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Investigating the Aviation English Needs of Ab-Initio Air Traffic Controllers

Arif TUNCAL[1]

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Abstract

The aim of the study was to investigate the Aviation English needs of ab-initio air traffic controllers by applying a needs analysis model from the field of English for Specific Purposes, which emphasizes three key dimensions: lacks, wants, and necessities. The participant group comprised 86 ab-initio air traffic controllers who were enrolled in course-based and university-based undergraduate education programs in Türkiye. The data were collected using a structured questionnaire employing a 5-point Likert scale. The results revealed that the highest average score was in the want dimension (M= 3.9163), indicating a strong internal motivation to improve Aviation English skills. The necessity dimension followed (M= 3.6964), showing that participants recognized the importance of meeting professional language requirements. The lack dimension received the lowest score (M= 3.5388), suggesting a moderate level of perceived language deficiencies. These findings point to the need for training programs that balance personal motivation with regulatory and operational standards. A well-designed Aviation English program should integrate learners' goals with the communication demands of the profession to enhance both language development and aviation safety.

Key Words: Air Traffic Controller, Aviation, Aviation English, Aviation English Training, Needs Analysis.

JEL Classification: I20, M10, M19.

Öğrenci Hava Trafik Kontrolörlerinin Havacılık İngilizcesi İhtiyaçlarının İncelenmesi

Öz

Çalışmanın amacı, özel amaçlı ingilizce alanında geliştirilen ve eksiklikler, istekler ile gereklilikler olmak üzere üç temel boyutu vurgulayan ihtiyaç analizi modeli aracılığıyla öğrenci hava trafik kontrolörlerinin havacılık ingilizcesi ihtiyaçlarını incelemektir. Araştırmanın katılımcı grubu Türkiye'de kurs ve üniversitelerde lisans programlarına kayıtlı 86 öğrenci hava trafik kontrolöründen oluşmaktadır. Veriler 5 dereceli Likert ölçeği kullanan yapılandırılmış bir soru formu aracılığıyla toplanmıştır. Bulgular en yüksek ortalama puanın istek boyutunda olduğunu göstermektedir (M= 3.9163). Bu durum havacılık ingilizcesi becerilerini geliştirmeye yönelik güçlü bir içsel motivasyonu işaret etmektedir. Bunu katılımcıların mesleki dil yeterliliklerini karşılama gerekliliğini fark ettiklerini ortaya koyan gereklilik boyutu izlemektedir (M= 3.6964). En düşük puanı alan eksiklik boyutu ise (M= 3.5388), algılanan dil yetersizliklerinin orta düzeyde olduğunu göstermektedir. Bu bulgular kişisel motivasyon ile düzenleyici ve operasyonel standartlar arasında bir denge kuran eğitim programlarına duyulan ihtiyacı işaret etmektedir. Etkili bir havacılık ingilizcesi programı öğrenenlerin bireysel hedeflerini mesleğin iletişimsel gereklilikleriyle bütünleştirerek hem dil gelişimini hem de havacılık emniyetini artırmayı hedeflemelidir.

Anahtar Kelimeler: Hava Trafik Kontrolörleri, Havacılık, Havacılık İngilizcesi, Havacılık İngilizcesi Eğitimi, İhtiyaç Analizi.

JEL Sınıflandırma: I20, M10, M19

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INTRODUCTION

Aviation is a dynamic industry that supports economic growth and social development by connecting people, countries, and cultures. These global connections help facilitate trade, promote tourism, and encourage cooperation between developed and developing regions (Camelia & Mihai, 2010). The development of aviation began with the first successful flights in the early twentieth century and has continued to advance through constant innovation and a strong focus on safety (Lohmann & Pereira, 2020). Important achievements such as the Wright brothers' first flight played a key role in shaping the early stages of the industry. Over time, aviation has become a complex global system supported by modern engineering (Raju et al., 2019), international regulations (Abeyratne, 2016; Paschke & Lutter, 2018), and standardized operational practices (Singh, Sharma & Parti, 2024). Alongside these technical and structural improvements, the growing complexity of the aviation environment has also shown the importance of clear and effective communication among professionals from diverse cultural and linguistic backgrounds. Within this dynamic industry, air traffic controllers hold an important responsibility in maintaining the safety and systematic management of air traffic operations. These professionals come from diverse cultural and linguistic backgrounds, which makes effective communication and coordination essential in ensuring safe and efficient air traffic services.

Charged with managing the safe and orderly movement of aircraft, air traffic controllers are often required to make decisions under considerable time pressure, balancing the competing goals of selecting the best possible option and doing so within a limited time frame (Johnson, Payne & Bettman, 1993). This decision-making process demands not only technical competency but also the effective use of cognitive abilities and social integrative skills to guide aircraft and organize a safe and efficient flow of traffic (Sanne, 2001). In addition to these operational competencies, communication emerges as a fundamental determinant of performance. To optimize the effectiveness of pilot-controller interactions, standardized aviation phraseology, English language competency, and domain-specific knowledge are essential components (Hamzah, 2021). In this regard, the development of professional competencies such as the correct use of standardized phraseology, listening comprehension, sustained concentration, and the ability to deliver instructions that are accurate, clear, and concise is essential for reducing communication errors and strengthening aviation safety (Yang, Chang & Chou, 2023). Although technological innovations such as data link communication, sophisticated air traffic control displays, and other advanced systems have significantly enhanced the technical infrastructure of air traffic control, the human element remains central to the system's effectiveness (Rodgers, 2017).

