Mayday: Assessing Pilots' Communication Ability in Simulated Emergencies

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Effective radio communication is paramount to aviation safety, particularly during non-standard or emergency events where standard phraseology fails and plain language must be deployed. While the International Civil Aviation Organization (ICAO) mandates a minimum Language Proficiency Requirement of Level 4 (Operational), current training and testing standards face growing scrutiny regarding their real-world validity under high-workload conditions. This study investigates the ability of non-native English-speaking student pilots holding an ICAO Level 4 rating or higher (91% ICAO Level 4, 9% Level 5) to execute standard distress calls during simulated emergencies, comparing their operational performance in both their native language (Turkish) and English. The findings reveal a significant degradation in communication performance during the English scenario compared to the native language scenario. The performance variation demonstrates that the dual demand of managing a critical system failure while communicating in a second language triggers cognitive overloading and fatigue, severely depleting working memory. The study strongly advocates for the integration of high-workload, non-standard emergency tasks within practical Aviation English testing and training paradigms to ensure genuine operational safety.

Keywords: Aviation English, Language Proficiency Requirements, Emergency Communication

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1. Introduction

In the world of aviation, the role played by communications is crucial. Every day, thousands of pilots and Air Traffic Service Units (ATSU) exchange information pertaining to all aspects of flights to ensure a safe transfer of people and goods. These communications are often held in what is known as Aviation English, which Estival and Farris (2016) define as "prescribed exchange formats, standard phraseology, which is defined as prescribed vocabulary and syntax, and specific pronunciation," and that represents a subset of the English language as a whole. The International Civil Aviation Organization (ICAO) categorizes Aviation English as a type of English for Special Purposes (ESP) (ICAO, 2010) and, by design, the relatively fixed phrases that make it up aim to cover as many situations as possible, from ground to flight operations and beyond, while ideally reducing the chances for misunderstanding to a minimum. However diversified the domains of use for Aviation English's phraseology might be, though, they all fall within the realm of routine operations; for all those situations in which phraseology cannot ensure safe and/or successful communication, ICAO advises the usage of "plain language" (PL), a subset of Aviation English for which there is no clear definition in ICAO regulations (Farris, 2016). For all intents and purposes of this study, though, PL will be defined as the creative[1] use of the English language that makes use of aviation's vocabulary and its spelling, grammatical, and pronunciation conventions.

As both phraseology and plain language constitute the backbone of communication in aviation, ICAO sought to implement a system of holistic descriptors that could help determine the proficiency level of aviation personnel and set up requirements for operating worldwide. Thus, after a series of accidents and incidents involving pilots and air traffic controllers, in 1998 ICAO, with resolution A32-16, made English proficiency

[1] Creative use of language is a tricky concept to define and there exist numerous works in linguistics that seek to describe it from several different theoretical perspectives. Broadly speaking, however, a language is used creatively when a speaker can produce new utterances ad infinitum by combining the limited number of learned pairs of linguistic forms (that is, phonemes, morphemes, words, phrases) available (Goldberg, 2006).

a matter of the highest priority; a few years later, in 2003, new provisions regarding air-ground and ground-ground communications in international civil aviation were adopted in Annexes 1, 6, 10, 11 and the Procedures for Air Navigation Services - Air Traffic Management (PANS-ATM); the following year, the first edition of the Manual on the Implementation of ICAO Language Proficiency Requirements (LPRs) was published; finally, in 2007, in order to support the implementation of proficiency requirements, Resolution A36-11 concerning globally harmonized language testing criteria, was published (the complete historical overview of ICAO's proficiency criteria can be found in ICAO, 2010).

ICAO measures proficiency in Aviation English across six categories pertaining mainly to listening and speaking skills: pronunciation, structure, vocabulary, fluency, comprehension, and interaction. Depending on the speaker's ability across all of them, a proficiency level can be assigned from one, the lowest ("Pre-elementary"), to six, the highest ("Expert") (ICAO, 2007). The minimum level of proficiency that can ensure safe pilot - controller communications in English is four (denominated "Operational"). In general, an operational-level speaker should have good control of the English grammar, a vocabulary range that can allow them to speak with relative ease in the most common work-related topics without interruptions, the ability to understand spoken language when related to common and work-related topics (provided that the speaker is confronted with a variety of English that they find intelligible), interact with generally appropriate responses for the most common situations, and, finally, the speaker's ability to pronounce English words in a comprehensible manner despite the influence of their native language's phonology (ICAO, 2011).

