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Common Deviations from Standard Phraseology among Indonesian Pilots and Air Traffic Controllers

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ABSTRACT

Ensuring the flight safety, it requires clear and standardized pilot-controller communication through ICAO phraseology. However, deviation still exists in routine operations. Thus, this study examines deviations from ICAO standard phraseology among Indonesian pilots and air traffic controllers (ATCs) by identifying the types and prevalence of these deviations and to explore the underlying reasons behind their use in operational communication. A qualitative design was employed, using an open-ended questionnaire and semi-structured interviews with licensed Indonesian pilots and ATCs. The questionnaire was used to capture and quantify reported deviations, while the interviews explored factors shaping participants' communication choices. The findings showed that, although both pilots and ATCs were aware of ICAO standards, deviations occurred frequently in day-to-day operations. Common deviations involved the pronunciation of letters and numbers, as well as the transmission of wind information, radar beacon codes, altitude, altimeter settings, frequency, time, and aircraft registration/call signs. The primary reasons for these deviations included habitual use, perceived efficiency, local adaptation, and occasional memory lapses. These results highlight the need for ongoing training and sustained awareness efforts to strengthen standardized communication and support operational safety.

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1. INTRODUCTION

Aviation English communication refers to the language skills required for effective communication in the aviation industry. Effective communication is essential for clear information exchange, coordination, and teamwork among flight crew members, which reduces the likelihood of operational errors (Ceken, 2024). In aviation, communication is also critical for maintaining shared situational awareness and assigning responsibilities to ensure safety and effective air traffic coordination (Tiewtrakul & Fletcher, 2010). Kubáň and Hořínka (2020) note that information flow between pilots and other stations is complex and must be delivered at the appropriate time.

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Effective communication should be an active process in which all parties ensure that intended meanings are understood; conversely, ineffective communication is a major contributor to human error in complex, high-risk sectors (Cushing, 1994, cited in Chatzi, n.d.). Research has reported that a substantial proportion of aviation accidents are associated with poor crew coordination and ineffective communication (Lautman & Gallimore, 1987, cited in Chatzi, n.d.). Zahra (2011) also reported high rates of incorrect pilot communications and noted that communication errors contribute to a considerable share of incidents, particularly in airport settings. Communication breakdowns between pilots and air traffic controllers (ATCs) have repeatedly been identified as key factors in accidents, incidents, and mid-air collisions; therefore, voice communication between ATCs and pilots remains one of the most critical elements of flight operations (Tiewtrakul & Fletcher, 2010). Supporting this, analyses of Cockpit Voice Recorder (CVR) data have documented miscommunication and miscoordination among cockpit crews in major accidents, including the 2009 Air France Flight 447 disaster (Flin & Maran, 2015; Loup et al., 2019; BEA, 2012, cited in Ceken, 2024). Other well-known accidents have also been linked to communication problems (Ceken, 2024). In the United States, the Federal Aviation Administration has reported that communication errors contribute significantly to accidents and impose substantial economic costs (Sobieralski, 2013; Archer, 2015, cited in Pierson, 2024).

Multiple factors influence pilot–ATC communication performance, including gender, traffic density, shift work, personality, workload, time pressure, and familiarity with operating procedures. However, language-related issues are consistently identified as among the most relevant contributors to communication errors and serious incidents (Turney, 1997; Hulit & Howard, 1993; Fegyveresi, 1997; Rantanen & Kokayeff, 2002; Corradini & Cacciari, 2002; Morrison & Wright, 1989; Morrow et al., 1993; Reilly, 1989; Cushing, 1994, cited in Tiewtrakul & Fletcher, 2010). To prevent misunderstanding and ambiguity in international operations, a shared global language is necessary (Alharasees et al., 2023).

In response, the International Civil Aviation Organization (ICAO) established English as the primary language of international aviation to improve precision and efficiency in pilot–ATC communication (Tiewtrakul & Fletcher, 2010). Accordingly, pilots and ATCs are expected to use English in radiotelephony communications regardless of the native language of the airspace (Pierson, 2024). To minimize miscommunication and detect potential misunderstandings, both groups must have adequate language proficiency (Alderson, 2011). ICAO (2010) reports that accident investigations have linked numerous fatal events to insufficient English proficiency among pilots and controllers. Following a series of accidents and incidents associated with inadequate language skills, ICAO began strengthening relevant provisions in Annexes 1 and 10 related to language proficiency and radiotelephony communication. As a result, both ATCs and flight crews are required to demonstrate proficiency in aviation English. Further updates were

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reinforced through ICAO resolutions, including the revision associated with A36-11 and guidance to Contracting States regarding implementation (International Civil Aviation Organization Manual on the Implementation of ICAO Language Proficiency Requirements, 2010).

Prior research has also highlighted specific sources of communication difficulty. Molesworth and Estival (2015) found that although several factors contribute to communication errors (e.g., workload, accent, audio quality, English proficiency, and phraseology use), pilots reported that understanding other pilots was the most challenging aspect of communication. Tiewtrakul and Fletcher (2010), examining 312 international flights at Bangkok International Airport, reported that accent and inherent linguistic differences, especially among non-native English speakers were critical factors in miscommunication. In Malaysia, Hamzah and Fei (2018) analyzed 30 hours of recorded communications across frequencies and found that procedural deviations often linked to difficulty adhering to standard phraseology and policy accounted for the largest proportion of miscommunications. Similarly, Kim (2023) surveyed 67 air traffic controllers and 85 pilots (Korean L1) and reported that both groups experienced communication errors, with a key source being the use of plain English instead of standard phraseology during radiotelephony exchanges.

