

Aviation Communication Practices and Challenges Among Malaysian Air Traffic Controllers

Nur Zafirah Razali¹, Veronica Petrus Atin¹

¹ Centre for the Promotion of Knowledge and Language Learning, Universiti Malaysia Sabah, Malaysia

Correspondence: Nur Zafirah Razali, Centre for the Promotion of Knowledge and Language Learning, Universiti Malaysia Sabah, Malaysia.

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Abstract

English functions as the international language of aviation and plays a critical role in ensuring safe communication between air traffic controllers (ATCs) and pilots. While aviation communication is governed by standardised phraseology, non-routine situations often require the use of spontaneous plain English, particularly in multilingual operational environments. This qualitative study explores communication practices and challenges among Malaysian ATCs in operational aviation contexts. Semi-structured interviews were conducted with eight licensed Malaysian ATCs, and the data were analysed thematically. The findings indicate that routine aviation communication is highly structured and role-dependent, relying heavily on standard phraseology to maintain operational clarity and efficiency. However, non-routine situations require controllers to adapt their language use beyond fixed phraseology. Accent intelligibility emerged as a major communication challenge, particularly in interactions with international pilots, where pronunciation differences occasionally contributed to misunderstandings and increased cognitive demands. The findings also highlight the importance of collaborative repair strategies, including repetition, clarification, and readback verification, in maintaining communication safety. This study provides context-specific insights into how Malaysian ATCs manage multilingual operational communication in safety-critical environments and highlights the importance of intelligibility and adaptive communication practices in aviation English.

Keywords: aviation English, air traffic controllers, aviation communication, multilingual aviation environments, Malaysia

1. Introduction

Effective communication between air traffic controllers (ATCs) and pilots has been widely recognised as a cornerstone of aviation safety and operational efficiency. In safety-critical environments such as air traffic control, communication breakdowns have repeatedly been identified as contributing factors to incidents and operational disruptions (Alharasees et al., 2023). Given the transnational nature of aviation, the International Civil Aviation Organization (ICAO) has established English as the standardised language for international air-to-ground and ground-to-ground communication. As the aviation industry expands on a global scale, regulatory bodies such as the Federal Aviation Administration (FAA) require pilots and ATCs to be proficient in English, and the International Civil Aviation Organization ICAO requires aviation personnel engaged in international operations to demonstrate adequate English proficiency and to use a dialect or accent that is intelligible to the aeronautical community (Hamzah, 2021).

A central feature of aviation discourse is the distinction between standardised phraseology and plain English. Standard phraseology consists of fixed, regulated expressions designed to minimise ambiguity during routine operations (Yıldız, 2024). However, operational communication frequently extends beyond predictable exchanges. While standardised phraseology and clear communication in aviation are designed to mitigate potential communication breakdowns, such precautions depend on a minimum degree of language proficiency (Kanki et al., 2010). Non-routine situations such as unexpected weather conditions, equipment malfunctions, medical emergencies, or pilot deviations require controllers to move beyond formulaic language and engage in spontaneous plain English interaction. Unlike phraseology, plain English introduces variability in lexical choice, syntactic structure, pronunciation, and interactional style. This highlights the importance of adaptive and context-sensitive English use, particularly in relation to pragmatic effectiveness and intelligibility in multilingual communication settings.

The dynamics of aviation English operating at the intersection of controlled linguistic systems and context-sensitive language use are particularly significant in multilingual contexts such as Malaysia. Malaysian ATCs operate in a linguistically diverse environment, interacting with pilots from varied first-language backgrounds while using English as the mandated operational medium. Although Malay functions as the national language, English remains the lingua franca of aviation communication; hence, this professional reliance on English requires ATCs to navigate accent variation, differing discourse conventions, and varying levels of English proficiency among interlocutors. Within this multilingual ecology, communication challenges may arise not only from grammatical or lexical limitations, but also from issues of intelligibility, pragmatic interpretation, and interactional alignment. In this context, understanding how communication is enacted in real-time aviation environments becomes critical.

Despite growing scholarly interest in aviation English, existing research has often focused on language testing, training models, and the validation of ICAO proficiency scales (e.g., Kim & Elder, 2014; Yin et al., 2024; Treadaway & Read, 2025). While studies have also examined communication breakdowns and operational discourse in aviation contexts (Hamzah et al., 2023; Wang et al., 2024), comparatively fewer studies have examined the lived communicative experiences of ATCs in operational contexts, particularly within multilingual environments. In Southeast Asia, and Malaysia specifically, research exploring Malaysian ATCs' communication practices and challenges remains relatively limited. As a result, there is limited understanding of how English is negotiated, adapted, and managed in real-time operational contexts within Malaysia's multilingual environment.

Addressing this gap contributes to applied linguistics in several ways. First, it advances understanding of English as a lingua franca in high-stakes professional domains. Next, it sheds light on how English is negotiated and performed under cognitive and operational constraints in safety-critical environments. Finally, it provides context-sensitive insights that may inform language training, assessment, and professional development for aviation personnel in multilingual settings. In this regard, the current study aims to explore communication practices and language-related challenges experienced by Malaysian ATCs in operational aviation environments, drawing on their professional experiences in routine and non-routine aviation contexts. The study was guided by the following research objectives:

1. To examine the communication practices of Malaysian air traffic controllers in operational aviation contexts
2. To explore communication challenges and communication management strategies encountered during routine and non-routine operations

From an applied linguistics viewpoint, this study examines how English is used and negotiated in real-world aviation communication, with particular attention to intelligibility, interaction, and operational effectiveness as opposed to native-like accuracy. By foregrounding the perspectives of Malaysian ATCs, this study seeks to contribute to the broader discourse on professional English use, multilingualism, and language practices in safety-critical environments. Although English is the mandated language of aviation communication, which serves as the lingua franca, interactions typically occur among speakers from diverse linguistic backgrounds. As such, communication is likely shaped by variations in pronunciation, accent, and discourse patterns rather than by language switching per se.

2. Literature Review

This section reviews key literature on aviation language policy and proficiency standards, operational aviation communication practices, and communication challenges in multilingual aviation contexts. Existing research in the Malaysian context is also highlighted in this section to establish the gap addressed by the present study.

2.1 ICAO Language Policy and Proficiency Standards

The International Civil Aviation Organisation (ICAO) mandates the use of English for international aeronautical radiotelephony communication and introduced the ICAO Language Proficiency Requirements (LPRs) in 2003 based on the recognition that language proficiency is critical for effective air-ground communication (ICAO, 2004). The ICAO LPRs require pilots and air traffic controllers (ATCs) to demonstrate operational proficiency in the language used for aviation communication, with Level 4 designated as the minimum acceptable operational standard (ICAO, 2010). This framework was introduced to reduce language-related risks and standardise communication across multilingual aviation environments, requiring aviation personnel to demonstrate adequate communicative competence in the operational language of aviation (Alderson, 2009).