1.2 Literature review

Since the definition of ICAO's LPRs, a number of commercial institutions and national aviation authorities sought out to establish testing systems that would comply to ICAO's descriptors: by way of example, some of the current most common tests for Aviation English are the English Language Proficiency for Aeronautical Communication (ELPAC), Test of Aviation English (TEA), and the Royal Melbourne Institute of Technology English Language Test for Aviation (RELTA). However, as reported by Farris (2016), the validity and quality of some tests is dubious, as there is very little information and accountability, regarding their development. As a response to this, ICAO established the Aviation English Language Test Service (AELTS), which evaluates the compliance of independently developed tests to the LPRs and lists them on its website. At the time of writing this article, the only listed test in the AELTS website is the ELPAC test for pilots and controllers.[2] The perceived lack of quality in Aviation English tests reflects a generalized suspicion of ICAO's LPRs, as Farris (2016) mentions that, in a study surveying pilots and controllers' opinions on whether level four is good enough for communicating in non-standard occurrences, more than half of the subjects responded negatively; similarly, in a study conducted in Italy, the idea that the level four is barely good enough to ensure safety in aviation was commonly held by the pilots and controllers who participated, and proposed level five as the long-term goal for aviation in lieu of level four (Mazzolini, 2019).

While a good part of the research conducted on Aviation English consists of surveys capturing what pilots and controllers think of ICAO's LPRs (see also Clark & Williams, 2020), academic research has also tried to examine the efficacy of language training with the aim of developing better training programs, testing formats, and, ultimately, a real international standardization of Aviation English assessment. Fowler et al. (2021), for example, by analyzing data from the Aviation Safety Reporting System,[3] demonstrated that, ever since the establishment of ICAO's LPRs, the number of incidents due to poor English language proficiency has not decreased with time: an alarming result which reveals a substantial inadequacy of Aviation English training and assessment based on ICAO's requirements; Monteiro (2022), instead, investigated radiotelephonic communications between pilots and controllers through the lens of English as a Lingua Franca, intercultural awareness, and intercultural competence, showing how pilot and controllers' communication demands can inform the creation of effective test tasks; and Treadaway (2022), noticing how

[2] https://aelts.icao.int/Home/RecognizedTests retrieved on May 18, 2026.
[3] A database consisting of information about incidents reports from pilots, submitted voluntarily.

language requirements for Non Native English Speakers (NNES) to access English-based flight training programs are hardly ever informed by research, warned of the defectiveness of ICAO's proficiency descriptors to discriminate between levels of ab initio student pilots; finally, Masiulioniene & Tupciauskaite (2023) studied strategies for filling the gap between pilot students who hold the Operational level to level five by proposing more challenging English courses.

Despite all the contributions to understanding the shortcomings of Aviation English training and testing, very little research focused on understanding NNES pilots' ability to communicate in Aviation English in real-life and/or simulated scenarios and, specifically, in non-standard situations which, as reported above, are the moments in which PL may be used according to ICAO's guidelines. One such study was carried out by Farris (2007), who sought to measure the performance of (mostly) NNES in pilot-controller communications in the presence or absence of cognitive workload: the study concluded that for native English pilots, controller messages should not exceed two commands per utterance under heavy workload conditions, while for NNES pilots, the number of commands should be reduced to one. Interestingly enough, the studies evaluating English preparation of pilots and controllers in situations of emergency, in which, according to ICAO (2010), the need of PL is acknowledged, can be counted on the fingers of one hand, the most significant being the one conducted by Borowska (2021), in which real distress and urgency calls broadcast by native and non-native English pilots were retrieved from the internet and checked against the recommended model established by ICAO: the study found that pilots generally follow the standards for emergency calls, albeit not in the strict order professed by ICAO composed of seven parts (as it will be shown below), and proposed to render obligatory only four of them as pilots are unlikely to perfectly adhere to ICAO standards in a situation of emergency.

1.3 Research aim

The present study sets out to inquire into the ability of pilots holding ICAO's English Operational level rating to hold communications in Aviation English during a situation of emergency, and measure how their performance differs when they are free to use their native language. In particular, given the standard emergency call structure established by ICAO, this article sought to understand if pilots holding the Operational level are able to go through all of its parts in their order and supply ATSUs with as much information as possible regarding their emergency. This means that both the ability to promptly recall the appropriate phraseology and use PL to give any crucial additional information have been observed in a simulated emergency scenario.