The aim of the study is to fill that gap by examining the Aviation English needs of ab-initio air traffic controllers in Türkiye, drawing on a needs analysis framework that differentiates among necessities, lacks, and wants. Particular attention is given to the role of personal motivation and professional expectations in shaping these needs, as well as to how ICAO's global standards intersect with local training practices and cultural dynamics. The findings are expected to guide curriculum designers, support ESP practitioners in evaluating and enhancing pedagogical strategies, and contribute to the development of contextually relevant

course materials that promote motivated, effective, and standardized communication in air traffic control.

1. LITERATURE REVIEW

Effective communication between air traffic controllers and pilots continues to be a fundamental component of aviation safety, as even minor errors in verbal exchange can lead to serious consequences (Prinzo & Britton, 1993). A key part of controller-pilot communication is the readback-hearback loop as shown in Figure 1, where pilots repeat instructions and controllers confirm their accuracy (Prinzo, Hendrix & Hendrix, 2008). The effectiveness of the loop depends on communication competency, including the correct use of standard phraseology, clear speech, and mutual understanding. Deficiencies in these skills can lead to misunderstandings and compromise safety. Therefore, enhancing communication competency is essential for ensuring the effectiveness and integrity of this safety-critical exchange.

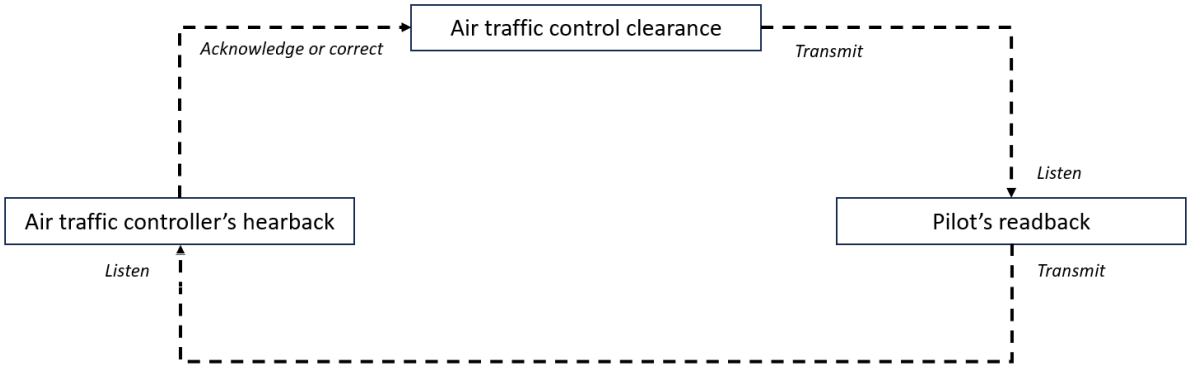

Figure 1. Readback-hearback Loop Between Air Traffic Controllers and Pilot

Considering the high stakes of air travel, the importance of standardized communication cannot be overstated. Graddol (2006) states that nearly 75% of flights occur between countries where English is not the main language, highlighting the significance of communication proficiency in Aviation English, especially for those participating in international aviation operations. Historical accidents, most notably the 1977 Tenerife disaster, clearly demonstrate how miscommunications can lead to catastrophic outcomes (Billings & Cheaney, 1981). In this particular incident, which remains the deadliest accident in aviation history, ambiguous phraseology and non-standard communication between the cockpit crew and air traffic control contributed to a fatal runway collision between two Boeing 747 aircraft. This tragedy highlighted the urgent need for globally harmonized aviation language protocols and strict adherence to standard phraseology. Subsequent accidents have further reinforced the critical role of effective communication in maintaining aviation safety. For example, the 1990 Avianca Flight 052 crash near New York was attributed in part to the flight crew's failure to communicate fuel emergency status in clear and assertive terms, which resulted in a misinterpretation by air traffic controllers and ultimately led to fuel exhaustion and a fatal crash (Helmreich, 1994). Similarly, the 1995

crash of American Airlines Flight 965 near Cali, Colombia, which caused the death of all 163 people on board, involved multiple contributing factors. Although the primary cause was identified as a navigation error by the American pilots, the Spanish-speaking air traffic controller failed to provide appropriate instructions. This failure was attributed to insufficient proficiency in English, and it was later acknowledged that more effective communication might have prevented the accident (Tajima, 2004). The 1996 Charkhi Dadri mid-air collision over India between Saudi Arabian Airlines Flight 763 and Kazakhstan Airlines Flight 1907 was caused by a breakdown in communication, compounded by limited English proficiency and non-compliance with air traffic control instructions. The 2006 collision at Brazil's upper airspace between Gol Transportes Aéreos Flight 1907 and a business jet, Embraer Legacy 600, also exposed the consequences of inadequate phraseology use and loss of situational awareness due to communication lapses (Mathews et al., 2023).