Despite the establishment of these proficiency requirements, research suggests that meeting the minimum ICAO operational level does not necessarily guarantee effective communication in real operational settings. Miscommunication may still occur among licensed pilots and controllers who meet the required proficiency threshold (Kale et al., 2021; Kim, 2023). This highlights a gap between regulatory proficiency standards and the realities of operational communication, particularly in multilingual contexts where intelligibility and rapid interpretation are critical. In practice, aviation personnel must often engage in context-sensitive communication that extends beyond what is captured in standardised language assessment frameworks.

2.2 Operational Aviation Communication: Phraseology and Plain English

Aviation communication operates through two complementary systems, namely, standard phraseology and plain English. Standard phraseology consists of fixed and codified expressions designed to ensure clarity, brevity, and predictability during routine operations. In contrast, plain English refers to non-standardised language used when phraseology alone is insufficient for effective communication (Kim & Elder, 2009).

Routine aviation communication is highly structured and governed by established procedures. Interactions typically follow a predictable communication sequence involving transmission, instruction, and readback confirmation (Mackay & Mountford, 1978). Controllers generally initiate transmissions and provide operational instructions, while pilots confirm information through readback procedures (Morrow et al., 1993). Such communication structures are designed to minimise ambiguity and maintain operational safety.

However, aviation operations are inherently dynamic, and non-routine situations may require aviation personnel to move beyond fixed phraseology. Situations involving severe weather, technical malfunctions, medical emergencies, or unexpected operational disruptions often require the use of spontaneous plain English communication (Hamzah et al., 2023; Zhao, 2024). Unlike phraseology, plain English introduces greater variability in vocabulary, pronunciation, syntactic structure, and discourse style, increasing the potential for

misunderstanding.

Although plain English plays an important role in facilitating communication during non-routine situations, ICAO continues to emphasise that standard phraseology should remain the primary mode of radiotelephony communication whenever applicable (ICAO, 2004). The relationship between phraseology and plain English therefore reflects the need to balance standardisation with communicative flexibility in operational aviation environments.

2.3 Communication Challenges in Multilingual Aviation Contexts

Although English serves as the lingua franca of aviation for both air traffic controllers (ATCs) and pilots from diverse linguistic backgrounds, communication in real operational environments remains highly complex, even with the ICAO phraseology. In multilingual aviation settings, such as during emergencies, severe weather conditions, or unexpected operational situations, ATCs and pilots often need to rely on spontaneous plain English communication to maintain operational safety and mutual understanding (Kim, 2018). Research suggests that communication difficulties are more likely to occur among non-native English-speaking personnel, where varying levels of proficiency, accent variation, and non-standard phraseology may affect communication clarity and operational efficiency (Alharasees et al., 2023; Kale et al., 2021). Since English is not the first language of many aviation personnel, communication challenges may arise not only from linguistic limitations but also from differences in pronunciation and interactional patterns.

Previous studies have identified accent intelligibility, pronunciation differences, vocabulary limitations, and pragmatic misalignment as important contributors to aviation miscommunication (Moder, 2012; Estival et al., 2016). Prinzo et al. (2008), for example, reported that many communication problems involving foreign-registered aircraft were associated with pronunciation, fluency, and comprehension difficulties among non-native English-speaking pilots. Similarly, Alketbi and Sipos (2025) highlighted how accent variation, listening demands, and emotional stress may affect communication clarity in high-pressure operational environments. Research further suggests that even pilots and controllers who satisfy ICAO Operational Level 4 requirements may still experience difficulties managing rapid speech delivery, unfamiliar accents, and unexpected phraseology under high-workload conditions (Kim, 2018; Kim & Billington, 2018). Kim and Billington (2018), in particular, noted that first-language-influenced pronunciation and unfamiliar accent patterns may reduce intelligibility during pilot-controller radiotelephony communication. These findings indicate that communication breakdowns in aviation are influenced not only by grammatical competence but also by multilingual interaction, operational pressure, and real-time processing demands in safety-critical contexts.

These communication challenges become evident in multilingual regions such as Southeast Asia, where English functions as a shared operational language among speakers from diverse linguistic and cultural backgrounds. In such contexts, communication extends beyond the use of standard phraseology alone, as differences in pronunciation, accent, and communicative style may influence message interpretation, especially during fast-paced operational situations. Kim and Elder (2009), in their study on Korean aviation personnel, found that unfamiliar accents and pronunciation differences reduced intelligibility during radiotelephony exchanges, particularly when communication extended beyond routine phraseology. Likewise, Tiewtrakul and Fletcher (2010), in their study at Bangkok International Airport, reported that regional accent variation and rapid speech delivery frequently created difficulties in understanding air-ground transmissions. Thus, maintaining mutual understanding in multilingual aviation environments often requires aviation personnel to adapt communicative strategies and negotiate meaning under operational pressure.

Previous studies in Malaysia have similarly highlighted communication challenges experienced by aviation personnel operating in multilingual environments. Hamzah et al. (2023), in a study involving Malaysian pilots and ATCs, found that English proficiency, non-standard phraseology use, and linguistic diversity contributed to misunderstandings and reduced communication efficiency. Communication challenges were reported to be more apparent during emergencies and non-routine operational situations where aviation personnel needed to rely on spontaneous plain English interaction. As in many other international aviation contexts, aviation communication in Malaysia increasingly involves intercultural interaction among speakers who do not share a common first language (Hamzah et al., 2022, 2023). Consequently, effective communication depends not only on familiarity with standard phraseology but also on the ability to communicate intelligibly and adaptively in dynamic operational environments.

2.4 Research Gap

These multilingual communication challenges are particularly significant in Malaysia due to the country's linguistically diverse environment and its strategic position within international aviation routes in Southeast Asia. Malaysian ATCs operate in a setting where communication involves interactions with pilots from diverse linguistic and cultural backgrounds, while also navigating a multilingual local environment shaped by Malay, Chinese, Indian, and other indigenous languages or dialects. While ICAO phraseology provides an essential communicative framework, previous studies suggest that effective aviation communication extends beyond phraseology mastery alone, particularly in relation to listening comprehension, accent intelligibility, and spontaneous plain English use (Kim & Elder, 2009; Estival et al., 2016; Kanki et al., 2019; Hamzah et al., 2023; Alketbi & Sipos, 2025).

Within this context, existing research on aviation English has often focused on ICAO language proficiency requirements, training, and general communication challenges among pilots and ATCs in international settings. Meanwhile, in Malaysia, studies have examined areas such as aviation English materials development (Paramasivam, 2013), communicative discourse (Hamzah & Fei, 2018), and communication challenges and training needs among aviation personnel (Hamzah et al., 2023). Although ATC communication has been widely studied internationally, recent research involving Malaysian ATCs has focused on a relatively limited range of topics, such as their

well-being at the workplace (Tharikh & Hamzah, 2020), decision-making practices during conflict resolution (Anthony & Ahmad, 2021), clarity and pronunciation in pilot-controller communication (Hamzah, 2021), and aviation communication challenges and language training development (Hamzah et al., 2022). There remains relatively limited research exploring the real-world communication practices of Malaysian ATCs in operational multilingual environments, such as how they manage spontaneous plain English interactions, accent diversity, and intercultural communication during non-routine situations. This highlights the need for context-specific research to better understand the communicative realities and challenges experienced by Malaysian ATCs in operational settings.

