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Review Article

Pedagogical Approaches to Aviation English in Higher Education: A Systematic Review

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About Article

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ABSTRACT

This systematic review examines the pedagogical aspects of Aviation English in terms of how well teaching methods are assessed to meet real-world communication needs derived from the aviation industry. Seventy publications were identified using relevant databases following the PRISMA guidelines, of which 13 were selected for further detailed analysis. These content-based teachings included task-based, corpus-driven, simulation, and multimodal navigation. Almost unanimously, the theme was cultural skills, dealing with cognitive overload, and ensuring that learning is applicable to the real world of aviation. A large gap was also found between the way language skills are evaluated, as compiled in an ICAO standard, and the specific communicative demands of aviation industry professionals. While the implications of using technology in teaching and developing an inclusive cultural learning experience are encouraging, they have not been fully-explored. The findings point to a compromise between addressing variation and utilizing precise natural language to increase efficiency and safety. Educators, academics, and industry partners should work together to develop structured syllabi using applicable research in language learning and human cognition, along with applied knowledge in aviation training. The change will create a more realistic model of the type of communication challenges millennial aviation professionals are likely going to experience.

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1. INTRODUCTION

Aviation English is a specialized branch of language designed to ensure safety in international civil aviation and facilitate smooth communication between pilots, air traffic controllers (ATCOs), ground staff, and technical teams (Ragan, 1997). As a subfield of ESP, it aligns with the ICAO language requirements, emphasizing clarity, accuracy, and brevity (Alderson, 2009).

In contrast, purposive communication involves deliberate, audience-centered interactions focused on achieving specific objectives. Higher education, particularly in technical or professional programs, equips students with the skills to convey ideas clearly and concisely, both of which are essential for ensuring safety in aviation.

Beyond ICAO phraseology, Aviation English includes technical language used in aerospace engineering, procedural language for operations, and administrative communication such as flight clearances and ticketing (Ragan, 1997). As a global lingua franca, it operates in multilingual and multicultural settings, facilitating international teamwork, where miscommunication can have serious consequences (Tosqui-Lucks & Silva, 2020). Meeting these requirements implies an organization of linguistic formulas with predictive discourse as well as the development of mastery of vocabulary, pragmatic corpus patterns, and cultural literacy (Prado & Tosqui-Lucks, 2019). Pedagogies that focus on purposive communication are essential for preparing aviation professionals to work effectively in complex and high-stakes situations. However, little is known about how pedagogical innovations in Aviation English and purposive communication directly translate into measurable improvements in operational safety outcomes. This gap underscores the necessity for further research that bridges the divide between educational practices and real-world aviation performance, ensuring that language teaching contributes effectively to safer and more efficient aviation operations.

2. LITERATURE REVIEW

2.1. Pedagogy and curriculum design in aviation english

An important part of teaching Aviation English is linking the target language with actual use, including appropriate non-routine or emergency language. Addressing this challenge,

Prado and Tosqui-Lucks (2019) compiled the Radiotelephony Plain English Corpus (RTPEC), a spoken corpus of transcribed exchanges between pilots and controllers under non-routine circumstances. The corpus provides the primary dataset for real aeronautical communication and thus informs pedagogy design, enabling it to account for both the pragmatics of actual interaction as well as inherent challenges. In addition, it is also important to gain insight into the linguistic and cultural meanings behind these communications in terms of education. Understanding cultural issues is critical for error management and successful Crew Resource Management (CRM) training to foster a safety culture (Helmreich & Merritt, 2001).

Tosqui-Lucks and Silva (2020) highlighted the critical significance of conceptual equivalence in Aeronautical English. Their research indicates that treating Aeronautical English as a unique dialect influences educational content, assessment methods, and, crucially, aviation safety. This emphasizes the need for such a common research framework to improve how we educate and train pilots in the most effective way possible while training better air traffic controller communication skills. The study also supports the idea that language is what linguists and cognitive scientists consider “essentially social” and is most effectively learned in a social context. This strategy changes the emphasis from cognitive-process-centered models to an interactional view of language-based activity, which is more compatible with real communication in aviation, as Firth & Wagner contend (2007).

