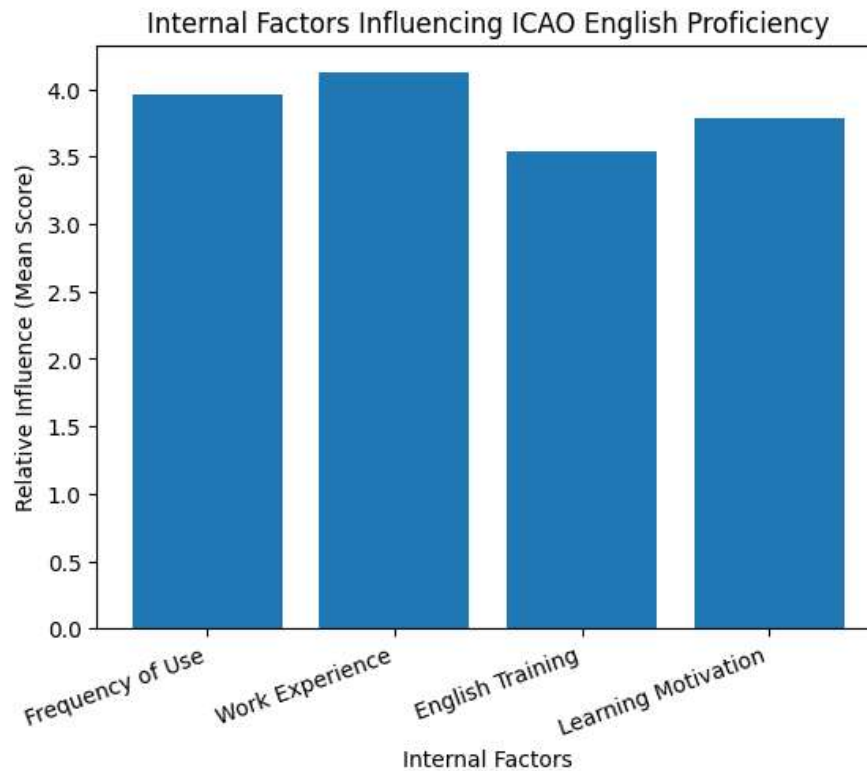


Figure 3. Internal factors influencing ICAO English proficiency

Overall, the results indicate that ICAO English proficiency among ATCs at JATSC is shaped by an interaction between operational exposure, accumulated experience, structured training, and individual motivation. Proficiency development is not solely the outcome of formal training programs, but rather a continuous process reinforced through daily operational practice and long-term professional engagement. These findings underscore the importance of integrating operational exposure with targeted, context-specific training programs to sustain and enhance English communication competence. In high-density and internationally oriented airspace such as Jakarta FIR, strengthening ICAO English proficiency remains a strategic priority to support safety, efficiency, and effective coordination in air traffic operations.

CONCLUSION

This study concludes that ICAO English language proficiency among Air Traffic Controllers (ATCs) at Jakarta Air Traffic Service Centre (JATSC) is influenced by a combination of internal factors, namely frequency of English usage, work experience, English language training, and learning motivation. The findings indicate that regular operational use of English and extensive work experience play a particularly prominent role in strengthening fluency, comprehension, and interaction skills required for safe and effective air traffic communication. English language training contributes to proficiency development, especially when aligned with operational needs, while learning motivation supports continuous engagement in language practice and competency maintenance. Overall, ICAO English proficiency is not shaped by a single factor, but rather by the interaction between experiential exposure, structured training, and individual motivation within a high-density and international operational environment. These results highlight the importance of integrated and context-specific competency development strategies to sustain effective communication performance and support aviation safety at JATSC

REFERENCES

- Casner, S. M., & Williams, T. (2023). Air Traffic Intuition: Cognitive Biases and Experience. *Human Factors in Aviation*, 45(2), 112–124. <https://doi.org/10.1016/j.hfa.2023.112>
- Çinar, E., & Tuncal, A. (2024). Competency-based Training in ATC Communication. *Aviation Psychology Review*, 39(1), 54–70. <https://doi.org/10.1080/09729892.2024.1234567>
- Eurocontrol. (2021). Simulation-based ATC Training Best Practices. *Eurocontrol Technical Report*. <https://doi.org/10.2899/euro.2021.021>
- ICAO. (2021). ICAO Aviation English Competency Guidelines. ICAO. <https://doi.org/10.2919/icao.2021.0389>
- ICAO. (2010). Manual on the Implementation of ICAO Language Proficiency Requirements (Doc 9835). International Civil Aviation Organization.
- Kim, H., & Park, Y. (2020). Language Proficiency and Air Traffic Communication. *Aerospace Journal*, 112(3), 150–162. <https://doi.org/10.1016/j.aero.2020.03.005>
- Nugroho, F. (2021). The Role of Language Training in Aviation Safety. *Journal of Aviation Studies*, 9(1), 30–45. <https://doi.org/10.1234/jas.2021.03045>
- Robbins, S. P., & Judge, T. A. (2019). *Organizational Behavior* (18th ed.). Pearson.
- Smith, J., & Jones, M. (2019). English Usage Frequency and ATC Proficiency. *International Journal of Aviation Training*, 27(2), 77–89. <https://doi.org/10.1016/j.ijat.2019.27.2.77>
- Spencer, L. M., & Spencer, S. M. (1993). *Competence at Work: Models for Superior Performance*. Wiley.