3. Method

This study employed a qualitative approach to examine communication practices and challenges among Malaysian air traffic controllers (ATCs). Data were collected through semi-structured interviews with licensed ATCs in East Malaysia and analysed thematically to identify recurring patterns in participants' communication experiences.

3.1 Research Design

The qualitative research design employed in this study is grounded in an interpretivist paradigm. Interpretivism views social reality as constructed through individuals' experiences and interpretations, making it suitable for examining participants' perspectives within specific contexts (Ryan, 2018; Alharahsheh & Pius, 2020). Given the study's focus on real-world operational communication, a qualitative approach enables in-depth exploration of ATCs' lived experiences and professional insights. Semi-structured interviews were employed as the primary data collection method, as they provide a flexible yet structured format for eliciting detailed accounts of participants' communication practices, perceived challenges, and the contextual factors shaping aviation communication (Kallio et al., 2016; DeJonckheere & Vaughn, 2019). This approach is well suited to addressing the research objectives of examining communication practices and challenges of Malaysian ATCs in operational aviation contexts.

3.2 Participants

Participants were recruited using purposive sampling to ensure the selection of individuals with relevant professional experience in air traffic control operations. A total of eight licensed Malaysian ATCs participated in the study. All participants held active licenses and had a minimum of three years of operational experience in either Control Tower or Area Control Centre (ACC) environments, ensuring sufficient exposure to both routine and non-routine communication scenarios. At the time of the study, all participants were actively engaged in operational duties.

Prior to the main data collection, two pilot interviews were conducted online to test the clarity and relevance of the interview protocol. As the purpose of the pilot phase was to refine the interview questions rather than to generate primary data, an online format was considered sufficient. These pilot interviews were not included in the final analysis. Following minor revisions, eight participants were interviewed in person at air traffic control facilities in East Malaysia to allow for richer interaction and more context-sensitive data collection, thus ensuring data quality.

To protect confidentiality, all participant identities were anonymised in the transcripts and reporting. The sample size ($n = 8$) was considered sufficient based on the principle of information power, whereby a smaller number of participants can provide adequate data when the study has a specific aim, a relatively homogeneous sample, and in-depth qualitative data (Malterud et al., 2016). The relative homogeneity of the participant group strengthened the relevance of the data obtained, as all participants operated within a highly regulated professional environment governed by common aviation training standards and standardised ICAO phraseology. This provided a consistent basis for examining their aviation communication practices and challenges, while differences in operational ratings and years of experience contributed additional variation to participants' perspectives. In this study, the participants' expertise enabled the researchers to identify recurring patterns in their communication experiences. The profiles of the participants are shown in Table 1.

Table 1. Participant Profile

Participant	Gender	Years of Service	Operational Rating(s)
ATC 1	Female	6-9 years	Area Control (Procedural/Surveillance)
ATC 2	Male	≥ 10 years	Area Control (Procedural/Surveillance)
ATC 3	Female	6-9 years	Aerodrome Control; Flight Information Services; Aeronautical Information Services
ATC 4	Male	3-5 years	Aerodrome Control; Flight Information Services; Aeronautical Information Services
ATC 5	Female	6-9 years	Area Planner; Area Radar
ATC 6	Female	3-5 years	Area Planner; Area Radar
ATC 7	Male	6-9 years	Aerodrome; Area Planner; Area Radar; Approach Control (Procedural/Radar)
ATC 8	Female	≥ 10 years	Aerodrome Control; Area Radar

Note: The operational ratings represent the professional qualifications held by the participants and reflect the range of operational functions they were certified to perform within Malaysian air traffic control services.

3.3 Data Collection Procedures

Data were collected from semi-structured interviews at two air traffic control centres in East Malaysia. The interviews lasted

approximately 60 to 75 minutes and were conducted in English. With participants' consent, all interviews were audio-recorded and subsequently transcribed verbatim to ensure accuracy of the data.

The interview protocol consisted of open-ended questions designed to encourage participants to reflect on their communication experiences in operational contexts. Informed by the research objectives, the questions explored several key areas, including participants' communication practices in daily operations, challenges encountered when interacting with pilots and fellow controllers, perceptions of communication clarity and breakdown, and contextual factors that may influence communication such as accent variation, workload, and cultural differences among pilots.

The semi-structured format allowed the researcher to ask follow-up questions and probes where necessary, enabling participants to elaborate on specific incidents or experiences. In addition to audio recordings, field notes were taken during and immediately after interviews to document contextual observations and preliminary reflections.

3.4 Data Analysis

The interview data were analysed using thematic analysis, which enables the identification, organisation, and interpretation of patterns within qualitative data (Braun & Clarke, 2006). An inductive and data-driven approach was adopted to allow themes to emerge from participants' accounts of their communication experiences.

First, the researchers familiarised themselves with the interview transcripts through repeated reading to gain a comprehensive understanding of participants' narratives while recording initial observations and reflections. The transcripts were then coded line-by-line to identify meaningful units of data related to communication practices and operational challenges. Codes were generated inductively to capture various aspects, including accent intelligibility, non-routine communication, clarification strategies, and situational stress during complex operational scenarios.

Subsequently, related codes were grouped into broader categories to identify recurring patterns across participants' responses. For example, codes associated with pronunciation and speech clarity were grouped under communication barriers, while codes related to repetition and clarification requests were categorised as strategies for managing communication difficulties. The categories were then refined into themes aligned with the research objectives. These themes were reviewed and compared across transcripts to ensure consistency and accurate representation of the data. Finally, the themes were interpreted and reported using supporting excerpts from participants' responses to preserve contextual richness and transparency. To illustrate the analytical progression from participants' responses to themes, selected examples of the coding process are presented in Table 2, which depicts how data excerpts were assigned initial codes, grouped into sub-themes, and subsequently developed into main themes.

Table 2. Exemplary Coding Process of Theme Development

Quote Fragment	Initial Code	Sub-Theme	Main Theme
"For us, for aerodrome controllers, we directly speak to the pilot on the frequency..." (ATC 3)	Direct communication with pilots	Role-specific communication practices	Structured and Role-Dependent Communication Practices
"Because we have this technical English. We can't simply use normal English with them." (ATC 7)	Use of technical aviation English	Specialised language requirements	Structured and Role-Dependent Communication Practices
"The American pilots... they don't really understand our accent. I don't think it's a language barrier. It's just the accent." (ATC 5)	Difficulty understanding Malaysian accent	Accent-related intelligibility difficulties	Accent Intelligibility as a Primary Communication Challenge
"I told him (pilot) to turn on heading two four zero; he misunderstood that I told him to descend the flight level to four zero." (ATC 1)	Misinterpretation of ATC instruction	Instructional ambiguity and misunderstanding	Miscommunication Risks and Safety Implications
"Sometimes pilots couldn't read me, then they will have to say <i>again</i> ." (ATC 6)	ATC requesting repetition	Repetition and clarification	Collaborative Repair Strategies and Distributed Communication
"The transmission is recorded instantly. We will play the recording... so we can listen to it together and try to translate (the transmission)." (ATC 5)	Joint replay and interpretation of recorded transmission	Collaborative interpretation and peer consultation	Collaborative Repair Strategies and Distributed Communication
"I had to translate that on the spot with whatever English that I know... in abnormal situations and emergencies." (ATC 1)	Spontaneous English use during emergencies	Plain English adaptation in non-routine situations	Plain English and Non-Routine Operational Scenarios

Based on the examples in Table 2, the iterative nature of the thematic analysis allowed for conceptually related codes to be compared across transcripts and further consolidated into broader patterns of meaning. Furthermore, in the present study, NVivo 15 qualitative data analysis software was used to support systematic data organisation, coding, and theme development throughout the analysis process (Paulus et al., 2017).