These tragic events prompted the aviation industry to increasingly adopt standardized phraseology and communication protocols aimed at minimizing ambiguity and enhancing clarity in operational contexts (Drayton & Coxhead, 2023). English has emerged as the de facto language of international aviation, a position shaped by significant historical developments in global air transport and reinforced by linguistic characteristics that promote precision and brevity in professional discourse (Alderson, 2011; Kraśnicka, 2016). As the designated lingua franca within the aviation sector, English serves a fundamental role in facilitating effective and reliable communication among pilots, air traffic controllers, and other aviation personnel operating in linguistically diverse environments (Campbell-Laird, 2004). Within this framework, Aviation English has developed as a specialized linguistic register designed to address the communicative and safety-related demands of aeronautical operations. In contrast to general English, Aviation English is defined by a controlled lexicon and formulaic structures that support unambiguous, concise, and context-specific exchanges during critical phases of flight (Tosqui-Lucks & de Carvalho, 2020). The codified nature of this communicative variety enables the mitigation of language-related misunderstandings and contributes to the standardization of communication across multicultural settings, thereby strengthening safety margins. Furthermore, effective proficiency in Aviation English extends beyond lexical knowledge to encompass phonological accuracy, prosodic features, and adherence to institutionalized communicative routines, all of which are integral to maintaining situational awareness and coordinated decision-making under time-constrained and high-stress conditions (Rankov, Jovanović, & Kapor, 2024). Accordingly, operational competency in both general and Aviation English is recognized as an essential professional qualification that directly influences the efficiency and safety of international aviation operations (Rashid & Teslenko, 2020).

Given its distinct communicative characteristics and critical operational role, Aviation English has been the subject of various scholarly definitions that reflect different disciplinary perspectives and practical considerations. While Aiguo (2008) defines Aviation English as a branch of English for Specific Purposes (ESP) with a clear focus on the aviation field, covering both standardized phraseology and plain language, Estival and Farris (2016) emphasize its functional nature, highlighting its use by both native and non-native English speakers in operational communication. In a similar context, Feak (2013) considers Aviation

English to be a spoken variety shaped by international guidelines, national policies, and instructional content. Moder (2012), on the other hand, conceptualizes Aviation English as the intersection of two forms: one that is simplified yet detailed for use in unexpected situations, and another that is limited and routine-based, both regulated through professional standards. Supporting this perspective, Cutting (2011) highlights that aviation professionals use standard features of English, including pronunciation, structure, and interaction, but these are adapted to meet the specific needs of aviation tasks and contexts. Aviation English cannot be considered a native language, as its use requires specific training and adherence to operational standards, regardless of the speaker's native proficiency in English (Seiler, 2009).

Recognizing the safety risks posed by miscommunication, international aviation authorities have emphasized the need for standardized language use. The International Civil Aviation Organization (ICAO) has played a central role in setting global Aviation English standards. Following several incidents in the late 1990s, ICAO identified inadequate English proficiency among pilots and air traffic controllers as a critical safety concern. This led to major regulatory amendments in 2003, a training and assessment manual in 2004, and the adoption of standardized testing systems in 2007 (ICAO, 2010). ICAO's Language Proficiency Requirements define minimum expectations based on the ICAO Rating Scale. Operational Level 4 is the baseline for certification and requires reassessment every three years, while Level 6 allows permanent qualification. The scale includes six components: pronunciation, grammar, vocabulary, fluency, comprehension, and interaction. At Level 4, speech may reflect accent but remains intelligible; grammar and vocabulary are adequate for standard operations; fluency may include some hesitation without disrupting flow; and comprehension is generally accurate in routine contexts. Interaction, in particular, involves timely and appropriate responses, as well as the ability to manage dialogue and resolve misunderstandings through effective communication strategies (Alderson, 2009).

In order to meet the ICAO-mandated proficiency standards, educational frameworks have increasingly relied on ESP methodologies tailored to aviation contexts. Training in ESP is designed to meet the specific academic or professional requirements of learners, emphasizing meaningful themes and real-world communicative tasks. Aviation English, as a specialized branch of ESP, focuses on the linguistic needs of aviation professionals by offering task-based and domain-specific content (Rochmawati, 2017). Due to the high-stakes nature of aviation communication, such training must extend beyond general language training to incorporate technical terminology, standardized phraseology, and intercultural competency (ICAO, 2010).

At the core of effective ESP training lies a thorough needs analysis (Rahman, 2015). This process is essential for identifying learners' existing proficiency, specific competencies required by their target context, and their personal goals and expectations (Basturkmen, 2010; Demirdöken, 2019). Needs analysis allows educators to tailor training content by determining learners' strengths, weaknesses, skills, and prior experiences with the English language (Sally & Pradana, 2019). Moreover, the process of needs analysis involves several stages, including problem definition, data collection planning, and the sequencing of relevant procedures (Brown, 2016). Contemporary approaches to ESP highlight the importance of

defining the target situation and studying the environment in which learners apply their language skills (Otilia & Brancusi, 2015). This ensures that the course content is both context-sensitive and learner-oriented. By grounding curriculum development in the principles of communicative competency, needs analysis helps to design a syllabus that reflects learners' needs (Astika, 1999). Additionally, needs analysis contributes directly to the construction of relevant learning tasks. Task design should stem from a clear understanding of learners' communicative needs within a particular professional domain or learner community (Malicka, Gilabert Guerrero & Norris, 2019). In this respect, needs analysis acts as a bridge between theoretical curriculum planning and practical language training, ensuring that learners acquire language skills that are immediately applicable to their future tasks. This learner-centered and systematic approach allows ESP training to become more effective, relevant, and aligned with the demands of specific professions such as aviation.