Despite these regional findings, the Indonesian context remains underrepresented in the literature. Studies focusing on deviations in aviation communication within Indonesian airspace are limited, and Indonesia-based observational research is particularly scarce. Therefore, this study aims to examine the frequency and nature of deviations from ICAO standard phraseology among Indonesian pilots and ATCs and to analyze their implications for communication clarity and operational safety.

2. METHOD

This study employed a qualitative research design to investigate deviations from International Civil Aviation Organization (ICAO) standard phraseology in pilot-ATC radiotelephony communication. Qualitative inquiry is appropriate when the goal is to understand a phenomenon in context and to capture participants' experiences, perspectives, and meaning-making processes (Creswell, 2012). Accordingly, a qualitative approach was selected to examine not only the types of phraseology deviations and their occurrence but also the underlying reasons and contextual factors shaping communication choices among Indonesian pilots and air traffic controllers (ATCs).

Data were collected through semi-structured interviews and an online open-ended questionnaire. While numerical summaries (e.g., counts and percentages) were used to describe the prevalence of identified deviation categories, the primary focus remained interpretive: exploring how participants explain their communication practices, what operational pressures or habits influence them, and how they perceive standard versus non-standard usage. This approach enabled an in-depth examination of phraseology use as a

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complex communicative practice embedded in real operational contexts.

2.1. Location and Time of Research

The study was conducted in Indonesia, focusing on licensed Indonesian pilots and ATCs working in domestic and international operational environments.

Participants were drawn from several airports, including Soekarno–Hatta, Budiarto, Sentani (Jayapura), and Halim Perdanakusuma. Data collection took place over four months, from April to July 2025, allowing participation from professionals working under a range of operational conditions.

2.2. Research Subjects

Participants comprised 31 ATCs and 32 pilots (N = 63) who were actively involved in flight operations. Participants ranged in age from 25 to 62 years and reported professional experience from less than 5 years to 28 years across operational contexts (e.g., tower operations; domestic and international flights).

Most pilots were male (72%), while most ATCs were female (68%). Most pilots held Captain positions (62%), and nearly all ATCs were controllers (97%). Most participants reported Bahasa Indonesia as L1 (pilots 91%; ATCs 87%). Most participants' ICAO language proficiency was Level 4 (pilots 81%; ATCs 94%), with smaller proportions at Level 5 and none at Level 6.

Participants were recruited using purposive sampling, targeting licensed Indonesian pilots and ATCs who regularly engage in operational radiotelephony communication. This sampling strategy ensured alignment with the study's focus on professionals who apply ICAO phraseology in routine practice. Variation in age, experience, and ICAO proficiency levels was sought to support comparison across subgroups and to capture diverse perspectives.

2.3. Research Instruments

Two instruments were used, semi-structured interview and online open-ended questionnaire. The semi-structured interview protocol (17 guiding questions), designed to elicit detailed accounts of communication experiences, including instances of deviation from ICAO phraseology and perceived factors influencing communication choices. The semi-structured format allowed the interviewer to probe emerging themes while maintaining consistency across participants.

Additionally, online open-ended questionnaire, based on the same core prompts as the interview protocol. This instrument enabled wider participation and allowed respondents to elaborate freely without restrictions imposed by fixed response categories (Creswell, 2018). The open-ended format supported the collection of nuanced explanations, examples, and reflections relevant to phraseology use.

2.4. Data Collection Techniques

Data collection was conducted in two phases. First, individual semi-structured interviews were conducted in person. Interviews were audio-recorded with participant consent and transcribed verbatim to preserve accuracy. Second, an online open-ended questionnaire was distributed to additional participants to broaden the dataset and capture further perspectives. Across both phases, participants were informed about the

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study purpose and were assured of anonymity and confidentiality to encourage candid responses.

2.5. Data Analysis Techniques

Data were analyzed using thematic analysis to identify, analyze, and report patterns across the qualitative dataset (Ahmed et al., 2025). Analysis proceeded through iterative stages: familiarization with the data, initial coding, code refinement, and theme development. Interview transcripts and questionnaire responses were coded systematically, and recurring categories of deviation and explanatory factors were identified.

To provide a descriptive overview of prevalence, the study also calculated frequency counts and percentages for each deviation category derived from the coded data. Identified deviation categories were then organized with reference to ICAO phraseology-related domains (e.g., pronunciation of letters and numbers; altitude and altimeter setting; frequency readbacks; time reporting; callsign/registration use; wind and radar beacon codes).

To enhance trustworthiness, two strategies were applied. Triangulation was used to compare and cross-check themes emerging from interview and questionnaire datasets for consistency. In addition, expert review (expert judgment) was conducted: experienced aviation professionals reviewed the coding framework and interpretations to evaluate clarity, plausibility, and alignment with operational realities. These procedures strengthened the credibility and dependability of the thematic findings regarding deviations from ICAO standard phraseology.