Tosqui-Lucks and Silva (2020) stressed the significance of achieving conceptual clarity in defining Aeronautical English. Their findings revealed that perceiving it as a distinct linguistic variety influences instructional content, assessment practices, and ultimately, safety outcomes. This highlights the pressing need for more standardized research to enhance teaching approaches and strengthen pilot-controller communication competencies. The point is further supported by the view that language should be approached as a social accomplishment, shifting emphasis from purely cognitive models to interaction-focused perspectives that more accurately reflect the authentic communicative demands of aviation (Firth & Wagner, 2007).

Table 1. Summary of key pedagogical approaches

Approach	Main Features	Outcome in Aviation English	Representative Study
TBLT	Authentic tasks, role-plays, simulations	Improved real-world performance	Prado & Tosqui-Lucks (2019), Xie & Lan (2025)
CLIL	Integrated content (aviation) and language	Enhanced contextual language learning	Tosqui-Lucks & Barbosa de Carvalho e Silva (2020)
Simulation-based	Virtual/physical simulations	Practical application of communication	Kohnke <i>et al.</i> (2021)
Collaborative Learning	Peer interaction, feedback, group tasks	Greater adaptability and teamwork skills	Tosqui-Lucks & Silva (2020), Kohnke <i>et al.</i> (2021)
Corpus-/Data-Driven	Analysis of authentic communications	Materials aligned with actual usage	Prado & Tosqui-Lucks (2019)



Culturally Aware	Integration of cultural understanding; awareness of diverse communication styles	Enhanced cross-cultural communication; improved safety and teamwork	Helmreich & Merritt (2001)
Interactionally Focused	Emphasis on social interaction and communicative competence; real-world contexts	Improved language acquisition; more effective communication skills	Firth & Wagner (2007)

2.2. Assessment and certification in aviation english

The global aviation community recognizes that language proficiency certification is critical in preventing communication breakdowns. As Alderson explains, the International Civil Aviation Organization (ICAO) introduced the Language Proficiency Requirements Rating Scale for air traffic controllers, establishing fixed deadlines for compliance and setting a baseline standard for competence in Aviation English. However, such efforts to develop professional testing norms and to produce assessment standards and instruments have not been well matched by monitoring of the quality of tests delivered or by interaction between agencies, which has led Alderson (2009) to ask how much efficacy policy measures may actually have on test quality.

Monteiro criticized the ICAO proficiency framework for not reflecting what is really being demanded of pilots and controllers in intercultural radiotelephony contexts. Monteiro moves towards a construct framework comprising awareness, knowledge, skills, and attitudes to operationalize proficiency constructs and task designs that mirror authentic workplace communication over time through multistage mixed methods. This strict perspective shows the difficulty of evaluating linguistic proficiency in this specialized, safety-critical field and indicates the need to rely on valid context-based diagnosis tools in higher education programs (Monteiro, 2019).

2.3. Challenges in communication and cognitive load

Effective communication in Aviation English is often hindered by environmental noise and mental strain associated with complex operational tasks. Molesworth *et al.* (2014) observed that background noise can significantly impair the cognitive performance of non-native English speakers in aviation settings. Their findings suggest that both instructional design and assessment practices should consider the disruptive effects of noise and the particular vulnerabilities of learners operating in a second language.

Similarly, the cognitive and psychological demands of aviation are well known. EEG/ERP studies have shown that processing multiple auditory and visual cues while carrying out concurrent control tasks in the case of being distracted would burden the cognitive system to a significant extent. This results in decreased cognitive resources and negative performance (Causse *et al.*, 2015). Therefore, Aviation English training should focus not only on language skills but also on techniques to better manage workload and maintain attention in cognitively difficult settings.

Given the many aviation safety issues, psychological research further supports the importance of stress and workload management. Developing capabilities in cognitive resilience

and stress management in Aviation English can provide learners with the skills needed to work well under operational pressure (Masi *et al.*, 2023).