The study has been conducted with the intent to confirm that Aviation English training and testing is currently not standardized enough. The study will also make a case for introducing practical test tasks in Aviation English assessment that encompass emergency and non-standard scenarios to test pilot English proficiency under heavy workload.

1.4 The standard structure of a distress call

According to ICAO, emergency messages can be divided into two types: distress and urgency calls. The former refers to aircraft in serious and imminent danger that require immediate assistance, while the latter refers to situations of concern for the safety of an aircraft or other vehicles, which, however, do not need immediate assistance (ICAO, 2007). Distress and urgency calls, when broadcast, require an identifying word to be repeated three times at the start of the message, respectively, Mayday and Pan-Pan. For both distress and urgency calls, ICAO's Manual of Radiotelephony (2007, from now on MR) advises following a specific outline composed of seven passages:

1. Mayday (or Pan-pan) repeated for three times;
2. Name of the station addressed;
3. Identification of the aircraft;
4. Nature of the distress condition;
5. Intention of the person in command;
6. Position, level, and heading of the aircraft;
7. Any other useful information.

All ICAO member states adopt emergency communication conventions that overlap with the MR's one, although there might be some occasional differences. For instance, the United States' Federal Aviation Administration (FAA) advises pilots to broadcast messages with as many of the following parts, in the order shown (differences from ICAO's emergency call are in italics)[4]:

1. Mayday (repeated three times);
2. Name of station addressed;
3. Aircraft identification *and type*;
4. Nature of distress;
5. *Weather*
6. Pilots intentions and request;
7. Present position and heading; *if lost, last known position, time, and heading since that position;*
8. Altitude or flight level;
9. *Endurance in minutes;*
10. Number of people on board;
11. Any other useful information.

Similarly, the European Aviation Safety Agency (EASA) recommends broadcasting the following message in the following order (differences from ICAO's call are italicized):

1. Mayday (repeated *preferably three times*);
2. Name of ATS unit addressed (*time and circumstances permitting*);
3. Identification of the aircraft;
4. Intention of the pilot-in-command;
5. Present position, level, and heading[5]

However, in order to measure the pilots' ability to broadcast distress calls, it was decided to adopt, as a reference, the call structure proposed by Pooleys' Manual of Communication (2025, from now on MoC) for the nature of the information required and the recent[6] publication date:

1. Mayday (repeated three times);
2. Name of the station addressed;
3. Callsign;
4. Type of aircraft;
5. Nature of the emergency;
6. Intention of the pilot-in-command;
7. Present or last known position;
8. Flight level/altitude;
9. Heading;
10. Pilot qualifications (not mandatory): (Student pilot and/or No instrument qualification and/or IMC rating and/or Full instrument rating;
11. Any other useful information: endurance and people on board.

2. Method

2.1. Participants

The study involved 11 pilot students from the Pilotage Department of Antalya Bilim University. The study was structured with pilots who hold at least an ICAO Language Proficiency Level 4. This criterion was applied to ensure that all pilots already met the minimum operational language proficiency requirements for aviation communication. This was to emphasize the chosen pilot sample already was licensed competent.

All pilots were informed that audio recordings of their simulator sessions would be collected for research purposes and their consent was obtained.

2.2. Simulator Setup

The study was conducted using a full-motion (6-DOF) Cessna 172S flight simulator. The motion platform was intentionally disabled in order to isolate cognitive and procedural performance from kinetic influences. Three individuals were present during each simulator session: the student pilot, an observer acting as Air Traffic Control (ATC) who was also a licensed pilot, and a language expert specialized in English language assessment.

2.3. Procedure

Pilots were individually notified through the university's flight scheduling system, which is routinely used for simulator training operations, that they had been assigned a navigation flight task from Isparta Süleyman Demirel Airport (LTFC) to Denizli Çardak Airport (LTAY), scheduled for the following day.

Students arrived one and a half hours prior to their assigned simulator sessions and completed the necessary preparations, including navigation charts, weight-and-balance calculations, and flight planning procedures based on the predetermined route.