Considering the central role of needs analysis in ESP curriculum development, various theoretical models have been proposed to structure this process. Among them, one of the most influential was introduced by Hutchinson and Waters (1987), who categorized learners' needs into three main components: necessities, lacks, and wants. In this model, "necessities" refer to the essential skills and knowledge required for successful performance in a given target situation. "Lacks" point to the gaps between the learner's current abilities and these target requirements, whereas "wants" relate to the preferences and motivations expressed by learners themselves or identified by professionals involved in the educational process. This tripartite framework allows for a more comprehensive understanding of learner profiles and facilitates the design of tailored training programs. Beyond individual learner analysis, needs assessment also serves broader institutional goals. It enables educational stakeholders to examine the current state of curricula, programs, and teaching practices with a view to strategic improvement (Karababa & Karagül, 2013; Lambert, 2010). In this sense, needs analysis is not limited to language training but becomes a valuable tool for program evaluation and long-term planning. Moreover, the outcomes of a well-conducted needs analysis contribute to more effective course design by identifying learning barriers, defining course objectives, and selecting or adapting training materials (Ali & Salih, 2013; Macalister, 2012; Mahmoud, 2014; Wu, 2012). This process supports educators in aligning course content with both learners' actual needs and the communicative expectations of their target contexts. In domains such as aviation English, where communicative clarity and operational precision are vital for safety, the importance of a robust needs analysis becomes even more pronounced. However, the limited availability of domain-specific and contextually appropriate teaching materials continues to be a challenge. By incorporating multiple stakeholder perspectives, needs analysis provides a structured foundation for designing targeted courses. This approach helps address learning gaps by clarifying learner objectives and enabling instructors to prioritize training content accordingly (Dudley-Evans & St John, 1998; Lertchalermtipakoon, Wongsubun, & Kawinkoonlasate, 2021).

Given the growing demands of the global aviation industry, the need for highly competent air traffic controllers who can communicate effectively in English has become increasingly evident. In Türkiye, as in many other countries, Aviation English is integrated into the ab-

initio training phase to prepare future controllers for the linguistic demands of operating in international airspace. However, the success of this training depends largely on how well it reflects the specific linguistic and contextual needs of learners. To ensure such alignment, conducting a comprehensive needs analysis is essential. Without a clear understanding of the learners' communicative requirements, there is a risk that training programs may fall short of preparing controllers for real-world operational scenarios. Although Aviation English curricula are commonly shaped by the ICAO language proficiency requirements, the extent to which these standards are met in local contexts remains underexplored.

Despite this, existing research in the field of aviation communication and language has primarily focused on identifying and analyzing deviations from standardized phraseology (Cardosi, 1994; Cardosi, Brett & Han, 1996; Hamzah & Fei, 2018; Howard, 2008; Molesworth & Estival, 2015; Morrow, Lee & Rodvold, 1993; Morrow, Rodvold & Lee, 1994; Prinzo, 1996), which are recognized as key contributors to communication breakdowns in aviation operations. Further attention has also been paid to the role of clarity and pronunciation in ensuring mutual intelligibility, particularly in international and multilingual flight operations (Hamzah, 2021; Jenkins, 2000). These findings highlight the importance of designing training content that not only prioritizes correct phraseology but also addresses pronunciation and other operational aspects of communication. Despite this, limited research has addressed these needs within the Turkish context, particularly from the perspective of ICAO language proficiency requirements. Although Demirdöken (2019) and Sirin and Inan (2024) conducted a study exploring the ICAO language proficiency requirements for ab-initio pilots, no comparable research appears to have been carried out for ab-initio air traffic controllers. Given that effective communication in aviation is a shared responsibility between pilots and controllers, examining the language needs of both parties is critical. Therefore, identifying the specific linguistic challenges faced by ab-initio air traffic controllers represents an important step toward improving communication competency and promoting compliance with ICAO standards within the cultural and institutional context of Türkiye.

2. METHODOLOGY

2.1. Population-Sample

The study population consists of 240 ab-initio air traffic controllers currently enrolled in training programs at institutions authorized by the Directorate General of Civil Aviation of Türkiye, namely the General Directorate of State Airports Authority, Eskişehir Technical University, and İstanbul Nişantaşı University. At the General Directorate of State Airports Authority, ab-initio air traffic controllers begin their course based-training after graduating from university and meeting certain entry requirements. On the other hand, those studying at Eskişehir Technical University and İstanbul Nişantaşı University receive undergraduate education in air traffic control, where both operational training and Aviation English are part of the curriculum.

A convenience sampling method was employed for data collection. The data were gathered through an online questionnaire, which was distributed to participants via social media platforms commonly used by ab-initio air traffic controllers. Data collection took place

between October 2024 and April 2025. A total of 86 respondents completed the survey in full, and no data loss was observed.