3.5 Trustworthiness and Ethical Considerations

Several strategies were employed to enhance the trustworthiness of the findings. First, all interview recordings were transcribed verbatim to support the accuracy of the data. The transcripts were reviewed repeatedly during the coding process to ensure that interpretations remained grounded in participants' original accounts. Second, an audit trail was maintained throughout the research process, documenting coding decisions, category development, and theme refinement to enhance transparency and dependability. Finally, the inclusion of detailed participant quotations in the findings provides further credibility by allowing readers to evaluate how interpretations were derived from the data.

Ethical considerations were carefully observed throughout the study. Participants were informed of the research purpose and provided voluntary consent prior to participation. They were assured of confidentiality, and all identifiable details were removed during transcription. Pseudonyms or codes were also used to protect participants' identities. Overall, trustworthiness was addressed through credibility (verbatim transcription and use of participant quotations), dependability (audit trail), and confirmability (transparent documentation of the analytical process).

4. Results and Discussion

The thematic analysis revealed five major patterns characterising communication practices and challenges among Malaysian ATCs: (1) structured and role-dependent communication practices, (2) accent intelligibility as a primary communication challenge, (3) miscommunication risks and safety implications, (4) collaborative repair strategies in managing communication breakdown, and (5) the role of plain English in non-routine operational scenarios.

4.1 Structured and Role-Dependent Communication Practices

The findings indicate that communication practices among Malaysian ATCs are highly role-dependent and structured by operational position. Participants consistently explained that the nature of communication differs depending on whether they are working as planners, radar controllers, aerodrome controllers, or flight information service (FIS) officers. Planner positions primarily involve coordination with adjacent control units and internal ATC personnel, whereas radar and tower controllers engage directly with pilots via radio frequency or transmissions.

"If I'm working as a planner, most of the communication will be with ATCs from other regions... If I'm working as a radar controller, then my communication will mainly be with the pilots and with my planner. I wouldn't be talking with the ATCs as much as the planner does. That's the difference in the approach of communication." (ATC 1)

"For us, for aerodrome controllers, we directly speak to the pilot on the frequency... startup clearance, pushback clearance, taxi clearance, departure clearance..." (ATC 3)

"Basically, for flight information services, we don't provide active separation. Whenever we know the aircraft (e.g., helicopter) is within close vicinity with each other, we give them traffic information so that the pilots can communicate with each other in order for them to stay separated." (ATC 2)

Across all roles, communication remains governed by standardised aviation phraseology, which participants described as a form of technical English that is distinct from everyday conversational English. In this setting, communication on the radio is "set in stone," reflecting the procedural rigidity required for safety in aviation environments. Therefore, routine communication is highly structured, concise, and clearance-oriented, focusing primarily on aircraft movement, separation, weather updates, and traffic information.

"When we talk about English in air traffic control, we're not talking about the English we spoke. Because we have this technical English. We can't simply use normal English with them." (ATC 7)

"There are standard procedures that we have to follow. Standard procedures means that they are already legally written that we have to follow every time we communicate with the pilots." (ATC 8)

"But other than that, if it's on the radio, it's set in stone. You have to follow it." (ATC 7)

These findings reinforce existing research that positions aviation English or standard phraseology as a restricted linguistic register designed to minimise ambiguity and ensure operational efficiency (Zhao, 2023). At the same time, they highlight that communication practices are not uniform, but shaped by operational roles and system design, reflecting a socio-technical organisation of communication in operational environments. This shows that most routine communications are governed by phraseology, which makes them predictable, structured, and clearance-oriented.

From an applied linguistics perspective, the findings suggest that aviation communication is not merely a matter of linguistic proficiency, but a form of situated professional discourse shaped by institutional norms, operational roles, and interactional expectations. The heavy reliance on standard phraseology reflects the characteristics of English for Specific Purposes (ESP), where language use is highly contextualised within a specialised professional community. In this sense, routine controller-pilot interactions can be understood as institutional discourse practices that prioritise precision, predictability, and communicative efficiency in safety-critical settings. This further supports recent studies in which aviation English is regarded as a specialised lingua franca governed by operational purposes and collaborative task performance rather than everyday conversational norms (Kim, 2026; Pacheco et al., 2023).

4.2 Accent Intelligibility as a Primary Communication Challenge

Accent intelligibility emerged as the most prominent communication challenge faced by Malaysian ATCs, especially in situations involving international pilots. Participants consistently reported that difficulties in understanding international pilots, and vice versa, were primarily related to pronunciation differences rather than grammatical or lexical issues. A wide range of accents, including American, French, Russian, Japanese, and Korean, were cited as sources of comprehension difficulty. Participants also observed lexical and stylistic differences between pilots trained under ICAO versus FAA systems. For example, American pilots were noted to use terms such as “course” instead of “track.” Speech rate and assertiveness were also mentioned as distinguishing characteristics in communication.

“French, sometimes they could understand you. For us to understand them, very hard.” (ATC 7)

“Sometimes during the midnight shift... we have United Airlines. The American pilots... they don’t really understand our accent. I don’t think it’s a language barrier. It’s just the accent.” (ATC 5)

“For Japanese airlines, there will be some differences in pronunciation.” (ATC 7)

“United is one airline where they (pilots) speak quite fast, and their assertive words could be different from other pilots. If there’s any deviation, usually they will request for how many miles right of *track* to define that they are moving out of the airways... but for United, they prefer to use *course*.” (ATC 1)

“Everybody else uses ICAO’s terminology, but Americans use FAA. Unless you are used to FAA’s standard, then it’s easy to see the difference.” (ATC 4)

While local pilots posed minimal communication difficulty, international pilots occasionally required repetition or clarification. Some participants also perceived differences in tone or attitude, suggesting that sociolinguistic factors may influence communication dynamics beyond pure linguistic comprehension. This suggests that intelligibility, rather than grammatical competence, constitutes the primary communicative constraint in operational aviation contexts. Participants reported that these difficulties were especially pronounced during night shifts or when dealing with long-haul pilots who might also be fatigued. In addition, inter-unit coordination with neighbouring countries occasionally resulted in misunderstanding due to differences in pronunciation or linguistic structuring of requests.

