# Aviation English - A Global Perspective

## analysis, teaching, assessment

Patrícia Tosqui-Lucks
Juliana de Castro Santana
(Editors)

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# INTRODUCTION

This e-book brings together 13 chapters written by aviation English researchers and practitioners settled in six different countries, representing institutions and universities from around the globe. The idea of having this publication was conceived during the 8th GEIA Seminar, an event held online, in November 2021, as a consequence of the COVID-19 pandemic. In the next lines, we introduce GEIA research group, based in Brazil, followed by a brief explanation of the topics addressed in each chapter.

GEIA[1] is the "Aeronautical English Research Group", accredited by Brazil's National Council for Scientific and Technological Development (CNPq[2]) and maintained by ICEA[3], the Airspace Control Institute: a military organization of the Brazilian Air Force. It gathers researchers from different aviation authorities in Brazil, such as the Department of Airspace Control (DECEA)[4], ICEA and the National Civil Aviation Agency (ANAC[5]), and from prestigious universities spread throughout different parts of our country. This group aggregates research studies whose objective is to investigate different aspects of aeronautical English in the Brazilian context, divided into three areas of investigation: aviation language description and analysis; aeronautical English teaching and learning; aeronautical English testing and assessment. The group aims at studying topics such as:

- the description of the language used in pilot-ATCO radiotelephony communications that go beyond standard phraseology in non-routine and emergency situations, as well as the analysis of the impacts of this communication as a safety component in accidents and incidents, concerning human factors;
- the analysis of the content, syllabus, instructional material, and other elements of English courses/training offered to pilots and ATCOs, as well as of aviation English teacher training courses;
- the description and analysis of assessment tools used to evaluate pilots' and air traffic controllers' language proficiency for their jobs, test development and delivery, washback effect and rater's training;
- other related topics in the interface of aviation English, such English teaching for other aviation professionals, compilation of glossaries and

[1] GEIA stands for Grupo de Estudos em Inglês Aeronáutico, an acronym in Portuguese. Available at: ICEA - Subdiretoria de Ensino - GEIA - Grupo de Estudos em Inglês Aeronáutico (decea.mil.br)

[2] CNPq stands for Conselho Nacional de Desenvolvimento Científico e Tecnológico, an acronym in Portuguese.

[3] ICEA stands for Instituto de Controle do Espaço Aéreo, an acronym in Portuguese.

[4] DECEA stands for Departamento de Controle do Espaço Aéreo, an acronym in Portuguese.

[5] ANAC stands for Agência Nacional de Aviação Civil, an acronym in Portuguese.

other terminology tools, translation, contrastive analysis with other languages, etc.

It is important to emphasize that, for us, aviation English is an umbrella term that refers to the use of the English language by any aviation-related professionals, including not only pilots and ATCOs, but also mechanics, meteorologists, flight attendants, and others. Aeronautical English, by its turn, is the language used solely by air traffic controllers and pilots while controlling international traffic, and the object of the language proficiency requirements addressed by the International Civil Aviation Organization (ICAO) on Doc 9835[6] (2010). Other researchers from the international community have adopted this distinction in order to avoid misunderstanding[7]. This is why sometimes we use the term aviation English, to refer to research about aircrafct mechanicals or meteorology, for example; and sometimes we prefer the term aeronautical English to emphasize pilot-ATC communications.

The results from those studies have highlighted the development and improvement of English language teaching, learning, and assessment resources targeted at Brazilian air traffic control professionals, so as to ensure they are able to use English as a tool for safety in operations.

## Aviation English reflections in the pandemic

Since its inception, in 2013, every year GEIA promotes seminars in which group members discuss and share research results. These events are addressed to pilots, air traffic controllers, teachers, examiners, and all the community interested in teaching, learning and assessing aviation and aeronautical English.

Over the past couple years, humanity has faced a huge challenge. The COVID-19 pandemic scenario, which imposed lockdowns and social isolation, forcing people all over the world to change their ways of living, studying, working and connecting to others. It has dramatically affected aviation and, as a consequence, its training and testing devices worldwide. On-site courses and exams were canceled, postponed or adapted to the online format. New ways of training and testing had to be developed, using the tools and resources available, which have also been constantly improved too, to meet these new demands. Likewise, research groups have held their meetings online, and even events had to be adapted to rely on technology to survive.