2.2. Research Purpose

The study focuses on ab-initio air traffic controllers, who are in the early stages of their professional training and are currently developing the communication skills needed for their future roles in aviation. As clear and effective communication is essential for aviation safety, it is important to understand the level of Aviation English proficiency these trainees possess and to identify the specific areas where they experience difficulties. By examining their needs, the study aims to provide insights that can support the development of more targeted and effective language training programs. Grounded in the needs analysis model proposed by Hutchinson and Waters (1987), the research distinguishes among three dimensions of need: necessities, lacks, and wants. The primary goal of the research is to analyze the Aviation English needs of ab-initio air traffic controllers by identifying the challenges they face, the language skills they consider most important, and the aspects of training that can be improved. The study also aims to explore how personal motivation and professional expectations shape learners' perceptions of their language needs. Ultimately, the study aims to help improve the overall communication competency of future controllers, supporting safer and more efficient air traffic operations. By aligning training design with both learner motivation and industry standards, the findings are expected to contribute to more effective and context-specific Aviation English education.

2.3. Research Instruments

Information Form: The demographic information form included items designed to gather information on participants' gender, age, and ab-initio training type.

Aviation English Needs Analysis Questionnaire: The Aviation English Needs Analysis Questionnaire, developed by Demirdöken (2019), was used in the study. The questionnaire consists of 29 items divided into three sections, based on the classification by Hutchinson and Waters (1987), who categorized target needs into three types: lacks, wants, and necessities. The first section, comprising six items, aimed to identify learners' lacks, meaning the language skills they currently do not possess but need for the target situation. The second section, consisting of five items, focused on learners' wants, referring to the specific language skills they wish to acquire based on their own interests and goals. The third section, which included eighteen items, was designed to explore the necessities, that is, the language skills that are considered essential for functioning effectively in the target situation. All items were rated on a five-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). The Cronbach's alpha value for the questionnaire was calculated as 0.893, indicating high reliability.

2.4. Ethical Approval

Ethical approval for the study was granted by the Ethics Committee of International Science and Technology University. The approval was issued during the committee meeting held on October 18, 2024, under the decision number 202410-01.

3. FINDINGS

The demographic characteristics of the participants are presented in Table 1. In terms of gender distribution, 59.3% of the participants were male (n = 51), while 40.7% were female (n = 35). Regarding the type of ab-initio training pursued, 53.5% of the participants (n = 46) were enrolled in undergraduate education programs, whereas 46.5% (n = 40) were receiving course-based training. It is important to note that at the time of data collection, the participants had not yet completed their training programs and were still actively engaged in their educational processes. With respect to familiarity with Aviation English, 86.0% of the participants (n = 74) reported being familiar with the concept, while 14.0% (n = 12) indicated unfamiliarity. Similarly, when asked about their knowledge of ICAO language standards in aviation, 81.4% (n = 70) stated that they were familiar, whereas 18.6% (n = 16) reported a lack of familiarity.

The participants' mean age was 23.07 years (SD = 2.78). The relatively low standard deviation indicates that the age distribution was concentrated around the mean, reflecting a high degree of homogeneity among the participants.

Table 1. Demographic Characteristics of the Participants

		Frequency	Percent
Gender	Female	35	40.7
	Male	51	59.3
Ab-initio training type	University-based undergraduate education	46	53.5
	Course-based training	40	46.5
Are you familiar with Aviation English?	Yes	74	86.0
	No	12	14.0
Are you familiar with ICAO language standards in aviation?	Yes	70	81.4
	No	16	18.6

The Kaiser-Meyer-Olkin (KMO) and Bartlett's Test are presented in Table 2. KMO measure of sampling adequacy was calculated as .761, indicating a moderate level of sampling adequacy for conducting factor analysis. According to Kaiser (1974), a KMO value above .70 is considered acceptable, suggesting that the sample size is sufficient to produce reliable factors. Bartlett's Test of Sphericity was found to be statistically significant ($\chi^2(406) = 1424.77$, $p < .001$), confirming that the correlation matrix was not an identity matrix. This result indicates that the variables are significantly correlated and therefore suitable for factor analysis (Bartlett, 1954). Additionally, the cumulative percentage of variance explained by the extracted factors was 50.322%. In exploratory factor analysis, a cumulative variance above 50% is generally considered acceptable in the social sciences, as it reflects a satisfactory level of explanation of the total variance by the identified factors (Streiner, 1994). Therefore, the data were considered appropriate for further factor analysis procedures.

Table 2. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.761
Bartlett's Test of Sphericity	Approx. Chi-Square	1424.773
	df	406
	Sig.	.000

An exploratory factor analysis (EFA) was conducted to identify the fundamental structure of the Aviation English needs among ab-initio air traffic controllers. The factor loadings,

means (M), and standard deviations (SD) of each item are presented in Table 3. The exploratory factor analysis revealed a three-factor structure consistent with the theoretical framework of the original questionnaire. The first factor, labelled as Lacks, had factor loadings ranging from .460 to .793. The second factor, labelled as Wants, showed loadings between .552 and .674, while the third factor, labelled as Necessities, had loadings ranging from .388 to .786. All loadings exceeded the generally accepted minimum threshold of .30, which indicates that the items adequately represent their respective latent constructs (Büyüköztürk, 2020, Cassidy, 2016; Field, 2013).