[4] https://www.faa.gov/air_traffic/publications/atpubs/aim_html/chap6_section_3.html accessed May 21, 2026.
[5] https://aviation.bot/EASA/SERA-FEB-2023/SERA.14095-Distress-and-urgency-radiotelephony-communication-procedures?p=p_a1iTIJIrvdN&s=1&utm_source=chatgpt.com Accessed May 21, 2026.
[6] With respect to the time in which this study was conducted.

2.3.1. Briefing

Thirty minutes prior to each simulator session, pilots received a standardized briefing. During the briefing, pilots were informed that an abnormal scenario would occur during the LTFC– LTAY navigation mission and that they would be expected to respond appropriately in accordance with the needed procedures. Pilots were instructed to treat this navigation task as a solo flight operation, and the observer present in the simulator was introduced solely as an ATC representative responsible for conducting and facilitating radio communications throughout the session, while the English language expert was present only to record and document the communications for later analysis.

2.3.2. Scenario

Simulator Task Scenario I

The study consisted of two simulator sessions conducted with the same participants under identical operational conditions. In the first session, the entire navigation scenario and all ATC communications were conducted in Turkish. Participants performed a navigation flight from LTFC to LTAY and were instructed to enter the aerodrome traffic pattern, report the downwind leg, and subsequently report leaving the control zone. During their planned cruise altitude at 6,500 feet (above mean sea level), an engine failure scenario was introduced. This scenario was given when the pilots in the cruise phase to avoid any additional mental stress that the more workload-demanding phases of flight can create.

Simulator Task Scenario II

Following completion of the first session, the identical navigation task was reassigned to the same participants the following week. The route, briefing, simulator conditions, information given by ATC (meteorological conditions, clearances, etc.), and emergency scenario remained completely unchanged in order to maintain procedural consistency between sessions. However, during the second session in the simulator, after pilots had completed their before take-off checklist and reported to the ATC that they were ready for departure, the ATC started talking in English. At 6,500 feet, the same engine failure scenario was introduced once again.

The purpose of this procedure was to evaluate whether transition from Turkish to English during an ongoing flight operation affected pilots' emergency communication performance, with the given procedural execution of communication.

2.3.4. Recordings and Transcription

Each simulator session was audio-recorded for subsequent analysis. All verbal communications produced during both sessions were separately transcribed word-by-word by the authors for comparative analysis.

The recordings included all pilot–ATC communications occurring throughout the simulator sessions, including routine operational phraseology and emergency-related communications following the engine failure scenario. Transcriptions were prepared in order to evaluate changes in communication. This study utilized a sequential design (Turkish followed by English) with a single-institution sample of 11 pilots subjected to a uniform emergency scenario (engine failure).

3. Analysis

Out of 14 pilots who currently hold at least an ICAO Level 4 proficiency rating, 11 of them attended the study, as three of them were in a di ferent city at the time this study was carried out. Among the 11 pilots who took part in the study, ten of them (%91) held ICAO Level 4 proficiency rating, one (9%) held ICAO Level 5 proficiency ratings, 11 (100%) possessed a Private Pilot License (PPL), seven (64%) held a Commercial Pilot License (CPL), and the same seven pilots possessed Instrument Rating (IR) endorsements. In addition, ten pilots (91%) also held seaplane ratings, and 4 pilots (36%) held acrobatics as an endorsement.

The gender distribution consisted of ten male pilots (91%) and one female pilots (9%). Pilots' total flight hours ranged from 89 hours 5 minutes to 237 hours 55 minutes, with a mean flight experience of 193 hours and 10 minutes (SD = 55). Pilots' age ranged from 21 to 25; One 20 years old pilot, eight 21 years old pilots, one

22 years old pilot, and one 25 years old pilot.

The pilots' simulator recordings were analyzed by the two authors word-for-word to ensure reliability in the difference between their English and Turkish communications.

After their first scenario, the communications held between the pilot and ATC were analyzed to see the degree of compliance with the distress call's structure outlined above.

Example of pilot 4 (scenario I):

Pilot: Isparta kule bekleme noktasında ayrılış için tamamen hazırız, TC-AYH.

ATC: TC-AYH. 05 pistine giriş kalkış serbest, rüzgar sakin, QNH 1003.

Pilot: 05 pistine giriş kalkış serbest, QHN 1003 TC-AYH.

ATC: Mutabık, 05 pisti için rüzgaraltı ikaz.

Pilot: 05 pisti için rüzgaraltı ikaz edilecek, TC-AYH.

Pilot: 05 pisti için rüzgaraltı, TC-AYH.