This pandemic context has affected GEIA and its seminars too. In 2020, for the first time in six years we offered the seminar as a virtual event,

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[6] INTERNATIONAL CIVIL AVIATION ORGANIZATION/ICAO. 2010. Doc. 9835 AN/453: Manual on the implementation of ICAO language proficiency requirements. 2. ed. Montreal.

[7] Fore more information about it, see Tosqui-Lucks, P., & Silva, A. L. B. de C. e. (2020). Aeronautical English: Investigating the nature of this specific language in search of new heights. *The ESPecialist*, *41*(3). https://doi.org/10.23925/2318-7115.2020v41i3a2

the 7th GEIA Seminar[8]. On one hand, we had to get used to recording and watching videos and interacting asynchronously by written messages instead of attending on site presentations. On the other hand, space, time and money were no longer constraints. So, we decided to extend the enrollment, completely free of charge, to the international community. This change came in handy for some GEIA members who were living, working and studying overseas. Besides that, some of us are also members of the International Civil Aviation English Association (ICAEA)[9], which enabled other researchers to take part in our project involving the seminar itself and the publication of an Aviation English edition of a journal. The 7th GEIA Seminar focused on the launching of a special edition of the ESPecialist, a very important scientific journal in Brazil in the ESP (English for Specific Purposes) field. That special edition comprised 18 papers written by GEIA members and guest researchers, organized in two volumes (TOSQUI-LUCKS & PRADO, 2020[10]). The authors from ten different countries recorded videos about their papers for the 7th GEIA seminar, which had 242 attendees from 26 countries. We were delighted with the opportunity of gathering so many international participants who offered us valuable contributions, which would have been impossible otherwise.

In 2021, building on the success of the 7th GEIA Seminar, we decided to promote the 8th GEIA Seminar[11] completely online. The event brought together 18 lectures and presentations conducted by 25 speakers from eight different countries, as well as 404 attendees from 32 countries. That was such an accomplishment! Besides consolidating the audience we already had we were able to attract more people from other countries. After all, in spite of all its horrible outcomes, the COVID-19 pandemic hasn't stopped us; on the contrary, it has strengthened our group, by motivating us to go beyond our borders and innovating the way we had been used to carrying out our events.

This e-book is an offshoot of the 8th GEIA Seminar, that counts on the collaboration of GEIA and ICAEA researchers, as well as guest speakers. It brings together thirteen chapters focused on aviation language description, teaching, and assessment, written by practitioners from several institutions around the globe. One of our guests and a keynote speaker, Prof. Eric Friginal, added the excellent contribution of his graduate students from Georgia State University, in the USA, and kindly wrote the Preface.

Regarding its content, this e-book has been divided into three parts, according to GEIA's areas of research: language description and analysis; aeornautical English teaching; and assessment practices. In fact, this distinction is not to be taken in absolute terms, for most of the chapters address teaching and/or testing to some extent. It is meant to help the reader find the

[8] Available at: VII Seminário do GEIA (decea.mil.br)

[9] ICAEA – Supporting the use of English for aviation safety

[10] Tosqui-Lucks, P., & Prado, M. C. de A. 2020. New routes in the study of Aviation and Aeronautical English. *The ESPecialist*, *41*(3); *41(4).* https://doi.org/10.23925/2318-7115.2020v41i3a1

[11] Avialable at: VIII Seminário do GEIA (decea.mil.br)

topics that would be of their most interest, but we can assure that all chapters present high quality insights, are pleasant to read and thought provoking.

The first part of the book “Aviation English Language Description and Analysis” is composed of four chapters. The first one, “Replacing phraseology and plain language with technical vocabulary to inform language training in aviation”, by Jennifer Drayton, examines the Tower Aviation Radiotelephony Technical Vocabulary List (TARTVL) which provides a technical vocabulary lens for lexical analysis of radiotelephony transmissions. The analysis shows that standard phraseology and plain language are situational constructs. A matrix of language used in radiotelephony communication is presented and identifies standard, non-standard and relational language. Both: the matrix and the TARTVL are useful for language training to reduce variation in language use, especially in multilingual workplaces. Such training relies on the skills and knowledge of content and language instructors to provide practices that help reduce miscommunication in the workplace, therefore, contributing to safety in aviation.