“American pilots... they flew from San Francisco to Singapore for 18 hours. By the time they arrived at our airspace, they’ve already flown for, I think, around 15 hours, 16 hours. Can you imagine?” (ATC 5)

“We coordinate with Jakarta and Singapore. Singapore is mostly English, so it’s understandable. But Jakarta, in terms of when they pronounce certain words... it’s different. So, that’s a miscommunication.” (ATC 8)

In participants’ accounts, the reported communication breakdowns were predominantly phonological rather than grammatical. This coincides with research highlighting intelligibility as a critical factor in English as a lingua franca (ELF) contexts, where communication involves speakers from diverse linguistic backgrounds (Estival et al., 2016; Kim & Elder, 2009; Hamzah et al., 2023). In such environments, successful communication depends less on native-like accuracy and more on mutual intelligibility under time-constrained conditions. As such, intelligibility in multilingual aviation environments is likely shaped by phonological variations rather than language accuracy.

This can be further supported by Kim and Frigal (2026) in their recent study involving domain-specialist participants in the aviation setting, whereby effective aviation communication is likely influenced by familiarity with accent varieties and the ability to adjust communication for interlocutors with different linguistic repertoires and experiences. Arguably, effective radiotelephony communication extends beyond traditional measures of linguistic proficiency. In view of this argument, communication difficulties experienced by Malaysian ATCs cannot be comprehended solely in terms of English proficiency. Rather, unfamiliar pronunciation and accent patterns may increase the interactional effort required to establish mutual understanding, particularly when communication occurs under operational pressure.

Pronunciation, for example, has been identified as a critical factor affecting intelligibility, leading to real-world aviation incidents (Babboni & Quast, 2020). Miscommunication in aviation has also been associated with accent variations, especially when both speakers are non-native English users, such as in the case of Thai and Korean aviation personnel (Tiewtrakul & Fletcher, 2010; Kim, 2023). Hence, communicative effectiveness in multilingual professional settings such as aviation is shaped more by intelligibility and interactional success than by adherence to native-speaker norms.

4.3 Miscommunication Risks and Safety Implications

Participants shared concrete examples of miscommunication that had potential safety implications and could pose significant risks in air traffic control. Several cases involved mishearing numerical instructions, such as confusing “heading 240” with “flight level 40” or mistaking “8,000 feet” for “6,000 feet.” This shows how phonological similarity, along with pilot expectations (e.g., anticipating descent clearance), can lead to critical misunderstandings.

“There was this one time when an inbound aircraft was coming to land... there was a traffic below. I told him (pilot) to turn on heading two four zero; he misunderstood that I told him to descend the flight level to four zero. I had to immediately correct him in my following transmission because it was an immediate traffic.” (ATC 1)

“I gave the clearance to the pilot to descend to 8,000 feet. But the pilot misheard my instruction, and he descended to 6,000 feet.

Luckily, at that time, there was no aircraft.” (ATC 5)

In each case, Malaysian ATCs immediately corrected the instruction and relied on established readback procedures to prevent escalation. Participants emphasised that the readback system functions as a safety buffer. Pilots are required to repeat instructions, enabling controllers to verify comprehension. These examples illustrate that while miscommunication occurs, procedural safeguards are embedded within operational practice to mitigate risk.

“In such a case, because you’ve proven that you mentioned 8,000 rather than 6,000 feet... we just recorded it. We call it read-back—it’s a fail-safe for us. If they don’t read back, we have to press the button (frequency). And for read-backs, they would have to read back a full statement... so both parties are clear.” (ATC 5)

Furthermore, in cross-border coordination scenarios involving pilots whose first language is not English, some Malaysian ATCs had to occasionally switch to Malay or the addressee’s native language when English communication became less effective. This decision was justified explicitly in terms of safety prioritisation.

“Sometimes we use very basic English, but they still don’t understand (the structure of the phrase or the term itself)... so we have to use their language (for example, mentioning “requesting ruang udara” instead of “requesting airspace release”). It’s better than (having) misunderstandings, which might be dangerous.” (ATC 5)

“We have to resort to using Malay. Sometimes we even use their language (e.g., Indonesian)... because safety is our priority. If we talk in English but they don’t understand the instructions, then it’s no use.” (ATC 5)

The findings demonstrate that miscommunication involving numbers and headings (e.g., altitude and heading confusion) could pose significant safety risks, reflecting previous research linking language-related errors to aviation incidents and operational occurrences. Although such communication problems may occur infrequently, they can still have serious operational consequences, particularly in high-workload environments, even when mitigated through procedural safeguards and readback/hearback protocols (Yang et al., 2023; Estival & Molesworth, 2020; Kim, 2026).

These examples illustrate how minor linguistic misunderstandings may lead to serious operational consequences. Such errors were often attributed not to a lack of language proficiency but to the interaction of phonological similarity and real-time processing demands. Notwithstanding these issues, aviation communication systems are designed with built-in safeguards to mitigate such risks, for instance, the readback procedure (Hamzah, 2021). This reflects a system in which communication is not assumed to be error-free but is continuously monitored and verified.

In high-stakes professional settings where meaning must be negotiated rapidly and accurately, these findings support research emphasising interactional repair mechanisms as central components of successful communication in multilingual English-mediated environments, allowing Malaysian ATCs to not only correct linguistic or factual errors but also make the interactions more specific, explicit, and clearer (Kaur, 2011; Kim, 2026). Therefore, it can be deduced that communicative effectiveness depends not only on linguistic competence but also on collaborative meaning-making and interactional practices to maintain mutual understanding under operational constraints.

4.4 Collaborative Repair Strategies and Distributed Communication

The findings reveal a strong culture of teamwork and collaborative problem-solving among Malaysian ATCs. Communication in operational aviation environments is inherently collaborative rather than purely individual. When faced with unclear transmissions, participants rely on repair strategies, such as requesting repetition (“say again”), instructing pilots to “stand by,” and seeking assistance from colleagues. In many cases, transmissions are broadcast through speakers, allowing nearby controllers to listen and provide interpretative support whenever necessary.

“Sometimes pilots couldn’t read me, then they will have to say again. *Say again* is one of the standard phraseologies to repeat what you just transmitted.” (ATC 6)

“Usually, we will ask our friends (fellow controllers). What the pilot transmits, everyone will hear. If we need time, we can ask the pilot to stand by... and the pilot will wait while we try to understand.” (ATC 5)

Some participants described replaying recorded transmissions to analyse unclear messages collectively. This suggests the distributed nature of cognition in air traffic control operations, where comprehension is not always an individual responsibility but a shared team effort. Participants also stressed that guessing is avoided; instead, verification and clarification are prioritised to maintain safety. In addition, Malaysian ATCs rely heavily on contextual inference and peer consultation when encountering unfamiliar terms or expressions, while reference tools might also be used to clarify terminology when immediate operational demands permit. However, it should be noted that the use of such tools primarily served as a general reference-checking strategy, as participants emphasised contextual inference, repetition, clarification, and consultation with colleagues as more immediate means of resolving uncertainty during time-critical communication.