3. FINDINGS AND DISCUSSION

3.1. Findings

3.1.1. ICAO phraseology deviation on pronunciation of letters

The questionnaire administered to the pilots indicated that 5 pilots (16%) reported pronouncing letters using the standard alphabet (A–Z) rather than the ICAO phonetic alphabet (Alpha–Zulu), while 27 pilots (84%) reported using ICAO-standard pronunciations (Alpha–Zulu). In contrast, the interview data showed no reported deviations in letter pronunciation: all five interviewed pilots stated that they consistently used the ICAO phonetic alphabet. The interview excerpts were as follows:

Pilot 1: I have never deviated.
Pilot 2: I follow the ICAO phonetic alphabet (e.g., Alpha, Bravo, Charlie).
Pilot 3: There is no deviation from ICAO phraseology.
Pilot 4: I have never deviated.
Pilot 5: I use the phonetic alphabet (e.g., Alpha, Bravo, Charlie).

In contrast, the questionnaire data indicated that ATCs reported no deviations in the pronunciation of letters. This finding aligned with the interview data. All interviewed ATCs stated that they consistently followed ICAO phraseology when pronouncing letters. The interview excerpts were as follows:

ATC 1: No deviation. I consistently use the ICAO phonetic alphabet (e.g., Alfa/Alpha, Bravo, Charlie) and do not switch to regular ABC pronunciation.
ATC 2: No deviation.
ATC 3: I always follow ICAO standards and do not deviate.
the ICAO phonetic alphabet during radiotelephony communication.
ATC 5: I have never deviated from the ICAO standard, and using the phonetic alphabet (e.g., Alpha, Bravo, Charlie) is a daily habit for me.

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3.1.2. ICAO phraseology deviation on pronunciation of numbers

The questionnaire results showed that 18 pilots (56%) reported deviating from ICAO phraseology in the pronunciation of numbers, particularly 9 and 4, which were often pronounced as "nine" and "four" rather than the ICAO-standard forms "niner" and "fower." Reported reasons for this deviation included ease of communication (n = 6), use of plain English (n = 5), cultural factors (n = 1), common usage (n = 2), following others (n = 1), habit (n = 2), and mispronunciation (n = 1). In contrast, 14 pilots (44%) reported adhering to the ICAO standard.

Interview data further supported this pattern. Four of the five interviewed pilots acknowledged deviations from ICAO number pronunciation, with habit frequently cited as a key reason. The interview excerpts were as follows:

Pilot 1: I have never deviated.
Pilot 2: I sometimes deviate from the ICAO standard, saying 'four' instead of 'fower' and 'nine' instead of 'niner,' mainly due to habit.
Pilot 3: Yes, there has been deviation, such as pronouncing 'four' and 'nine' in the non-standard way, due to habit.
Pilot 4: I have deviated, especially for numbers like 'four' and 'nine,' due to habitual usage.
Pilot 5: The term 'niner' is often shortened to 'nine.'

The ATC questionnaire results showed that 13 ATCs (42%) reported deviating from ICAO phraseology in the pronunciation of numbers. Similar to the pilots' responses, the deviations mainly involved the numbers 9 and 4, which were pronounced as "nine" and "four" instead of the ICAO-standard forms "niner" and "fower." Reported reasons for these deviations included habit (n = 7), ease of communication (n = 2), simplicity (n = 1), convenience (n = 1), and reducing confusion (n = 1). In contrast, 18 ATCs (58%) reported adhering to the ICAO standard.

Interview data provided additional nuance. Among the five interviewed ATCs, some acknowledged deviating from ICAO number pronunciation particularly for 4 and 9 citing reasons such as faster and more natural communication, workload and time pressure, and efforts to reduce misunderstandings. However, other interviewees reported consistent adherence to ICAO standards. The interview excerpts were as follows:

ATC 1: Yes, there are deviations. Instead of saying 'fower' and 'niner,' I use 'four' and 'nine' to make it faster and more natural in conversation.
ATC 2: I have deviated. I commonly use 'nine' and 'four' instead of 'niner' and 'fower,' especially under workload and time pressure.
ATC 3: I consistently use standard ICAO number pronunciation.
ATC 4: I often use ICAO pronunciation like 'fower' and 'niner,' but sometimes I switch to 'four' or 'nine' when pilots ask for confirmation due to misunderstandings.
ATC 5: I consistently follow the ICAO rules.

3.1.3. ICAO phraseology deviation on announcing wind direction and speed

The questionnaire results from the pilots indicated that none reported deviations from ICAO phraseology when communicating wind direction and speed. The interview data were consistent. All five interviewed pilots stated that they did not deviate in this

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domain. Overall, these results suggested strong adherence to ICAO standards for wind reporting among pilots. The interview excerpts were as follows:

Pilot 1: This is not the pilot's role; we only receive it from ATC.
Pilot 2: No deviation; I follow ICAO phraseology.
Pilot 3: No deviation.
Pilot 4: No deviation.
Pilot 5: No deviation.