ATC: TC-AYH, 6500 gidiş irtifası serbest, kontrol harici ikaz.

Pilot: 6500e tırmanış serbest, kontrol harici ikaz edilecek TC-AYH.

Engine failure at 6500. Before out of control.

Pilot 4: Mayday mayday mayday. Isparta kule, TC-AYH. Burdur hizaları 5000 feet motor arızası yaşadık. Burdur kıyı seridi iniş planlıyoruz.

Elements: Mayday, Name of the adressed station ("*Isparta Kule*"), Identification of the aircraft ("*TC-AYH*"), Nature of emergency ("*motor arızası yaşadık*"), Intention of the pilot in command ("*Burdur kıyı şeridi iniş planlıyoruz*"), Position and level of the aircraft (*Burdur hizaları, 5000 feet*").

Table 1 shows, for the given pilot, the Mayday call elements they successfully transmitted.

Table 1. Example of the analysis

Elements for Mayday Transmit	Pilot 4 (In Turkish)
Mayday, Mayday, Mayday	TRANSMITTED
Name of the addressed station	TRANSMITTED
Identification of the aircraft	TRANSMITTED
Type of aircraft (CM)	
Nature of the emergency	TRANSMITTED
Intention of the pilot in command	TRANSMITTED
Position, level, and heading of the aircraft	POSITION AND LEVEL
Pilot qualifications (CM/non mandatory, but advised)	
Additional info (fuel remaining, pob)	

After performing a forced landing, pilots were given no debriefing and no information about the scenario they would deal with the upcoming week were given. The following week, when the pilots were assigned the second simulator session, the exact same pre-flight briefing was held, which only informed them that a scenario would occur during their LTFC-LTAY navigation task.

For each pilot, during the second simulator session, when pilots were reporting ready for departure, communications suddenly turned into English as prompted by the observer-ATC. Thus, the pilots were given the same clearances and information as their first simulator task, albeit in English.

Example of Pilot 4 (scenario II):

Pilot: Isparta kule bekleme noktasında ayrılış için tamamen hazırız, TC-AYH.

ATC: TC-AYH. Cleared for take off from runway 05, wind calm, QNH 1003.

Pilot: Cleared for take of from runway 05, QHN 1003, TC-AYH.

ATC: TC-AYH report downwind leg.

Pilot: Will report downwind leg, TC-AYH.

Pilot: Downwind for runway 05, TC-AYH.

ATC: TC-AYH climb 6500, report out of control.

Pilot: Climbing 6500, will report out of control.

Engine failure at 6500. Before out of control.

Pilot 4: TC- AYH. Mayday Mayday Mayday. Engine failure over Burdur Lake. One person on board.

Elements: Identification of the aircraft ("*TC AYH*"), Mayday, Nature of emergency ("*engine failure*"), Position of the aircraft (*over Burdur Lake*), Person on Board.

Table 2 shows an example of the analysis of English communication on mayday transmission.

Table 2. Analysis with the English Transmission

	Pilot 4 (In Turkish)	Pilot 4 (In English)
Mayday, Mayday, Mayday	TRANSMITTED	TRANSMITTED
Name of the addressed station	TRANSMITTED	
Identification of the aircraft	TRANSMITTED	TRANSMITTED
Type of aircraft (CM)		
Nature of the emergency	TRANSMITTED	TRANSMITTED
Intention of the pilot in command	TRANSMITTED	
Position, level, and heading of the aircraft	POSITION AND LEVEL	POSITION
Pilot qualifications (CM/non mandatory, but advised)		
Additional info (fuel remaining, pob)		POB

4. Results

4.1. Scenario I Results (Turkish)

In the Turkish-language scenario, all pilots transmitted the MAYDAY warning, aircraft identification, nature of the emergency (engine failure), and the intention of the pilot in command. Ten pilots (91%) transmitted position information. Three of these pilots also transmitted flight level information. No pilot transmitted heading information. Eight pilots (73%) transmitted the name of the addressed station. Five pilots (45%) transmitted the number of persons on board as additional information.

No pilot transmitted information regarding aircraft type or pilot qualifications.

One pilot verbally stated the required procedures but failed to execute some of them correctly. The pilot stated that communication was being established on the 121.5 emergency frequency; however, the radio frequency was set to 121.2 and remained in standby rather than being activated. The pilot also stated "magneto off"; however, instead of switching the selector to the OFF position, the selector was turned to the RIGHT position.