The second chapter, called “Terminology of Aeronautical Meteorology Codes: a systematization by using *corpus*”, by Rafaela Rigaud Peixoto, offers a contribution to avoid misunderstandings regarding the criticality level of meteorological situations being communicated during air traffic operations. Her work is based on terminology and *corpora* theoretical foundations, and it aims at discussing definitions and translation to Portuguese of expressions and terms contained in Table 4678, concerning the main meteorology codes, as prescribed by the World Meteorological Organization (2011).

The study by Aline Pacheco, “Reported speech in Aviation English: an analysis through two specific *corpora*”, addresses the use of Reported Speech in aeronautical communications by analyzing the occurrences of this structure in two specialized corpora – CORPAC, the *Corpus* of Pilot and ATC Communications and RTPEC, the Radiotelephony and Plain English *Corpus*. The main findings reveal the most used reporting verbs and suggest that around 50% of the indirect reported clauses in aviation maintain the original tense. It seems to be evidence that pilots and ATCOs choose to report no changes in the *scenario*, when relaying information in a similar proportion to choosing to backshift. Such findings are quite important for aeronautical English teaching and learning, especially when developing resources and materials that depict real communication features and work-related activities.

Malila Prado and Adriana Mendes Porcellato’s chapter, entitled “When I land - if I ever land”: exploring if-clauses in Aeronautical English”, closes the first part of the book. The authors investigate *if-clauses* in a *corpus* of radio communications in abnormal situations in order to identify the functions they perform in plain aviation English and how they can affect aeronautical English teaching and assessment. A *corpus*-based analysis revealed that 60% of *if* occurrences in the *corpus* were employed in requests and orders, 22% in indirect questions, and only 18% expressed conditionality such as “When I

touch down / if I ever touch down / do I just kill the throttle or what?" For each of these three functions, they examined the structures in which *if* was used and compared them with traditionally taught conditional structures, without losing sight of aeronautical English pedagogical materials and resources from a real language use perspective.

The second part of the book presents four chapters with more empahasis on "Aviation English Teaching". The study called "A *corpus*-driven approach to Aviation English in pilot flight training", by Andrew Schneider, covers 53 hours of transcribed audio and video recordings of one-on-one, instructional communication in Aviation English between flight instructors and student pilots. Authentic linguistic data were collected in three key contexts of flight training operations: oral instructional activities, Flight Training Devices, and in-air flight. This paper shares the results of a quantitative, exploratory multi-dimensional analysis (MDA) comparing preliminary *Corpus* of Flight Training (CFT) data to other spoken and written registers of English. Preliminary findings suggest a strong overlap of flight training activities with the English registers related to involved persuasion and information interaction. These results can help improve target language usage for Aviation English assessments and inform *curricula* for *ab initio* pilots.

The second chapter, by Neil Bullock – "From the microphone to the classroom - ensuring that real-life communication is an integral part of teaching English to pilots and air traffic controllers" - highlights the need for teachers to carefully consider and identify students' real-life communicative needs when teaching English to pilots and ATCOs. It advocates for a more inclusive approach to understanding and using the broad range of communicative skills that both sets of students need for effective and efficient communication. This research offers tips and guidance to teachers by integrating real-life and scripted examples of communication in the classroom based on that used in real-life operational communication. The author concludes that a greater critical awareness of students' real-life professional communication can actually help in curriculum planning, material development and classroom practice.

The following chapter, "Games, *corpus* and medals – challenging and innovating experiences in Aeronautical English hybrid learning", by Patrícia Tosqui-Lucks, Juliana Santana and Patrícia Palhares Tupinambá de Sá, presents and describes an innovative training program developed during the COVID-19 pandemic, combining the hybrid mode and gamification. The authors discuss the conception, elaboration and implementation processes of five trainings, designed for Brazilian Air Traffic Controllers, and based on the ICAO Rating Scale (Pronunciation; Structure; Vocabulary; Comprehension; Fluency-and-Interaction). The synchronous part of the training was developed to offer a better understanding of the rating scale descriptors, whereas the elaboration of the game-like activities for the second part was data-driven. The data were composed of frequent mistakes compiled in corpora with authentic

oral productions. The gamification of aeronautical English for Specific Purposes has shown to be an engaging and more appealing environment for proficiency level elevation.