In contrast, the ATC questionnaire results showed that 5 ATCs (16%) reported deviating from ICAO phraseology in announcing wind direction and speed. Reported reasons included limited precision of wind data, inaccurate or rapidly changing information, and attempts to provide clearer communication under operational conditions. Meanwhile, 26 ATCs (84%) reported adhering to ICAO standards. Interview results provided additional nuance. Deviations were described as situational and minor, occurring mainly when precise numerical wind data were unavailable due to changing conditions. The interview excerpts were as follows:

ATC 1: *I sometimes deviate. When precise data is unavailable due to changing wind, I use terms like 'southerly' or 'northerly' instead of numerical values.*
ATC 2: I sometimes omit the direction and state only the speed (e.g., 'Wind 08 knots') due to changing wind conditions on the field.
ATC 3: I follow ICAO phraseology and do not deviate.
ATC 4: Early in my career, I used terms like 'northerly' or 'southerly' based on senior advice. However, now I consistently follow the standard.
ATC 5: No deviation.

3.1.4. ICAO phraseology deviation on announcing visibility

The pilots' questionnaire results on ICAO phraseology for visibility reporting indicated that 12 pilots (38%) reported deviations in this area. Reported reasons included using Bahasa Indonesia (n = 3), shortening the transmission (n = 3), making the message easier to understand (n = 3), forgetting the standard (n = 1), and seeking additional information (n = 1). However, interview data from five pilots suggested fewer deviation. Only one interviewee reported occasionally deviating by using Bahasa Indonesia when reporting visibility. The interview excerpts were as follows:

Pilot 1: I sometimes respond in Indonesian when ATC initiates in Indonesian.
Pilot 2: No deviation; I always use standard phraseology.
Pilot 3: No deviation.
Pilot 4: No deviation.
Pilot 5: No significant deviation.

In contrast, the ATC questionnaire results showed that 10 ATCs (32%) reported deviations from ICAO phraseology for visibility reporting. Reported reasons included using plain English (n = 2), simplicity (n = 2), ease of communication (n = 2), habit (n = 1), and confidence in being understood despite non-standard phrasing (n = 1). Interview results also indicated some deviation. Two out of five ATCs described non-standard visibility expressions, citing habit and code-switching/mixing Bahasa Indonesia with English to communicate more quickly. The interview excerpts were as follows:

ATC 1: Yes, deviations occur. Instead of saying 'three kilo mike,' I

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sometimes say 'three kilometers' or mix Indonesian and English for quicker communication.
ATC 2: No deviation. I always follow ICAO phraseology.
ATC 3: No deviation.
ATC 4: I usually say '3 kilometers' rather than the ICAO standard '3 kilo mike,' due to habit and the METAR format. I acknowledge this is a deviation.
ATC 5: No deviation.

3.1.5. ICAO phraseology deviation on announcing ceiling and sky coverage

The questionnaire results from both pilots and ATCs indicated no reported deviations from ICAO phraseology in announcing ceiling and sky coverage. This finding was consistent with the interview data. Both groups reported that they consistently follow ICAO standards in this area. Overall, this high level of consistency suggests a strong shared understanding of ICAO phraseology for ceiling and sky coverage. The interview excerpts were as follows:

Pilot 1: This is not announced by the pilot; we only receive it from ATC.
Pilot 2: I always follow standard ICAO phraseology.
Pilot 3: No deviation.
Pilot 4: No deviation.
Pilot 5: No deviation.
ATC 1: No deviation.
ATC 2: No deviation. I relay meteorological data exactly as I receive it.
ATC 3: I follow standard ICAO phraseology with no deviation.
ATC 4: I always use standard METAR terms such as 'broken' and 'overcast,' and I have not deviated from ICAO phraseology.
ATC 5: I always announce these according to ICAO standards.

3.1.6. ICAO phraseology deviation announcing cloud heights

The questionnaire results from both pilots and ATCs indicated no reported deviations from ICAO phraseology in announcing cloud heights. The interview findings were consistent for ATCs. None of the five interviewed ATCs reported deviations in this area. However, two of the five interviewed pilots acknowledged deviations. They explained that these occurred when flying in remote or uncontrolled areas without ATC coverage, where pilot-to-pilot communication may require the use of local language or mixed language to maintain effective coordination. Excerpts from the interviews with both groups were as follows:

Pilot 1: This is not measured or announced by the pilot.
Pilot 2: No deviation.
Pilot 3: Yes, deviation occurred in mountainous areas like Papua where there's no ATC coverage; communication was done pilot-to-pilot in Bahasa Indonesia.
Pilot 4: I have deviated when flying in uncontrolled areas; communication between pilots may include mixed language (including Bahasa Indonesia).
Pilot 5: I use standard phraseology consistently.
ATC 1: No deviation.
ATC 2: No deviation.
ATC 3: I follow standard ICAO phraseology without any deviation.
ATC 4: I follow the METAR reports and use standard phraseology.
ATC 5: No deviation.

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3.1.7. ICAO phraseology deviation on announcing temperature/ dewpoint

Analysis of the questionnaire results from both pilots and ATCs indicated no reported deviations from ICAO phraseology in announcing temperature and dew point. The interview data were generally consistent with this finding. Both groups reported using standard ICAO phraseology. Overall, these results showed that pilots and ATCs consistently follow ICAO standards when communicating temperature/dew point information. One pilot noted that dew point may be omitted only when it is not available. The interview excerpts were as follows:

Pilot 1: This is not announced by the pilot.
Pilot 2: I follow the phraseology, but I may omit the dew point if it is unavailable.
Pilot 3: No deviation.
Pilot 4: No deviation.
Pilot 5: No deviation.
ATC 1: No deviation.
ATC 2: No deviation.
ATC 3: I consistently use ICAO standard phraseology.
ATC 4: No deviation.
ATC 5: I follow the rules and state the temperature and dew point digit by digit.