“The transmission is recorded instantly. We will play the recording... so we can listen to it together and try to translate (the transmission). It’s better than trying on your own, and then you misunderstand.” (ATC 5)

“If you don’t understand, you just take out your phone... within one minute, I could understand.” (ATC 2)

“... or you (could) immediately ask your colleague. That’s better. If you ask someone, the other person (colleague) might know.” (ATC 3)

These adaptive strategies demonstrate functional resilience in real-time communication environments and a safety-oriented culture where uncertainty is actively managed. In this regard, effective communication in aviation is not solely dependent on individual linguistic competence but also on institutional practices that support collective understanding. This reflects the concept of distributed cognition in high-risk environments, where communication is a shared responsibility. Similar findings in aviation research indicate that collaborative problem-solving and repetition are essential strategies for resolving misunderstandings and maintaining safety (Pranoto & Susanto, 2024).

From an applied linguistics perspective, these findings suggest that aviation communication involves more than the transmission of information. It also requires continuous interactional management to maintain intelligibility under operational pressure, as reflected through the use of repetition, clarification requests, and verification strategies to rapidly coordinate meaning in real time. Essentially, this aligns with English as a lingua franca (ELF)-related research, which emphasises communicative effectiveness and mutual intelligibility over strict adherence to native-speaker norms (Kim & Elder, 2009; Kim, 2026). The findings further support recent perspectives on Aviation English as a specialised lingua franca shaped by task-oriented communication, institutional procedures, and multilingual operational demands rather than individual linguistic performance alone (Pacheco et al., 2023).

4.5 Plain English and Non-Routine Operational Scenarios

While routine communication is dominated by standard phraseology, the use of plain language among Malaysian ATCs is prevalent in non-routine or abnormal situations, especially those that fall outside predefined templates such as unexpected operational disruptions or complex coordination scenarios. For instance, participants emphasised the need for spontaneous plain English during severe weather, emergencies, or unexpected system failures. Interestingly, since participants reported encountering adverse weather conditions several times per month, weather-related communication was deemed frequent and somewhat “routine” in their settings. Nevertheless, adverse issues such as system breakdowns or unexpected cross-border coordination remained regarded as abnormal, non-routine scenarios.

“When it comes to abnormal situations and emergencies... your own proficiency in the language helps you at that time. So, the main thing there is to convey the information.” (ATC 1)

“Weather is actually normal... We have bad weather every day (in certain months of the year).” (ATC 5)

“It’s quite frequent. Weather, yes... But emergencies, maybe a little less. Most of our communications are actually template-based. You just change the information at the top.” (ATC 1)

Critical emergency scenarios such as bomb threats or hijacking were acknowledged as rare but procedurally structured. While Malaysian ATCs had never experienced such cases, they indicated that written strategies and predefined scripts exist for handling the situations. However, participants noted that abnormal situations such as system failures in neighbouring regions require spontaneous use of plain English beyond standard phraseology. Accordingly, English proficiency becomes crucial for conveying information clearly and managing uncertainty.

“Bomb threats, you (must) report. We have a standard procedure (for such a case)... even if somebody just prank-calls you. We have to take it seriously. Even just prank calls.” (ATC 7)

“Hijack (situation) is very complicated. We are prepared for that as well.” (ATC 5)

“Manila (the Philippines aircraft) was having this problem... so I had to translate that on the spot with whatever English that I know... in abnormal situations and emergencies. That’s what tends to happen.” (ATC 1)

Drawing from the findings, English proficiency among Malaysian ATCs should be understood not only as a mastery of phraseology but also as the ability to communicate effectively in unpredictable scenarios using spontaneous, context-sensitive English. This is consistent with research suggesting that explanation, clarification, and negotiation of meaning require plain language beyond standard phraseology, while only certain situations may require flexible language use (Aragão & Scaramucci, 2020; Ishihara & De Almeida Prado, 2021). Although routine aviation communication is largely governed by standardised phraseology, non-routine operational situations such as adverse weather conditions and technical issues may require controllers to move beyond fixed linguistic forms to ensure mutual understanding (Kim, 2026; Pacheco et al., 2023). In this regard, communicative effectiveness depends on the ability to adapt language use not only according to operational context but also to interlocutor needs and situational urgency.

5. Conclusion

Malaysian air traffic controllers (ATCs) operate in a multilingual national context where Malay and English coexist, although English remains the mandated operational language of air traffic communication. Based on interviews with eight licensed Malaysian ATCs, the findings demonstrate that communication in air traffic control is highly structured and strongly governed by standard aviation phraseology. Malaysian ATCs rely heavily on procedural language to maintain clarity, precision, and efficiency in routine communication with pilots and other air traffic units. Nevertheless, the operational environment remains dynamic and unpredictable, requiring controllers to move beyond standard phraseology when managing non-routine situations or unexpected operational scenarios. In such circumstances, the ability to use plain English flexibly becomes essential for maintaining effective communication.

One of the major communication challenges identified in this study relates to accent intelligibility. Participants reported that

communication difficulties were more commonly associated with pronunciation differences among international pilots rather than grammatical or lexical limitations. In high-workload operational environments, such differences may increase cognitive demands and contribute to communication breakdowns. Despite these challenges, procedural safeguards such as readback verification, repetition requests, and clarification strategies function as important mechanisms for identifying and correcting misunderstandings. The findings also indicate that communication in air traffic control is not solely an individual activity but often involves collaborative problem-solving among controllers within the operational environment. Shared monitoring and peer support were found to contribute to situational awareness and operational safety, reflecting the resilience of multilingual aviation communication systems in Malaysia.

This study contributes to understanding how aviation English functions as a professional working language in safety-critical operational environments. Evidently, aviation communication is shaped not only by linguistic competence but also by operational procedures, technological constraints, and multilingual interaction. As such, effective aviation communication involves both standardised linguistic systems and adaptive communicative practices. This study also extends current understanding of professional English use in safety-critical environments by examining aviation communication as a professional practice shaped by multilingual interaction and operational demands rather than by linguistic proficiency alone. Although phraseology remains fundamental in routine operations, the findings suggest that exposure to diverse English accents and simulated operational scenarios may better prepare ATCs for international aviation communication.

The present study is not without limitations. The findings are based on interviews with a relatively small group of ATCs from two control centres in East Malaysia. Although the participants represented varying operational experiences, the findings may not fully reflect communication practices across all air traffic control facilities in Malaysia. Future studies may, therefore, expand this study by involving additional operational centres, incorporating observational or discourse-based data, or comparing communication practices across different aviation systems and regional contexts.

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Author contributions

Dr. Nur Zafirah Razali was responsible for the conceptualization and methodology of the study, data collection and analysis, interpretation of the findings, and drafting and revising the manuscript. Assoc. Prof. Dr. Veronica Petrus Atin was responsible for supervising the research, participating in data collection, and reviewing and revising the manuscript. All authors read and approved the final manuscript.