Among all items, the highest mean score was observed for the item "*I can ask for clarification when I do not understand other people in terms of Aviation English*" (M = 4.13, SD = 0.682). This result suggests that participants feel confident in using communication strategies to resolve misunderstandings during interactions. This was followed by "*Oral communication is vital for me to be competent in Aviation English*" (M = 4.03, SD = 0.818) and "*I can ask for confirmation when a misunderstanding occurs*" (M = 4.02, SD = 0.735), indicating a strong perceived importance of effective oral interaction skills in aviation contexts. On the other hand, the lowest mean score was found for the item "*I need to improve my reading comprehension skill to meet the Aviation English language standards*" (M = 3.15, SD = 1.079). This may imply that participants perceive their reading abilities as relatively sufficient or consider them less critical compared to speaking and listening skills. This was followed by "*I need to improve my pronunciation more than the other skills in Aviation English*" (M = 3.20, SD = 1.038) and "*I can maintain fluent speech even in emergency/abnormal situations*" (M = 3.38, SD = 0.738), suggesting that fluency under pressure and pronunciation are seen as more challenging areas or lower priorities in their current learning needs.

Table 3. Means (M), Standard Deviations (SD), Factor Loadings, and Factor Distributions

		M	SD	F1	F2	F3
Lacks	1.I need to improve my pronunciation more than the other skills in Aviation English.	3.20	1.038	.663		
	2. I need to be a more fluent speaker of Aviation English.	3.83	.935	.694		
	3. I need to break through the difficulty of understanding different accents of aviators.	3.74	.785	.460		
	4. I need to improve my listening skill to meet the Aviation English language standards.	3.67	.900	.793		
	5. I need to improve my reading comprehension skill to meet the Aviation English language standards.	3.15	1.079	.597		
	6. I need to improve my oral communication skill to meet the Aviation English language standards.	3.64	.867	.792		
Wants	7. It is essential for me to comprehend what I read in order to meet the Aviation English language standards.	3.81	.819		.552	
	8. It is essential for me to comprehend oral messages in order to meet the Aviation English language standards.	3.92	.843		.669	

	9. It is vital for me to understand written aviation documents in order to meet the Aviation English language standards.	3.85	.976	.674	
	10. It is vital for me to understand aviation-related speeches in order to meet the Aviation English language standards.	3.97	.774	.615	
	11. Oral communication is vital for me to be competent in Aviation English.	4.03	.818	.603	
Necessities	12. I can speak Aviation English fluently.	3.52	.808		.433
	13. I can pronounce Aviation English terms correctly.	3.85	.712		.603
	14. My Aviation English accent is intelligible for other aviators.	3.78	.693		.435
	15. I can have good control of sentence patterns in Aviation English.	3.57	.695		.514
	16. My knowledge of Aviation English terms is enough to understand audio files related to Aviation English.	3.42	.677		.388
	17. My knowledge of Aviation English terms is enough to express myself to other aviators.	3.76	.650		.658
	18. My knowledge of Aviation English terms is enough to explain an emergency/abnormal situation.	3.65	.763		.710
	19. I can communicate with other aviators effectively.	3.74	.706		.774
	20. I can maintain fluent speech even in emergency/abnormal situations.	3.38	.738		.786
	21. I am a fluent English speaker in terms of aviation.	3.48	.763		.783
	22. I can respond to the questions of other aviators appropriately.	3.73	.562		.631
	23. I can maintain effective communication when I speak Aviation English.	3.69	.619		.628
	24. I can easily understand a speech related to aviation.	3.73	.640		.430
	25. I can ask for clarification when I do not understand other people in terms of Aviation English.	4.13	.682		.559
	26. I can easily inform other aviators on a topic related to aviation.	3.73	.658		.678
	27. My knowledge of Aviation English terms is enough to explain a problem.	3.69	.690		.702
	28. I can ask for confirmation when a misunderstanding occurs.	4.02	.735		.574
	29. I can express myself in black and white easily.	3.66	.806		.712

The mean scores, standard errors, and normality test values for the three dimensions of the Aviation English Needs Analysis are shown in Table 4. According to the findings, the highest mean score was observed in the wants dimension (M = 3.9163), followed by necessities (M = 3.6964) and lacks (M = 3.5388). This pattern suggests that ab-initio air

traffic controllers placed more emphasis on what they personally desire to improve in Aviation English, rather than on what they objectively lack or what is required by the job. The normality of the data was evaluated based on skewness and kurtosis values. As suggested by Tabachnick and Fidell (2013), values between -1.5 and +1.5 for both skewness and kurtosis indicate an acceptable level of normality. In the study, all three dimensions met this criterion. Specifically, the skewness and kurtosis values for lacks were .111 and -.336; for wants, .070 and -.785; and for necessities, -.162 and .219. These results confirm that the data were approximately normally distributed and therefore suitable for further parametric statistical analyses.