3.1.8. ICAO phraseology deviation on announcing altimeter setting

The questionnaire results indicated that neither pilots nor ATCs reported deviations from ICAO phraseology in announcing the altimeter setting. Interview findings were consistent for ATCs: all five interviewed ATCs reported adhering to standard ICAO phraseology. Among the pilots, four of the five interviewees reported no deviations; however, one pilot described a deviation related to transition levels, attributing it to confusion when operating in a different region with differing local practices. Excerpts from the interviews were presented below:

Pilot 1: I have never deviated.
Pilot 2: I sometimes deviate, especially regarding transition levels (e.g., referring to 12,000 feet as a 'flight level' inappropriately due to differing regional practices).
Pilot 3: No deviation.
Pilot 4: No deviation.
Pilot 5: No deviation.
ATC 1: No deviation.
ATC 2: No deviation.
ATC 3: I follow ICAO standards and relay information received from the meteorological office.
ATC 4: I always use the correct ICAO format.
ATC 5: No deviation.

3.1.9. ICAO phraseology deviation on announcing weather and obscuration

The pilots' questionnaire results indicated that 21 pilots (66%) reported deviating from ICAO phraseology when communicating weather and obscuration, while 11 pilots (34%) reported adhering to the standard. The reported deviations involved using non-standard expressions when requesting weather avoidance, for example, "due to weather," "due to CB (cumulonimbus)," and "due to build-up" instead of the ICAO-standard phrase "weather deviation required." Reported reasons for these deviations included habit (n = 8), common usage (n = 7), confidence that the message would still be understood despite non-

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standard phrasing (n = 3), following others (n = 1), and forgetting the standard (n = 1). Interview data reinforced this pattern. Three of the five interviewed pilots acknowledged deviating from the standard when communicating weather/obscuration, primarily to simplify and shorten transmissions. The interview excerpts were as follows:

Pilot 1: I have never deviated.
Pilot 2: I have deviated by using phrases like 'avoiding weather' instead of standard ICAO phraseology to simplify communication.
Pilot 3: Yes, deviation occurred, for example, saying 'due to weather' or 'due to CB' because it is simpler and more understandable.
Pilot 4: I have deviated (e.g., using 'due to weather' or 'due to CB') for the sake of brevity.
Pilot 5: I generally follow the standards.

In contrast, the ATC questionnaire results showed that 5 ATCs (16%) reported deviations from ICAO phraseology for weather and obscuration, whereas 26 ATCs (84%) reported adhering to the standard (see Figure 9). Reported reasons for ATC deviations included common usage (n = 1) and avoiding lengthy transmissions (n = 1).

3.1.10. ICAO phraseology deviation on announcing altitude

The ATC questionnaire results showed that 17 ATCs (55%) reported deviating from ICAO phraseology when issuing altitude-related instructions, a pattern similar to that reported by pilots. Most deviations involved inserting the word "to" (e.g., *"climb to five thousand"*) rather than using the ICAO-standard form (see Figure 11). Reported reasons for this deviation included habit (n = 7) and use of plain English (n = 3). In contrast, 14 ATCs (45%) reported adhering to ICAO standard phraseology.

Interview findings provided additional support. Three of the five interviewed ATCs acknowledged deviations from ICAO altitude phraseology. They attributed these deviations to habit, influence of natural/plain English, and a perceived need to emphasize the instruction. The interview excerpts are as follows:

ATC 1: I had a minor deviation and include 'to' (e.g., 'climb to five thousand'). This could cause confusion, but it is more a habit or influenced by natural English speech patterns.
ATC 2: Deviation occurred in phrases like 'climb to 5000,' which can be ambiguous.
ATC 3: No deviation.
ATC 4: I follow ICAO phraseology.
ATC 5: I often use the word 'to' (e.g., 'climb to two thousand'). I believe this adds emphasis to the instruction.

3.1.11. ICAO phraseology deviation on announcing MDA/DH

The questionnaire results from both pilots and ATCs indicated no reported deviations from ICAO phraseology when communicating MDH/DH (Minimum Descent Height/Decision Height)**.** This finding was consistent with the interview data. Both groups reported adhering to standard ICAO phraseology in this area. This consistency was expected because MDH/DH was a technical parameter that was primarily used and communicated by pilots during specific phases of flight.

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3.1.12. ICAO phraseology deviation on announcing time

The pilots' questionnaire results showed that 17 pilots (53%) reported deviations from ICAO phraseology when announcing time (see Figure 12). Examples included readbacks such as "MIDNIGHT ONE TWO" instead of the ICAO-standard "ZERO ZERO ONE TWO," and "TWO ONE ON THE HOUR" instead of "TWO ONE ZERO ZERO." Reported reasons for these deviations included following others (n = 6), culture (n = 4), common usage (n = 3), habit (n = 2), faster communication (n = 1), and simplicity (n = 1). In contrast, 15 pilots (47%) reported adhering to the standard ICAO format.