Another pilot anticipated an airspeed-related malfunction during the takeoff roll. Immediately after the application of full throttle, the pilot stated "sürat saati çalışmıyor" ("the airspeed indicator is not functioning") and rejected the takeoff by reducing the throttle to idle, applying brakes, and informing air traffic control (ATC). During the post-flight debriefing, the observer clarified that the scenario did not include any airspeed malfunction. The scenario was subsequently restarted from the beginning.

4.2. Scenario II Results (English)

Three pilots (%27) reverted to Turkish during the emergency situation despite previously communicating in English during standard ATC procedures, including downwind reporting and readback transmissions. Nine pilots (%82) transmitted a MAYDAY call. All pilots transmitted aircraft identification. Ten pilots transmitted the nature of the emergency. Six pilots (%55) transmitted the intention of the pilot in command. Eight pilots transmitted the position information and one pilot also transmitted level information. Only two pilots transmitted the name of the addressed station. Four pilots transmitted the number of persons on board as additional information.

No pilot transmitted information regarding aircraft type or pilot qualifications.

The pilots appeared startled during the emergency situation. Variations were observed in standard procedural communications, including takeoff clearance and QNH readbacks. Differences were identified in both transmission structure and speech rate. The rate of speech decreased substantially in eight pilots.

In Table 3, the compliance rates of pilots regarding emergency message components and behaviors are evaluated and compared across two different language scenarios.

Table3. Comparison of Emergency Message Components and Pilot Compliance Rates between Turkish and English Scenarios

Emergency Message Component / Behavior	Turkish Scenario (N=11)	English Scenario (N=11)	Percentage Variance	Description of Change
MAYDAY Call	%100	%82	-%18	Decrease in compliance
Name of Addressed Station	%73	%18	-%55	Decrease in compliance
Aircraft Identification	%100	%100	%0	No variance
Nature of Emergency	%100	%91	-%9	Decrease in compliance
Intention of PIC	%100	%55	-%45	Decrease in compliance
Position Information	%91	%73	-%18	Decrease in compliance
Flight Level Information	%27	%9	-%18	Decrease in compliance
Heading Information	%0	%0	%0	Absent in both groups
Persons on Board (POB)	%45	%36	-%9	Decrease in compliance

4.3. Discussion

The results reported above present us with compelling data to discuss. As can be observed from Table 3, when the pilots were free to express themselves in their first language, they managed to largely conform to the standard practice of the emergency call.

In the English scenario, however, pilots appeared to relate ATC information that could be either retrieved immediately or previously memorized, such as the emergency identification word Mayday, the aircraft callsign, and the nature of the emergency. The other elements of the distress call, such as the flight level, and the heading, on the other hand, being displayed on the flight deck in indicators that require processing, were mostly left out from the communication. Additional information, e.g., aircraft type and pilot qualification - both of which are not mandatory according to ICAO - which would imply a larger use of PL, was absent.

The difference in terms of performance between the Turkish and English scenarios can thus be explained by summoning the concepts of situational awareness and workload. As reported by Wickens (2002), situation awareness can be defined as (1) the perception of the elements in the environment within a volume of time and space, (2) comprehension of their meaning, and (3) the projection of their status in the near future. Given these premises, Wickens (ibid.) adds that the three most important aspects of situational awareness for pilots regard three-dimensional spatial awareness, system awareness, and task awareness, which all relate to the four principles of piloting known as aviate, navigate, communicate, manage systems (ANCS): these principles are listed in their usual hierarchy, which in any case can present some sort of flexibility depending on the context. Interestingly enough, Wickens reports that auditory communication tasks are more disruptive of the ANCS hierarchy and are less disruptible than tasks at a higher position in the hierarchy: in other words, when facing unusual situations that require auditory communications, which would normally hold a low position in the ANCS hierarchy, pilots tend to give them precedence over tasks that would normally have a higher priority. In this connection, in cognitive science, Cognitive Load Theory suggests that human minds have a limited working memory, and these limitations are felt in particular when new information must be worked in some respect (Farris, 2007; Sweller, 1994); the immediate consequence is that, in multi-task environments, any challenging information to process might take up portions of the working memory, affecting the overall performance. As a matter of fact, Wickens (2002) states that tasks might be neglected when salient perceptual events occur and redirect pilots' focus.