2.4. Technology-enhanced learning and multimodal assessment

Recent advances in educational technology have opened up further possibilities for the delivery and assessment of Aviation English. Research demonstrates that multimodal composing of infographics promotes reflective learning processes and develops students' confidence in professional communication. This approach also follows Kohnke, Jarvis and Ting's (2021) multimodal pedagogy which implements a variety of media formats to represent the complexity of communication in professional real worlds and caters for differing learning styles. Such strategies mirror larger trends in higher education, which are mainly driven by changes in technology, as it impacts how knowledge is accessed and disseminated. If it wants to remain relevant, Aviation English pedagogy must include these tools to ensure that trainees are knowledgeable and meet the communication demands of an increasingly digital and operationally complex industry (Innovative Learning Environments in STEM Higher Education, 2021).

2.5. Comparative analysis of teaching and assessment strategies

In the literature, a broad set of methods has been used in Aviation English education, ranging from empirical corpus-based work to policy analysis and experimental classroom interventions. For example, Prado and Tosqui-Lucks laid the groundwork for a data-driven approach to aligning classroom materials with authentic operational language by creating the Radiotelephony Plain English Corpus. Alderson (2009), on the other hand, tackles language policy and standardized assessment frameworks, while Monteiro (2019) links theoretical construct development with practical task design to provide models that are suitable for both teaching and testing.

However, a central problem is that some pedagogical solutions cannot be applied in practice. For instance, using ICAO's standardized proficiency scales may fail to quantify the interactional and intercultural dimensions of pilot-controller communication. Lucks and Silva (2020) suggest that curricula should move beyond rigid rating systems to include socially oriented competencies, such as pragmatic awareness and the ability to adapt communication effectively when faced with unexpected situations.

Instructional design should consider both learner motivation and cognitive load, with noise recognized as another key factor influencing performance. The authors further provide evidence



that incorporating multimedia warm-up activities can improve students' attentional readiness for challenging Aviation English tasks, such as those presented in ICAO proficiency examinations (Seçer *et al.*, 2015).

2.6. Research gaps and future directions

Although much progress has been made in this area, various gaps remain. Some studies have focused on the effectiveness of Aviation English programs in practical operational settings. Most existing studies focus on language, cognitive (ecological), or policy aspects in isolation rather than integrating these dimensions into a unified approach. Future research should draw on related areas, such as second language acquisition, cognitive psychology, and operational aviation studies, to more fully conceptualize how pilots are taught.

This suggests the necessity of flexible, learner-centered strategies due to variability in non-native language proficiency and operational contexts. The few non-routine scenario corpora, such as those by Prado and Tosqui-Lucks, are constructive advancements but need further investigation for use in the context of classrooms and exams.

Integrating technology-based multimodal learning is in its infancy. Future research endeavors should include more

immersive and realistic tools that can mimic the environmental and cognitive stressors faced by controllers or pilots in real time. Policy research also describes the necessity of ongoing review to monitor changing communication standards and development alongside technology use in assessment practices (Turner & Hayes, 2007). Alderson (2009) further stresses that tertiary education ought to conform to ICAO stipulations and encourage an innovative type of teaching that is adaptable to limitations in examination systems.

3. METHODOLOGY

3.1. Search strategy

This systematic review was guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (PRISMA, 2020). The literature search focused on academic peer-reviewed publications on purposive communication in higher education and pedagogical approaches in aviation English. The searches were conducted for dates set to 2000-2025—order to include the latest developments in the field. Specialized and disciplinary databases were included in the search because the sources were very wide. The following databases and repositories were targeted based on indexing patterns in key references: strategies due to variability in non-native language.