Interview findings supported the questionnaire pattern. Three of the five interviewed pilots acknowledged deviating from ICAO time phraseology, mainly due to habit, avoiding complexity, and simplifying communication. The interview excerpts were as follows:

Pilot 1: I do not use informal formats like 'midnight one two.'"
Pilot 2: "I sometimes deviate using informal expressions like 'midnight one four' or 'on the hour' due to habit influenced by others."
Pilot 3: "Yes, deviation occurred, such as saying 'midnight on the hour' for 00:00 to avoid complexity.
Pilot 4: I have deviated (e.g., saying 'midnight zero one' instead of the full ICAO-compliant time format) to avoid repetition and simplify communication.
Pilot 5: No deviation personally, but I have noticed that native-English-speaking ATC sometimes use non-standard expressions like 'midnight' or 'on the hour.'

In contrast, the ATC questionnaire results indicated that 10 ATCs (32%) reported deviations from ICAO phraseology when announcing time. These deviations resembled those reported by pilots. Reported reasons included faster communication (n = 3) and culture (n = 2). Meanwhile, 21 ATCs (61%) reported adhering to the standard phraseology. Interview findings again added nuance. Three of the five interviewed ATCs described deviations, citing local culture**,** use of plain English**,** and habit as key factors. The interview excerpts were as follows:

ATC 1: Yes, deviations are present. Instead of the ICAO standard like 'zero zero two four,' local expressions such as 'midnight,' 'on the hour,' or informal time expressions are common considered local culture in Papua.
ATC 2: I have deviated by using general English time expressions like 'midnight' or by omitting the full format.
ATC 3: I follow the ICAO format and pronounce each digit.
ATC 4: I pronounce time digit by digit and do not use non-standard terms like 'midnight' or 'on the hour.
ATC 5: I have deviated from the standard of saying 'zero zero' by using phrases like 'one two on the hour' or 'midnight.' I believe this is due to habit.

3.1.13. ICAO phraseology deviation on announcing heading/degree

The questionnaire results from both pilots and ATCs indicated no reported deviations from ICAO phraseology when communicating heading/degree. This finding was

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consistent with the interview data: both groups reported using standard ICAO phraseology for heading/degree. Overall, these results suggest strong adherence to the ICAO-standard format for heading instructions and readbacks. The interview excerpts were as follows:

Pilot 1: I use the standard format.
Pilot 2: No deviations.
Pilot 3: No deviations.
Pilot 4: No deviations.
Pilot 5: Standard usage is maintained.
ATC 1: No deviation.
ATC 2: No deviation, as this is handled through non-radar procedural operations.
ATC 3: No deviation.
ATC 4: I always use the digit-by-digit format, not cardinal directions like 'north' or 'south.'
ATC 5: As a tower controller, I do not issue heading instructions because this is the responsibility of radar controllers.

3.1.14. ICAO phraseology deviation on announcing radar beacon (Squawk)

The pilots' questionnaire results showed that 19 pilots (59%) deviated from ICAO phraseology when announcing the radar beacon code (squawk). Most deviations occurred during readback of the squawk code, with pilots using forms such as "Identing 7240," "Squawking 7240," and "Identing squawk 7240," instead of the standard phrase "Squawk 7240." The reasons reported by pilots included confidence that the message would still be understood (n = 7), repeating the instruction exactly as heard (n = 5), common usage (n = 3), habit (n = 2), and forgetting the standard (n = 1). In contrast, 13 pilots (41%) reported adhering to the ICAO standard. Interview data supported these findings. Three of the five interviewed pilots acknowledged deviations, attributing them mainly to improvisation and confusion. The interview excerpts were as follows:

Pilot 1: I say 'Squawk Ident 7240'; I have also used 'identing,' so there is some inconsistency.
Pilot 2: I deviate, using variations such as 'squawk ident,' 'identing,' and 'squawking ident,' due to improvisation.
Pilot 3: No deviation.
Pilot 4: No deviation.
Pilot 5: I experienced some confusion, especially with terms like 'recycle squawk.' Variations included 'identing' and 'squawking ident.'

Similarly, the ATC questionnaire results indicated that 4 ATCs (13%) reported deviations from ICAO phraseology in announcing squawk. These deviations resembled those reported by pilots and were attributed to habit (n = 2), following others (n = 1), and forgetting the standard (n = 1).

In contrast, 27 ATCs (87%) reported adhering to standard phraseology. Notably, no deviations were reported in the ATC interviews. The interview excerpts were as follows:

ATC 1: ATCs usually use standard phraseology such as 'squawk ident seven two five zero.'
ATC 2: No deviation.
ATC 3: No deviation.
ATC 4: I use the correct ICAO format, such as 'squawk ident' or 'squawk seven two four zero.'
ATC 5: I have not deviated in this area because I am not a radar controller.