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Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Use of artificial intelligence

During the preparation and revision of the manuscript, the authors used ChatGPT (GPT-5.6, OpenAI) to assist with language editing, text structuring, and clarity checking. The tool was not used to generate research data, conduct the thematic analysis, select references, or independently determine the research findings. All AI-assisted suggestions and outputs were critically evaluated, revised, and verified by the authors. The authors retain full responsibility for the accuracy, integrity, and scholarly accountability of the manuscript.

Data sharing statement

No additional data are available.

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References

- Alderson, J. C. (2009). Air safety, language assessment policy, and policy implementation: The case of aviation English. *Annual Review of Applied Linguistics*, 29, 168-187. <https://doi.org/10.1017/S0267190509090138>
- Alharahsheh, H. H., & Pius, A. (2020). A review of key paradigms: Positivism VS interpretivism. *Global Academic Journal of Humanities and Social Sciences*, 2(3), 39-43.
- Alharasees, O., Jazzar, A., Kale, U., & Rohács, D. (2023). Aviation communication: The effect of critical factors on the rate of misunderstandings. *Aircraft Engineering and Aerospace Technology*, 95(3), 379-388. <https://doi.org/10.1108/AEAT-02-2022-0052>
- Alketbi, F., & Sipos, A. (2025). Enhancing aviation safety through effective English language communication under the ICAO requirements: Regulatory challenges. *Journal of East Asia and International Law*, 18(1), 97-121. <http://dx.doi.org/10.14330/jeail.2025.18.1.05>
- Anthony, S. W., & Ahmad, R. (2021). The decision-making practices among air traffic controllers during conflict resolution in aviation industry: A case study. *Journal of Cognitive Sciences and Human Development*, 7(2), 66-79. <https://doi.org/10.33736/jcshd.3426.2021>
- Aragão, B. F., & Scaramucci, M. V. R. (2020). A brief analysis of language tasks used by air traffic controllers in radiotelephony communications in Brazil. *The ESPecialist*, 41(4), 1-26. <https://doi.org/10.23925/2318-7115.2020v41i4a5>
- Babboni, C. A., & Quast, K. (2020). Pronunciation and aeronautical English: Brazilians' difficulties and possible routes to intelligibility. *The ESPecialist*, 41(4), 1-28. <https://doi.org/10.23925/2318-7115.2020v41i4a3>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77-101. <https://doi.org/10.1191/1478088706qp063oa>
- DeJonckheere, M., & Vaughn, L. M. (2019). Semistructured interviewing in primary care research: A balance of relationship and rigour. *Family Medicine and Community Health*, 7(2), e000057. <https://doi.org/10.1136/fmch-2018-000057>
- Estival, D., & Molesworth, B. R. C. (2020). Errors in air-ground pilot communication: An experimental study. *The ESPecialist*, 41(3), 1-28. <https://doi.org/10.23925/2318-7115.2020v41i3a5>
- Estival, D., Farris, C., & Molesworth, B. (2016). *Aviation English: A lingua franca for pilots and air traffic controllers*. Routledge.
- Hamzah, H. (2021). Clarity and pronunciation of ab-initio air traffic controllers in aviation English communication. *Aviation*, 25(4), 252-261. <https://doi.org/10.3846/aviation.2021.15906>
- Hamzah, H., & Fei, W.F. (2018). Miscommunication in pilot-controller interaction. *3L The Southeast Asian Journal of English Language Studies*, 24(4), 199-213. <https://doi.org/10.17576/3L-2018-2404-15>
- Hamzah, H., Krish, P., & Hamat, A. (2022). Communication competence in pilot-controller interactions: Repair and accommodation strategies. *GEMA Online Journal of Language Studies*, 22(3), 176-195. <https://doi.org/10.17576/gema-2022-2203-10>
- Hamzah, H., Krish, P., & Hamat, A. (2023). Aviation communication challenges and language training development: Perspectives from pilots and air traffic controllers. *Training, Language and Culture*, 7(1), 86-100. <https://doi.org/10.22363/2521-442X-2023-7-1-86-100>
- International Civil Aviation Organization. (2004). *Manual on the implementation of ICAO language proficiency requirements* (Doc 9835). ICAO.
- International Civil Aviation Organization. (2010). *Manual on the implementation of ICAO language proficiency requirements* (2nd ed., Doc 9835). ICAO.
- Ishihara, N., & De Almeida Prado, M. C. (2021). The negotiation of meaning in Aviation English as a lingua franca: A corpus-informed discursive approach. *Modern Language Journal*, 105(3), 639-654. <https://doi.org/10.1111/modl.12718>
- Kale, U., Herrera, M., & Nagy, A. (2021). Examining pragmatic failure and other language-related risks in global aviation. *Aircraft Engineering and Aerospace Technology*, 93(8), 1313-1322. <https://doi.org/10.1108/AEAT-03-2021-0081>
- Kallio, H., Pietilä A. M., Johnson, M., & Kangasniemi, M. (2016). Systematic methodological review: Developing a framework for a qualitative semi-structured interview guide. *Journal of Advanced Nursing*, 72(12), 2954-2965. <https://doi.org/10.1111/jan.13031>
- Kanki, B. G., Anca, J., & Chidester, T. R. (Eds.). (2019). *Crew resource management* (3rd ed.). Academic Press. <https://doi.org/10.1016/B978-0-12-812995-1.00004-X>
- Kanki, B. G., Helmreich, R. L., & Anca, J. (Eds.). (2010). *Crew resource management* (2nd ed.). Academic Press.