In the last chapter of the second part – "Microlearning on the fly: Aviation English via *Instagram*", the authors - the language expert Natalia Guerreiro and the air traffic controllers Stephanie Faria, Thalita Diniz and Thiago Silva - go over the creation of an aeronautical English online learning initiative called 'An eye on you', regularly displayed on the *Instagram* profile @ an.eye.on.you. The Brazilian Air Force organization responsible for approach and tower controls in the states of São Paulo and Rio de Janeiro has increased the use of online education modes during the COVID-19 pandemic context to explore aeronautical English microlearning opportunities. The lessons learned from the experience of making *Instagram* posts and managing continuous online learning are thoroughly presented.

The third part of the book gathers five chapters more focused on "Aviation English Testing". The First one, entitled "Test preparation issues in the aeronautical context in Brazil", by Ana Lígia Barbosa de Carvalho e Silva and Natalia de Andrade Raymundo aims at discussing the potential positive and negative aspects of Aeronautical English test preparation for ATCOs and civil pilots on both teachers and students, in the Brazilian scenario. The discussion is based on the premise that test preparation can play a positive role if learning-oriented and leading to meaningful test scores. The study pointed out that safety is the main aim of aeronautical English Training rather than simply passing a test.

The chapter called "Creating a rubric for placement tests for Aviation English programs", by Ashleigh Cox and Mehrnoush Karimi addresses the need for assessment tools that are designed to be placement tests for programs training English learners who are not yet at operational level 4. In order to do so, a speaking placement test rubric was developed using qualitative case study data. Recordings of four aviation students learning English as a second language were analyzed. Their ability to carry out pilot-ATCO dialogues, as well as their mistakes and miscommunication repairs were observed in light of communicative ability, aviation safety, and the ICAO proficiency descriptors. Based on these observations, the authors present some exploratory findings, implications for pedagogy and assessment, and some directions for placing aviation students into different levels of ESL classes.

The study by Angela Garcia, entitled "The listening construct: theories and implications to the assessment of pilots and ATCOs", discusses the main theories that have informed the definition of the listening construct in language testing, as well as some implications for the testing of pilots' listening comprehension, as required by the ICAO policy. Some characteristics of the listening construct on a theoretical level and features of the language used by pilots and ATCOs that are useful for listening test developers are also presented.

"The assessment of English in aeronautical radiotelephony communications: a mixed methods study", written by Ana Lúcia Tavares Monteiro, reports on a multiphase mixed methods study that investigated the proficiency construct (awareness, knowledge, skills, and attitudes) in pilot-ATCO intercultural RT, following Fulcher and Davidson's (2007) test development framework. The communicative demands of intercultural RT communications and how they are specified within a construct framework and operationalized as test tasks were explored. The author's findings emphasize the importance of a broader view of professional communicative competence for intercultural RT communication and for the test development process.

The last chapter of the book, "The ICAO scale and language testing for ab initio cadets: is there a fit?", by Maria Treadway, proposes a language assessment aligned with the ICAO rating scale and contextualized to the specific needs of NNES *ab initio* pilots entering English-medium flight training. The methods used to investigate the reliability of the ICAO scale within a training context and for a diagnostic testing purpose are examined, as well as the procedures undertaken to articulate and define threshold levels of performance within the target languase use domain. Findings suggest that the ICAO scale is not enough to distinguish levels of linguistic readiness among *ab initio* pilots, nor does it adequately reflect the knowledge, skills and abilities valued by subject matter experts (SMEs) within this domain, suggesting that a specific scale may be needed.

Last but not least, in the end of the book we reproduce an interview given by the GEIA Leader, Prof Patricia Tosqui-Lucks, to Natalia Guerreiro, responsible for the Aeronautical English Section of the Regional Center of Airspace Control Southeast (CRCEA-SE), in Sao Paulo. The interview was broadcast live for the *Instagram* site An Eye On You[12], in November 2021, right after the 8th GEIA Seminar.

The studies collected in this e-book offer us enriching and enlightening discussions that support and promote a better understanding of some key features underlying aviation English language, teaching and assessment practices. We are very pleased to make part of this work.