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3.1.15. ICAO phraseology deviation on announcing frequency

The pilots' questionnaire results indicated that 20 pilots (63%) reported deviations from ICAO phraseology when announcing frequency. These deviations included compressing the readback (e.g., "ELEVEN NINE ONE" instead of the standard "ONE ONE NINER DECIMAL ONE") and omitting "decimal" (e.g., "ONE ONE EIGHT ONE" instead of "ONE ONE EIGHT DECIMAL ONE"). Reported reasons for deviation included faster communication (n = 6), habit (n = 3), simplicity (n = 3), culture (n = 2), shortening communication (n = 2), forgetting the standard (n = 1), confidence that it would not affect communication (n = 1), and confidence that it would still be understood (n = 1). In contrast, 12 pilots (37%) reported using the standard phraseology.

Interview findings supported this pattern. Four of the five interviewed pilots acknowledged deviations, most commonly through simplifying the readback or omitting "decimal." Selected interview excerpts were presented below:

Pilot 1: Personally, I use the word 'decimal,' although some readbacks omit it due to ATC usage.
Pilot 2: I deviate by simplifying (e.g., 'eleven nine one' instead of 'one one niner decimal one').
Pilot 3: I have minor deviation, sometimes using 'point' instead of 'decimal.'
Pilot 4: I have deviated by omitting the word 'decimal' (e.g., 'one one niner point one').
Pilot 5: I generally adhere to the standard.

Similarly, the ATC questionnaire results showed that 18 ATCs (58%) reported deviations from ICAO phraseology when announcing frequency. These deviations were comparable to those reported by pilots. Reported reasons included shortening communication (n = 5), simplicity (n = 3), use of plain English (n = 2), and habit (n = 1).

In contrast, 13 ATCs (42%) reported adhering to the standard phraseology. Interview data suggested even more frequent deviation among ATCs. All five interviewed ATCs acknowledged deviations in frequency announcements, most often through omitting "decimal" or using "point." Reasons included saving time**,** misinformation about the standard**,** and the belief that the message would remain clear and unambiguous. The interview excerpts were as follows:

ATC 1: I frequently deviate. Instead of 'decimal,' I often use 'point.' Also, informal pronunciations like 'eleven nine one' are used.
ATC 2: Deviation occurred. Sometimes I skipped the word 'decimal.'
ATC 3: I usually omit 'decimal' because it is understood and the frequency is not ambiguous.
ATC 4: Initially I used 'decimal,' but I was told 'point' was the updated standard. I later learned that ICAO still uses 'decimal,' so the deviation was due to misinformation.
ATC 5: While working at Halim Airport, which has complex traffic, I occasionally omitted the decimal in frequencies to save time.

3.2. Discussion

The findings showed that Indonesian pilots and ATCs frequently

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deviated from ICAO standard phraseology in radiotelephony communication, particularly when announcing numbers, frequency, time, and weather/obscuration. These results supported earlier studies reporting that non-native English speakers often used non-standard language in comparable operational contexts (Hamzah & Fei, 2018; Kim, 2023; Wu et al., 2019). At the same time, the study highlights several context-specific factors in Indonesia, including code-switching to Bahasa Indonesia and the transmission of local practices through flight schools and senior colleagues.

Although deviations in letter pronunciation were minimal similar to findings reported by Estival and Molesworth (2020) and Tsai et al. (2007) (2007) revealed that deviations in number pronunciation were common (over half of pilots and 42% of ATCs), primarily due to habit and perceived ease of communication. This aligns with Wu et al. (2019), who noted that accented English speakers may adopt pronunciation adjustments to enhance clarity, sometimes at the expense of full ICAO compliance.

Substantial deviation was also observed in the reporting of weather and obscuration, where participants used plain-English expressions such as *"due to weather," "due to build-up,"* and *"due to CB"* instead of the standard phrase *"weather deviation required."* This pattern is consistent with Kim's (2023) study in Korea and Hamzah and Fei's (2018) work in Malaysia, which similarly found that plain English often replaces standard phraseology, particularly during high workload or abnormal situations. In the Indonesian context, this tendency appears to be reinforced by operational shorthand and shared communicative norms, especially when pilots aim to communicate concisely under time pressure.

In addition, non-standard connectors such as *"climb to 5000"* were found to introduce potential ambiguity, a finding consistent with Tsai et al. (2007) and Tiewtrakul and Fletcher (2010). Deviations in time reporting were also notable (more than half of pilots and 32% of ATCs), and interview evidence suggested that these deviations were shaped partly by localized expressions and routine practices, highlighting how local linguistic patterns can influence adherence to standardized phraseology.

Deviation rates for frequency readback were particularly high (63% for pilots; 58% for ATCs). The main issue involved omitting "decimal" or replacing it with "point." This mirrors Baugh and Stolzer's (2018) argument that minor time-saving practices could gradually erode standardization. Importantly, the Indonesian data suggest an additional, context-specific mechanism: non-standard forms may be institutionalized through flight training and subsequently reinforced in operational environments.

By contrast, several categories such as ceiling and sky coverage, cloud heights, temperature/dew point, altimeter setting, heading/degree, and MDH/DH showed near-complete adherence to ICAO standards. This pattern is consistent with Hamzah and Fei (2018), who reported that phraseology directly tied to METAR-based information or clearly procedural transmissions is less likely to undergo informal modification.