The interweaving relationship between cognitive workload and situational awareness can explain why, for example, some of the pilots who participated in our study, despite experiencing an emergency scenario they had already successfully completed in Turkish, failed to transmit the thrice-repeated Mayday call when communicating in English: their working memory, once the engine failure occurred, must have become completely full, and the communication task - low on the ANCS hierarchy - was negatively affected. The same explanatory principle can be applied to the rest of the distress call: it is evidently not a case that, in the English scenario, the pilots (mostly) managed to relate the observer-ATC information that either require memorization or little processing: the Mayday call and the aircraft callsign fall into the former category, while information about the nature of the emergency (as in the case of the engine failure chosen for the simulator sessions) falls into the latter, as they, by their nature, can be easier to retrieve. Other information, such as aircraft type and pilot qualifications, which is not mandatory to add in the distress call, might, at this point, have been left out by the pilots as it would have required longer communication in PL while being under the pressure of executing the task for the simulator scenario.

A factor that should not be overlooked is the inherent workload increase stemming from the very fact that the environment in which the pilots were operating was adopting English as the means of communication. Abutalebi & Green (2016) demonstrated how speaking a second language generates cognitive fatigue, as it implies the activation of brain areas linked usually to the speaker's working memory. Moreover, the fatigue becomes more pervasive when the language switching is done rapidly (Alamgir et al., 2024). In this connection, as we reported above, as soon as the communication language switched to English, the pilots appeared taken aback, nervous, and hesitant when in need to engage with the observer-ATC, and their speech rate decreased substantially: signs, these, that strongly suggest the presence of fatigue.

In conclusion, the performance variation between the simulated engine failure scenarios in Turkish and English can be explained as the result of cognitive overloading coming from the simultaneous performance of tasks such as aviation, navigation, and system management while switching to their second language to communicate. As the pilots' working memory is limited, the overloading resulted in the negation of the communication tasks, as shown from Table 3.

4.4. Suggestion for testing and training

The findings reported in this study can offer useful insight into training and testing Aviation English. Piloting aircraft is a task from which derives great responsibility, in primis towards their own and any passengers' safety. In this, the ability to communicate effectively can make a difference in the ability to avoid or face danger. As the findings in this study show, however, holding the ICAO Operational proficiency level does not immediately translate into the ability to ensure effective communications, especially in situations where NNES pilots must manage several tasks taking up large portions of their working memory. It follows that Aviation English training should manage to build not only the ability to competently use phraseology and plain language, but also to lower the cognitive workload that ensues from speaking a non-native language. Consistent practice and exposure to the target language is already established as an effective method to reduce cognitive workload (Alamgir & al., 2024), and, in the case of Aviation English, Farris et al. (2008) highlighted how scaffolding techniques (that is, using a sequence of simple-to-complex activities related to a specific task) can help NNES pilots and controllers practice under real-life workload conditions avoiding cognitive overloading. Consequently, introducing drills and activities that progressively bring student pilots to communicate in English under situations of stress might be the key to ensuring safety communications during emergencies.

Given the stress that ICAO gives to communications in Aviation English and their importance for safety, it becomes surprising then, that none of the tests formats discussed above (ELPAC, TEA, RELTA) presents a section dealing solely with emergencies. By way of example, the ELPAC's pilot test - the only pilot test that is fully compliant with ICAO LPRs - is composed of two papers (Listening Comprehension and Oral Interaction), which do not test the English language proficiency in situations of stress or emergency. However, given the strong emphasis that ICAO places on safety, the authors of this article believe that Aviation English testing should instead focus more on non-standard situations and the pilots' ability to manage communications *while actually piloting*. This would imply the introduction of language testing in simulators, facing scenarios in controlled environments that resemble the one used to carry out this study.

Given the results discussed in this article, it is worth outlining what further research on this topic could do to better understand pilots' preparedness to communicate in emergency situations. This would require addressing the two main limitations of this study, namely, the pilot sample and the environmental set-up where the simulated scenario took place. More in detail, a larger sample of pilots would greatly enhance our understanding of the effectiveness of ICAO's Operational level and establish a more reliable statistical distribution of the elements of the Mayday call that pilots can successfully transfer during an emergency situation; on the other hand, testing pilots with a full-motion simulator would help create a more realistic emergency scenario and understand how pilots holding the Level 4 would communicate while managing kinetic stimuli.

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