Table 2. Key databases and sources for literature search on aviation english pedagogy

Database / Source	Primary Coverage / Purpose
Scopus	Multidisciplinary peer-reviewed journals and conference proceedings
Web of Science	High-impact journal coverage
EBSCOhost (Academic Search, Education Source, Humanities Source)	Education and linguistics-related works
ProQuest (ABI/INFORM, Education Database, Dissertations & Theses Global)	Journal articles and doctoral theses
ScienceDirect	Elsevier-published studies
PubMed	Research at the intersection of aviation communication and cognitive science
Cambridge Core	Annual Review of Applied Linguistics and similar publications
Wiley Online Library	TESOL Journal and The Modern Language Journal articles
SpringerLink	Educational innovations in STEM contexts
SciELO	Regional publications such as The ESpecialist
DOAJ	Open-access research in ESP and applied linguistics
Google Scholar	Supplementary retrieval and grey literature
Institutional Repositories	Dissertations not widely indexed elsewhere

Search terms used Boolean logic and truncation, combining domain-specific and pedagogical keywords:

- “Aviation English” AND “pedagogical approaches”
- “purposive communication” AND “higher education”
- “aviation communication” AND “assessment”
- “aviation English” AND “technology-enhanced learning”

3.2. Eligibility criteria

3.2.1. Inclusion criteria

- Publications in English.

- Pedagogies, Methodologies, or Assessment Models related to Aviation English and/or Specific Communications in Higher Education

- Peer-reviewed journal articles, conference proceedings, or academic theses.

- Empirical studies, theoretical papers, or systematic reviews with clear pedagogical implications.

3.2.2. Exclusion criteria

- Studies without an aviation or higher education context.



- ii. Opinion pieces, editorials, and non-peer-reviewed material.
- iii. Research on general English language teaching without aviation-specific content.

3.2. Study selection

There were 70 papers in the initial search. After removing duplicates using EndNote 21, 64 unique records remained. After title and abstract screening, 34 studies were excluded for not meeting the inclusion criteria.

The remaining 30 full-text articles were assessed for eligibility.

Of these, 17 were excluded because of the following reasons:

The study context was outside higher education ($n = 8$)

The pedagogical component was insufficiently developed ($n = 5$)

No empirical basis was provided ($n = 4$)

Thirteen studies met all the criteria and were included in the qualitative synthesis.

3.4. Data extraction and synthesis

A standardized extraction form recorded the following: author(s), year, publication type, study context, participant profile, pedagogical or assessment approach, technological integration, and the main findings. The studies were thematically grouped under instructional strategies, assessment frameworks, cognitive/environmental considerations, and intercultural competence. To highlight trends in methodology, identify gaps in research, and pinpoint common themes, the findings were summarized narratively.

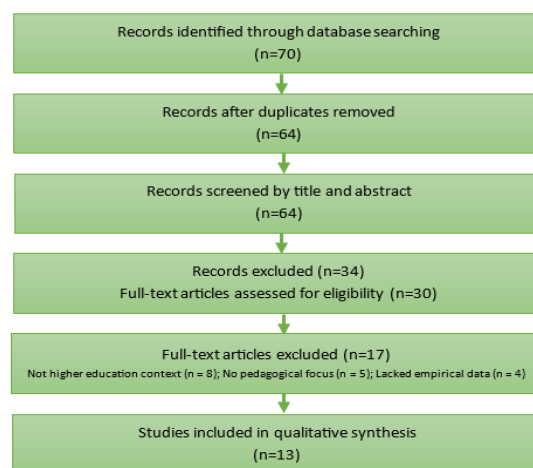


Figure 1. PRISMA flow diagram illustrating the identification, screening, eligibility, and inclusion of studies.

4. RESULTS AND DISCUSSION

The consolidated summary of recent research findings on pedagogical approaches in Aviation English is presented in the following table. This article describes the key concepts of successful teaching methodology, the place of technology integration, challenges in continued assessment, and benefits of thinking across disciplines. Every element is linked to example research studies that help to illustrate the practical application of these ideas.