Table 4. Mean, Std. Error and Normality test

	Mean	Std. Error	Skewness	Kurtosis
Aviation English Needs Analysis- Lacks	3.5388	.07528	.111	-.336
Aviation English Needs Analysis- Wants	3.9163	.07068	.070	-.785
Aviation English Needs Analysis- Necessities	3.6964	.04794	-.162	.219

The reliability analysis results, shown in Table 5, indicate high internal consistency for each dimension. The Cronbach's alpha coefficients were .838 for the lacks dimension, .831 for the wants dimension, and .912 for the necessities dimension. The overall reliability for the entire questionnaire was found to be .881. According to Nunnally and Bernstein (1994), a Cronbach's alpha value above .70 is considered acceptable, and values above .80 indicate good reliability. Therefore, it can be stated that the Aviation English Needs Analysis Questionnaire demonstrated strong internal consistency across all dimensions and overall.

Table 5. Reliability Statistics

	Cronbach's Alpha
Aviation English Needs Analysis Questionnaire- Lacks Dimension	.838
Aviation English Needs Analysis Questionnaire- Wants Dimension	.831
Aviation English Needs Analysis Questionnaire- Necessities Dimension	.912
Aviation English Needs Analysis Questionnaire	.881

The results of the independent samples t-test comparing Aviation English needs between two distinct training modalities are presented in Table 6. Analysis indicates that course-based trainees reported slightly elevated mean scores across all dimensions, with values of 3.5542 for lacks, 3.9350 for wants, and 3.7556 for necessities. In contrast, ab-initio undergraduate trainees demonstrated marginally lower means of 3.5254, 3.90, and 3.6449 for the respective categories. Despite these numerical differences, statistical testing confirmed the absence of significant between-group differences ($p > .05$) in any of the assessed need dimensions, suggesting equivalent perceived requirements for Aviation English proficiency regardless of training approach.

Table 6. t-test Air Traffic Control Training Based of Aviation English Needs Analysis

	Training Modalities	n	Mean	Std. Deviation	t	p
Lacks	University-based undergraduate education	46	3.5254	.77377	-.190	.859
	Course-based training	40	3.5542	.60903		
Wants	University-based undergraduate education	46	3.9000	.71274	-.246	.807
	Course-based training	40	3.9350	.59120		
Necessities	University-based undergraduate education	46	3.6449	.48524	-1.153	.252

Course-based training	40	3.7556	.39037

4. DISCUSSION

The study offers important insights into the Aviation English needs of ab-initio air traffic controllers. The participants formed a demographically homogeneous group, which allowed the data to be interpreted consistently. Although they had not yet completed their formal training, many of these ab-initio air traffic controllers were already familiar with Aviation English and ICAO language standards. This early exposure may reflect a growing awareness of the importance of English communication in aviation, even at the initial stages of training. Language proficiency is a key factor in ensuring the safety and efficiency of air traffic operations (Barbieri, 2015).

Given the participants' existing familiarity with standard phraseology and regulations, it was important to examine their language needs in a more systematic way. To achieve this, the study employed the needs analysis model developed by Hutchinson and Waters (1987), which categorizes language needs into three components: necessities (target situation), lacks (present situation), and wants (learning situation). The mean scores obtained for each component were 3.9163 for wants, 3.6964 for necessities, and 3.5388 for lacks.

The finding that ab-initio air traffic controllers scored highest in the "wants" category suggests a strong motivation to improve their English language skills, primarily driven by personal interest and career development goals. This result is consistent with previous studies emphasizing the importance of motivation in ESP learning. For instance, Alizadeh (2016) highlights that motivation plays a central role in successful language acquisition, particularly in professional contexts where language proficiency is closely linked to performance outcomes. Similarly, Tomak and Pavelić (2017) found that learners who rated their English proficiency higher were also more motivated to learn the language, highlighting the link between perceived competency and motivation. In the specific context of air traffic control, where clear and accurate communication is critical for safety, such motivation becomes even more valuable. Furthermore, learner motivation can be enhanced through well-structured training design. As shown by Kabdrgalinova et al. (2023), effective motivation strategies in ESP settings contribute to more active and goal-oriented learners. Conversely, demotivating factors such as outdated teaching methods and lack of relevance, as identified by Hotak et al. (2024), may hinder progress. Therefore, the high motivation levels observed in the study should be supported by modern, context-specific, and learner-centered training programs to ensure sustained engagement and improved communication performance in operational environments.

Following this, the relatively high score observed in the "necessities" category suggests that the participants are aware of the external expectations of their future profession. Among these expectations, English language proficiency stands out as a critical requirement for ensuring safe and effective communication in international aviation. Language-related communication failures between pilots and air traffic controllers have been identified as contributing factors in approximately 70% to 80% of aviation accidents (Yan, 2013). This finding highlights the need to prioritize English language training in air traffic control education. In addition to its role in safety, English proficiency is also essential for developing

the professional communication skills required for accurate and clear information exchange, both verbally and in writing (Satvindar Singh, Cheong & Rahman, 2021). Furthermore, the ICAO (2010) has emphasized that limited English proficiency among flight crew or controllers has played a contributing role in the chain of events leading to several aviation accidents. Therefore, the participants' awareness of such linguistic and operational necessities may be interpreted as a positive indication of their orientation toward meeting international safety standards.