Overall, the Indonesian findings reinforce conclusions from previous research (Baugh & Stolzer, 2018; Kim, 2023) that training interventions should

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extend beyond general language proficiency to emphasize consistent ICAO phraseology use, including in abnormal or high-workload scenarios. Addressing habitual shortcuts, cultural/linguistic transfer, and the influence of senior colleagues and training institutions likely requires targeted retraining and recurring assessment. Regulatory authorities (e.g., DGCA Indonesia) may also benefit from implementing regular phraseology audits, incorporating both simulation-based assessment and sampling of routine communications. In line with Alderson's (2011) recommendations, integrating phraseology compliance into English proficiency evaluations could help ensure that assessed language skills align more directly with operational safety requirements.

This study contributes to the growing regional literature on ICAO phraseology adherence by providing field-based evidence from Indonesia, where large-scale observational research remains limited. The findings echo patterns reported in Thailand (Tiewtrakul & Fletcher, 2010), Malaysia (Hamzah & Fei, 2018), and Korea (Kim, 2023), while also underscoring that each national context involves distinct contributing factors. In Indonesia, these factors include language mixing in controlled and uncontrolled airspace and the use of non-standard forms learned during flight training and reinforced through workplace norms.

Finally, the findings also contribute to English for Specific Purposes (ESP), particularly Aviation English. The deviations identified in this study highlight a persistent gap between ICAO-standard phraseology and the communicative habits that pilots and ATCs develop in real operations. From an ESP perspective, Aviation English instruction should therefore go beyond technical vocabulary and grammar to focus on formulaic phraseology, pronunciation accuracy, and the ability to maintain standardized communication under stress. Integrating authentic radio communication samples, error analysis, and scenario-based simulations may help learners internalize phraseology as a functional "sub-language."

Moreover, several deviations were associated with cultural habits and local language influence, ESP programs should address language transfer explicitly, build critical awareness of non-standard usage, and teach strategies for self-monitoring and self-correction. Aligning ESP instruction with empirically observed deviations can better prepare aviation professionals for the demands of global, high-stakes communication.

4. CONCLUSION

This study examined communication practices among Indonesian pilots and air traffic controllers (ATCs) and identified common deviations from standard ICAO phraseology. The analysis focused on radiotelephony exchanges involving key information, including the pronunciation of letters and numbers, heading/degree, radar beacon (squawk), altimeter setting, weather/obscuration, frequency, and time reporting. The findings indicate that deviations occur frequently and are largely driven by practical factors such as habit**,** communication simplification, and adaptation to local practices**.** Although most participants were familiar with ICAO standards,

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deviations still occurred due to routine operational habits and occasional memory lapses.

These findings highlight the importance of continuous training, consistent reinforcement of ICAO standards, and ongoing awareness initiatives to support clear, standardized communication an essential component of operational safety. However, this study was limited by a relatively small sample of Indonesian pilots and ATCs. As a result, the findings may not fully represent the practices of aviation professionals in other regions or within larger populations.

Based on these results, the study recommends implementing recurring training sessions for pilots and ATCs to strengthen compliance with ICAO standard phraseology. These sessions should incorporate realistic operational simulations to help professionals maintain standard communication in high-workload or high-pressure situations.

Further research is recommended to examine phraseology adherence in larger and more diverse samples. Comparative studies across regions and training contexts would provide valuable insights into the cultural, operational, and educational factors shaping communication practices, thereby informing more effective training programs and policy initiatives.

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APPENDIX

The questionnaire and interview items were developed based on ICAO phraseology.

Personal Data
Initial name:
Position:
Gender:
Age:
Country of origin:

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First language:
Education:
Experience: …. years

Phraseology Deviation

1. What is your current English level proficiency?
2. How good do you think you are in English? (Beginner, Intermediate, Advance)
3. Have you ever deviated from ICAO pronunciation of letters during a radio communication? If yes, which letters and why?
4. Have you ever deviated from ICAO pronunciation of numbers during a radio communication? If yes, which numbers and why?
5. Have you ever deviated from ICAO phraseology announcing wind direction and speed during a radio communication? If yes, why?
6. Have you ever deviated from ICAO phraseology announcing visibility during a radio communication? If yes, why?
7. Have you ever deviated from ICAO phraseology announcing ceiling and sky coverage during a radio communication? If yes, why?
8. Have you ever deviated from ICAO phraseology announcing cloud heights during a radio communication? If yes, why?
9. Have you ever deviated from ICAO phraseology announcing temperature/dewpoint during a radio communication? If yes, why?
10. Have you ever deviated from ICAO phraseology announcing altimeter setting during a radio communication? If yes, why?
11. 1Have you ever deviated from ICAO phraseology announcing weather and obscuration during a radio communication? If yes, why?
12. Have you ever deviated from ICAO phraseology announcing altitude during a radio communication? If yes, why?
13. Have you ever deviated from ICAO phraseology announcing MDA/DH during a radio communication? If yes, why?
14. Have you ever deviated from ICAO phraseology announcing Time during a radio communication? If yes, why?
15. Have you ever deviated from ICAO phraseology announcing Heading/Degrees during a radio communication? If yes, why?
16. Have you ever deviated from ICAO phraseology announcing Radar Beacon (Squawk)? If yes, why?
17. Have you ever deviated from ICAO phraseology announcing frequencies during a radio communication? If yes, why?