Table 2. Summary of results and discussion in aviation english pedagogy

Aspect	Key Findings	Supporting Studies	Areas Needing for Research
Real-World Relevance of Pedagogy	Real-world scenarios significantly improve practical communication skills in Aviation English.	Prado & Tosqui-Lucks (2019)	Longitudinal studies on long-term impact of real-world scenario integration.
Conceptual Clarity	Clear definitions of Aeronautical English are crucial for effective teaching, assessment, and safety.	Tosqui-Lucks & Silva (2020)	Research on how differing definitions impact communication and safety.
Technology's Role	Simulations and digital tools enhance engagement and bridge theory-practice gaps, but long-term impacts require further study.	Kohnke <i>et al.</i> (2021)	Longitudinal studies on the long-term impact of technology on learning outcomes.
Communication Challenges	Noise and cognitive load disproportionately affect non-native speakers, necessitating context-aware pedagogy and assessment.	Molesworth <i>et al.</i> (2014)	Research on effective strategies for mitigating cognitive load in challenging environments.
Assessment and Certification	Current ICAO frameworks need better alignment with real-world communication demands for effective measurement of skills.	Alderson (2009)	Development and validation of assessment tools measuring real-world communication skills.
Interdisciplinary Integration	Future research needs to integrate language acquisition, cognitive psychology, and aviation operations for comprehensive pedagogical models.	Monteiro (2019)	Holistic models integrating linguistic, cognitive, and cultural factors.
Technology-enhanced Learning	Multimodal resources enhance engagement and real-world application but require further investigation into optimal integration strategies.	Kohnke <i>et al.</i> (2021)	Studies on optimal integration of multimodal tools across diverse learning contexts.



Research Gaps	Further interdisciplinary research is needed to fully integrate linguistic, cognitive, cultural, and policy dimensions in Aviation English education.	Yang & Huang (2023)	Studies exploring the unique communication needs of various aviation professionals (beyond pilot-controller).
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Building on these findings, it is important to critically examine the limitations inherent in current assessment frameworks, particularly the ICAO proficiency scales, and explore how higher education programs can adapt and expand their assessment models to better address the complex, real-world demands of aviation communication.

Although the ICAO Language Proficiency Requirements provide a standardized baseline essential for international aviation safety, their focus on fixed proficiency scales often fails to capture the dynamic, context-specific communicative competencies required in real-world pilot-controller interactions (Alderson, 2009; Monteiro, 2019). This limitation highlights the urgent need for higher education programs to develop more flexible and nuanced assessment frameworks that extend beyond the rigid ICAO metrics.

Higher education institutions might adapt their assessment models by integrating task-based and performance-oriented approaches that simulate authentic operational scenarios, thus evaluating learners' practical communication skills under pressure and varying cognitive loads. For example, incorporating corpus-driven analyses and simulation-based assessments can offer valid, context-aware insights into learners' pragmatic awareness and adaptability (Prado & Tosqui-Lucks, 2019; Kohnke *et al.*, 2021). Embedding culturally and interactionally focused competencies into assessment criteria will better prepare students for the multilingual and multicultural realities of aviation communication (Helmreich & Merritt, 2001; Firth & Wagner, 2007).

Ultimately, higher education programs should complement the ICAO standards by fostering reflective, multimodal, and interdisciplinary evaluation methods that acknowledge the social, cognitive, and technological dimensions of language use. This approach could lead to more valid, reliable, and pedagogically meaningful assessments that better align with the operational safety goals of the aviation industry.

5. CONCLUSION

The systematic review of pedagogical approaches in higher education related to Aviation English and Purposive Communication highlighted a dynamic field where work concentrates on achieving a balance between controlling linguistic precision, cognitive loads, and safety. Good teaching draws on data from corpus-based research, adheres to the principles regarding cognitive overload, motivational tactics, and assessment models, and meets ideological goals. Advancing this subfield will require interdisciplinary research and pedagogical innovation that equip students with the complexity and dynamism of actual aeronautical communications.

A stronger emphasis on measurable outcomes, cognitive and scientific inquiry, and technology-driven learning has the potential to produce more effective educational tools that

support safer and more efficient global aviation communications. This paper is a scholarly and comprehensive examination of higher-education-level Aviation English pedagogy, supported by established citation practices and backed up by an array of literature while being transparent about current shortcomings and potential research paths.

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