In contrast to the others, the "lacks" category received the lowest score, pointing to how participants assess their current skills in relation to the expected performance level. As Hutchinson and Waters (1987) explain, this dimension identifies the gap between what learners can currently do and what they need to be able to do. This low score may not indicate a lack of needs, but instead shows that learners have difficulty recognizing their own deficiencies. Self-assessment in second language testing has shown mixed results and can serve as an alternative to formal assessment, but its accuracy largely depends on the learner's familiarity with the skill being assessed (Ross, 1998). Without adequate training or reflective practice, learners may not be able to identify their language gaps effectively (Sadler, 1989). In addition, social desirability bias may also play a role, especially in contexts like Türkiye, where learners may avoid admitting weaknesses in self-reports (Crowne & Marlowe, 1960). These factors suggest that low "lacks" scores might not only indicate limited awareness but also reflect socio-cultural and instructional variables, which should be considered when designing Aviation English training programs.

Even though the mean scores for wants (M= 3.9163) and lacks (M= 3.5388) were relatively close, the higher score for wants suggests that learners are more aware of what they want to learn than of the areas they actually need to improve. Ab-initio air traffic controllers often show strong interest and motivation to learn; however, they may not clearly understand which specific skills require development. This situation may result from learners focusing more on their personal interests or what they find relevant, instead of making an objective assessment of their current weaknesses. The difference between perceived needs and actual skill gaps is widely recognized in research on goal-based learning. While intrinsic motivation, especially when related to learning goals, helps learners stay committed over time (Rawsthorne & Elliot, 1999), it may not be enough to ensure accurate self-evaluation of skill levels. Even highly motivated learners may continue learning with enthusiasm while overlooking important weaknesses. For this reason, training programs should include structured feedback and assessment tools to help learners identify and improve their specific areas of need. This approach can ensure that learner motivation is aligned with real learning goals.

Lastly, the comparison between training environments revealed no statistically significant differences in the needs perceptions of ab-initio air traffic controllers from university-based and course-based programs. This consistency suggests that, regardless of educational setting, learners share similar views about their Aviation English needs. One possible explanation is the common exposure to ICAO phraseology and international communication standards (ICAO, 2010), which likely shapes a shared understanding of required language competencies across institutions.

5. CONCLUSION

The study aimed to investigate the Aviation English needs of ab-initio air traffic controllers in Türkiye by applying a needs analysis model that distinguishes between lack, want, and necessity. The results revealed that personal motivation (wants) was the most dominant factor, followed by awareness of professional obligations (necessities) and a moderate perception of existing deficiencies (lacks). These findings highlight the importance of designing training programs that not only fulfill external regulatory requirements but also align with learners' internal motivation. When training content reflects both professional standards and individual learning goals, it can promote more effective and sustainable language acquisition.

In addition, the findings are consistent with ICAO's (2010) emphasis on standardized language proficiency as a foundation for safety and operational efficiency in aviation. Although learner enthusiasm is high, the study reveals a need for objective language assessments to complement self-reported evaluations. A training model that combines learners' perceptions with performance-based data may enhance communication effectiveness, promote safety, and support long-term career development in the aviation field.

5.1. Theoretical and Practical Implications

Theoretically, the study reinforces the importance of distinguishing among lack, want, and necessity in needs analysis frameworks, as advocated by Hutchinson and Waters (1987). The findings emphasize that effective ESP course design must integrate both subjective learner perspectives and objective professional standards, particularly in contexts where safety and operational clarity are vital, such as air traffic control.

Practically, the study suggests that Aviation English training programs should:

- Leverage learners' motivation: Incorporate engaging and context-specific materials that build on learners' high internal drive to improve their English skills. This emphasis reflects the prominent role of the "want" dimension in the findings.
- Align with professional requirements: Emphasize the necessity of meeting ICAO (2010) and other aviation-specific language proficiency standards. Adhering to such standards supports both operational safety and international communication efficiency.
- Use objective assessments: Complement self-reported needs with initial diagnostic evaluations and performance-based tests. This combination helps address actual language deficiencies and reduces the risk of overestimating or underestimating competency based on self-perception.

A comprehensive and competency-based training approach that combines personal learning goals with professional communication demands is essential for optimizing language development among air traffic controllers. Such integration contributes to both individual career advancement and overall aviation safety.

5.2. Limitations and Future Research

Several limitations should be acknowledged. First, the study relied on self-reported data, which may be influenced by biases such as overconfidence or limited self-awareness. To strengthen future findings, researchers are encouraged to include objective language assessments, such as standardized proficiency tests or operational communication simulations.

Second, the sample of the study consisted of 86 ab-initio air traffic controllers in Türkiye. Although this provides valuable insights within a national context, the limited sample size restricts the generalizability of the results. Future research could expand the scope by conducting similar studies in different countries using comparable tools, which would allow for cross-cultural comparison and broader applicability.

Third, the study adopted a cross-sectional design, capturing a single point in time. Future research may benefit from a longitudinal approach to observe how English language needs change over time, particularly after formal training or on-the-job experience. Additionally, incorporating qualitative methods, such as interviews or focus group discussions, could provide a more nuanced understanding of learner motivation, perceived challenges, and training expectations beyond what quantitative data alone can reveal.

Fourth, the study did not account for contextual variables such as institutional training policies, instructor qualifications, or variations in local operational language environments across different training facilities. These contextual factors can significantly influence learners' perceptions of language needs and their actual communication performance. Future research could adopt a more ecological approach by integrating institutional data or conducting multi-site comparisons to examine how organizational settings mediate language learning outcomes.

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