It goes without saying the importance of this e-book for the aviation English field and community. This international publication, besides collecting the studies and work experiences of renowned researches, has also contributed to strengthen the enriching partnership between GEIA members and other researchers. The fact of having been published as an e-book will certainly benefit its circulation and the spreading awareness of aviation English challenges, updates and findings. One of our goals is to *spread the news*, by making this ESP e-book free for download by as many people and institutions as possible worldwide. Those who place great weight on aeronautical English teaching and assessment practices are aware of the interwoven relation among operational issues, communication and safety. That's why we believe

[12] See more about it in the chapter "Microlearning on the fly: Aviation English via *Instagram*".

the discussions and analysis carried out throughout this book are so relevant and should reach international communities and organizations in all parts of the globe.

Enjoy your reading!

Patrícia Tosqui-Lucks

Juliana de Castro Santana

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- Our deepest gratitude to our readers, who will certainly help make this e-book become a reference in Aviation English.

# PREFACE

## THE 8TH GEIA SEMINAR AND SUCCESSFUL EXPLORATIONS OF THE DISCOURSE OF AERONAUTICAL COMMUNICATION

**Eric Friginal**

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## 1. INTRODUCTION

It was an honor for me to deliver one of the keynote addresses at the 8th GEIA Seminar! I thank the organizers, especially Patricia Tosqui-Lucks for the invitation, and I congratulate the members of the organizing committee, the presenters, sponsors, and all participants for a very successful and productive online seminar. I look forward to attending and actively participating in GEIA initiatives again in the future, hoping that we will all be able to meet in person and share the same discussion space and time together. Certainly, one very meaningful and dynamic way for us in this community to share knowledge and experiences is to continue organizing seminars and conferences, including publishing proceedings, despite major logistical challenges. These activities and strategies allow us to learn from peers about the groundbreaking, impactful, and meaningful solutions to our common problems and concerns. I believe that GEIA and its globally-distinguished scholars and researchers are on the right path, leading our industry to producing practical, highly credible, and directly useful teaching and learning materials for our immediate stakeholders.

The title of my keynote presentation was, “Linguistic Characteristics of Aeronautical Communications: Implications for Assessment, Policy, and Pedagogy.” I shared a summary of results from my on-going studies that examine linguistic characteristics and distributions from specialized corpora of English-based, cross-cultural aeronautical communications, highlighting their similarities and differences across related domains of professional workplace interactions such as maritime communications, health care discourses, and global telephone-based business interactions. I utilize a framework of corpus-based (critical) discourse analysis in exploring various discursive practices among the cultural structures and task dimensions of these registers, focusing especially upon speakers’ (e.g., pilots and air traffic controllers) understanding of identities, role-relationships, and power dynamics at work. I follow an iterative cycle which combines computational approaches to data extraction

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and a progression of stages involving quantitative and interpretive, functional analyses (Friginal et al., 2020; Friginal, 2021). This process has allowed me to examine the structure and meaning of cross-talk and how it can be further described and explained using evidence from corpora.

In studying the expansive discourse of global aviation, we need to strategically incorporate discourse analytic approaches grounded in applied linguistics and a combination of technology-mediated tools (including corpus tools and corpora) to capture and fully describe the nature of real-time aeronautical communications. Our results can articulate implications for language-based performance assessment, training and the production of teaching materials, and macro and micro language policies. All these have been covered successfully well by GEIA Seminar presentations over the years, but especially at this 8th iteration, highlighting the impact of corpora and corpus-based research (e.g., presentations by Prado and Porcellato; Tosqui-Lucks, Tupinamba, and Santana; Pacheco; Schneider; Peixoto, to name a few). I am very encouraged and certainly proud of these studies, given my training and specialization in applied corpus linguistics. I am also a founding co-editor-in-chief of the Applied Corpus Linguistics (ACORP) Journal, with Paul Thompson (University of Birmingham, UK), published by Elsevier. I look forward to publishing a special issue on aviation communications in ACORP in the very near future with help from GEIA scholars.

## 2. GEIA and explorations of the discourse of aeronautical communication

The discourse of global aeronautical communication, particularly the communicative processes at work between airline pilots and air-traffic controllers (ATCs) is markedly different from other registers (i.e., genres) of professional spoken language. The difference is not only in vocabulary and syntax, as this domain is also easily affected by high stakes workload, mode and level of urgency of talk, speech rate, and various human factors such as fatigue and working memory constraints (BARSHI & FARRIS, 2013). Despite its complexity, pilots and ATCs are typically able manage moving heavy pieces of machinery all over the world to permit global travel, troubleshoot emergency situations, and avoid accidents. For global aviation discourse to be successful, all interlocutors need shared operational knowledge and adequate language proficiency to complete communicative tasks, often in both their first language (L1) and in English (FRIGINAL et al., 2020).