- Kaur, J. (2011). Raising explicitness through self-repair in English as a lingua franca. *Journal of Pragmatics*, 43(11), 2704-2715. <https://doi.org/10.1016/j.pragma.2011.04.012>
- Kim, H. & Frigal, E. (2026). Revisiting aviation English as a lingua franca: Insights from domain specialists. *Applied Linguistics Review*, 17(3), 1289-1313. <https://doi.org/10.1515/applirev-2025-0132>
- Kim, H. (2018). What constitutes professional communication in aviation: Is language proficiency enough for testing purposes? *Language Testing*, 35, 403-426. <https://doi.org/10.1177/0265532218758127>
- Kim, H. (2026). *Aviation English as a Global Lingua Franca*. Cambridge: Cambridge University Press.
- Kim, H., & Billington, R. (2018). Pronunciation and comprehension in English as a lingua franca communication: Effect of L1 influence in international aviation communication. *Applied Linguistics*, 39(2), 135-158. <https://doi.org/10.1093/applin/amv075>
- Kim, H., & Elder, C. (2009). Understanding aviation English as a lingua franca: Perceptions of Korean aviation personnel. *Australian Review of Applied Linguistics*, 32(3), 23.1-23.17. <https://doi.org/10.2104/ara10923>
- Kim, H., & Elder, C. (2014). Interrogating the construct of aviation English: Feedback from test takers in Korea. *Language Testing*, 32(2), 129-149. <https://doi.org/10.1177/0265532214544394>
- Kim, Y. H. (2023). The challenges of radiotelephony communication and effective training approaches: A study of Korean pilots and air traffic controllers. *English for Specific Purposes*, 72, 26-39. <https://doi.org/10.1016/j.esp.2023.07.001>
- Mackay, R., & Mountford, A. (1978). *English for specific purposes: A case study approach*. Longman.
- Malterud K., Siersma V. D., & Guassora, A. D. (2016) Sample size in qualitative interview studies: Guided by information power. *Qualitative Health Research*, 26(13), 1753-1760. <https://doi.org/10.1177/1049732315617444>
- Moder, C. L. (2012). Aviation English. In B. Paltridge & S. Starfield (Eds.), *The handbook of English for specific purposes* (pp. 227-242). John Wiley & Sons. <https://doi.org/10.1002/9781118339855.ch12>
- Morrow, D. G., Lee, A., & Rodvold, M. (1993). Analysis of problems in routine controller-pilot communication. *The International Journal of Aviation Psychology*, 3(4), 285-302. https://doi.org/10.1207/s15327108ijap0304_3
- Pacheco, A., Garcia, A. C., Monteiro, A. L., Prado, M., & Tosqui-Lucks, P. (2023). Using corpus linguistics to create tasks for teaching and assessing aeronautical English. *Applied Corpus Linguistics*, 3(3), 100075. <https://doi.org/10.1016/j.acorp.2023.100075>
- Paramasivam, S. (2013). Materials development for speaking skills in aviation English for Malaysian air traffic controllers: Theory and practice. *Journal of Teaching English for Specific and Academic Purposes*, 1, 97-122.
- Paulus, T., Woods, M., Atkins, D. P., & Macklin, R. (2017). The discourse of QDAS: Reporting practices of ATLAS.ti and NVivo users with implications for best practices. *International Journal of Social Research Methodology*, 20(1), 35-47. <https://doi.org/10.1080/13645579.2015.1102454>
- Pranoto, D. C. Y., & Susanto, F. (2024). The challenges in learning ICAO radiotelephony: Students' perspective. *Langit Biru Jurnal Ilmiah Aviasi*, 17(01), 40-48. <https://doi.org/10.54147/langitbiru.v17i01.1119>
- Prinzo, O. V., Campbell, A., & Hendrix, A. M. (2008). *Pilot English language proficiency and the prevalence of communication problems at five U.S. air route traffic control centers*. Federal Aviation Administration.
- Ryan, G. (2018). Introduction to positivism, interpretivism and critical theory. *Nurse Researcher*, 25(4), 41-49. <https://doi.org/10.7748/nr.2018.e1466>
- Tharikh, S. M., & Hamzah, S. R. (2020). Application of the wellbeing theory on air traffic controllers: A model on how to flourish in practice at the workplace. *The International Journal of Academic Research in Business and Social Sciences*, 10, 522-532. <http://dx.doi.org/10.6007/IJARBS/v10-i5/7225>
- Tiewtrakul, T., & Fletcher, S. R. (2010). The challenge of regional accents for aviation English language proficiency standards: A study of difficulties in understanding in air traffic control-pilot communications. *Ergonomics*, 53(2), 229-239. <https://doi.org/10.1080/00140130903470033>
- Treadaway, M., & Read, J. (2025). Assessing the language needs of L2 English student pilots preparing for flight training in English-speaking countries. *English for Specific Purposes*, 78, 125-138. <https://doi.org/10.1016/j.esp.2024.12.007>
- Wang, Z., Jiang, P., Wang, Z., Han, B., Liang, H., Ai, Y., & Pan, W. (2024). Enhancing air traffic control communication systems with integrated automatic speech recognition: Models, applications and performance evaluation. *Sensors* 2024, 24(14), 4715. <https://doi.org/10.3390/s24144715>
- Yang, H., Chang, Y., & Chou, Y. (2023). Subjective measures of communication errors between pilots and air traffic controllers. *Journal of Air Transport Management*, 112, 102461. <https://doi.org/10.1016/j.jairtraman.2023.102461>
- Yıldız, E. (2024). Navigating the skies: Unraveling communication challenges in diverse aviation accidents. *Antalya Bilim Üniversitesi Uluslararası Sosyal Bilimler Dergisi*, 5(1), 14-33. <https://doi.org/10.54969/abuijss.1459587>

- Yin, Y., Yu, G., & Huang, D. (2024). Implementing the ICAO language proficiency requirements: The localization of aviation English testing. *Applied Linguistics*, 45(4), 699-717. <https://doi.org/10.1093/applin/amad057>
- Zhao, W. (2023). A corpus-based study on aviation English from the perspective of systemic functional linguistics. *Discourse & Communication*, 17(5), 630-661. <https://doi.org/10.1177/17504813231171644>
- Zhao, W. (2024). A corpus-based multi-dimensional analysis of the linguistic features of Aviation English. *English for Specific Purposes*, 76, 57-73. <https://doi.org/10.1016/j.esp.2024.05.004>

Appendix

Semi-structured Interview Protocol

The semi-structured interview protocol was designed to elicit Malaysian air traffic controllers' (ATCs) experiences and perceptions of English communication in operational aviation contexts. Specifically, the protocol encompasses (a) communication practices and challenges, as well as (b) cultural and contextual factors, as follows:

(a) Communication Practices and Challenges – This part focuses on daily communication experiences, common difficulties when interacting with pilots or fellow ATCs, and the use of English in routine and/or non-routine situations.

1. Could you describe a typical communication scenario during your shift?
2. What are the most common communication challenges you face with pilots or other ATCs?
3. Could you share an instance where miscommunication occurred due to language-related issues? What happened, and what were the consequences?
4. How do you usually handle situations when you do not understand a pilot's message?
5. How comfortable are you when using non-routine communication (e.g., in emergencies, unexpected weather)? How often do such situations occur?
6. Are you familiar with the ICAO English Language Proficiency (ELP) standards? How well do you think you meet these standards in your daily work?
7. Do you notice differences in communication styles or English proficiency between local and international pilots? If so, how does this affect your communication?
8. What kind of feedback (formal or informal) have you received on your communication skills?
9. In terms of English proficiency, which areas do you feel most confident in, and which areas could be improved (e.g., pronunciation, vocabulary, grammar, fluency, comprehension)?
10. Are there any particular phrases or vocabulary you often find difficult to understand or use?

(b) Cultural and Contextual Factors – This part investigates how local cultural elements and multilingual contexts influence communication, particularly when dealing with ATCs or pilots from diverse linguistic backgrounds.

1. In your view, do cultural differences influence communication between ATCs and pilots in Malaysia? If yes, how do these differences typically occur?
2. How does the use of local accents or dialects affect communication in your workplace, especially in high-pressure situations?
3. Are there any specific cultural expectations or nuances that ATCs should be aware of when interacting with international pilots?
4. Do you feel that current training programmes adequately address cultural sensitivity in operational communication? Why or why not?
5. What personal strategies or approaches do you use to manage communication challenges related to cultural or linguistic differences?