As an industry which relies heavily on safe and effective communications to manage the tens of thousands of aircraft in the sky at any given point, the need to analyze the discourse of aviation, and transfer those findings to pedagogy, is evident (BREUL, 2013). This need is augmented by the phenomenal growth predicted for aviation in the coming decades. In the United States (U.S.) alone, the Federal Aviation Administration (FAA) estimated a growth rate of more than 50% in the next two decades, with the number of airline passengers increasing to 1.28 billion by 2038 (FAA, 2019) (data and

this information before the global pandemic of 2020-2021). The largest growth globally is forecast to be in regions which do not use the English language as a first or national language. In fact, Boeing predicts that of the 804,000 pilots needed in the next twenty years, 266,000 of them will be in the Asia-Pacific region, with large numbers also needed in other regions, such as the Middle East and Latin America, including Brazil (68,000 and 54,000, respectively) (BOEING, 2019). As new airways are opened and aviation becomes more of a viable industry to invest in for many countries, the airspace of the world, in turn, becomes much more multilingual and multicultural. More communication is occurring in the skies between native English speakers (NES) and non-native English speakers (NNES), as well as NNES and NNES in high-stakes, safety-critical contexts that rely on conciseness, accuracy, and the intercultural communicative competence to manage complex situations in a variety of work environments. In this communication setting, even small misunderstandings waste critical time, increase workloads, and congest already-crowded radio frequencies. Language issues have even proven to sometimes be contributory causes in fatal accidents (FRIGINAL et al., 2020).

My book, *English in Global Aviation: Context, Research, and Pedagogy* (FRIGINAL, 2019) co-written with Elizabeth Mathews and Jennifer Roberts (Embry-Riddle Aeronautical University) and with contributions from GEIA researchers, Patricia Tosqui-Lucks, Malila Prado, and Aline Pacheco focused on the major issues surrounding the use of English in the global aviation industry. Our goal was to draw clear connections between research and practice in Aviation English (AE), emphasizing evidence-based pedagogy across a variety of contexts, including the national and global policies impacting training and language assessment. Another important publication is Dominique Estival, Candace Farris, and Brett Molesworth's (2016) monograph, *Aviation English: A Lingua Franca for Pilots and Air-Traffic Controllers* which investigates ATC-pilot communications from a performance perspective based on several socio-cognitive factors, (mis)communication challenges based on the merging of human and equipment contexts, and a description of AE as a language variety. They also discuss how speakers may deviate from mandated phraseology from (or due to) contextual factors in actual practice. Estival, Farris, and Molesworth have collaborated on a number of related studies previously or have conducted their own extensive research, primarily based in Australia. For example, Molesworth and Estival (2015) investigated the relationship between four flight conditions including (1) pauses between items in ATC communication, (2) the number of items in a transmission, (3) pilot workload, and (4) the level of radio congestion and English L2 pilots' ability to communicate effectively without errors. They found that RT communication is both complex and "cognitively taxing", especially for English L2 speakers who face increased pressure when language performance is combined with other stressors related to high workload. When extremes in flight conditions are present, i.e. few to no pauses between items, high number of items in a transmission, high workload, and high levels of

radio congestion, etc., the language performance of all pilots - NS and NNES alike- deteriorates. Molesworth and Estival caution that the assumption that a pilot's communication skills will develop as he or she accumulates hours of flight experience is an erroneous and dangerous one. They suggest that communication performance should be judged upon a pilot's recall license qualifications instead.

GEIA has offered important contributions to this discussion with the publication of a special edition of the Brazilian Journal The ESPecialist (TOSQUI-LUCKS & PRADO, 2020 a, b) totally devoted to Aviation and Aeronautical English. This edition, organized in two volumes, had 17 papers written by researchers from 10 different countries. Among the papers, which addressed teaching, testing and language description, some tackled the discourse of aeronautical communication and used *Corpus Linguistics* as methodological or theoretical background.

## 3. How can we utilize corpus-based approaches in exploring and analyzing aeronautical communication?

*Corpus Linguistics* has become increasingly popular as a research approach that facilitates practical investigations of language variation and use, producing a range of reliable and generalizable linguistic data on the characteristic features of cross-cultural communication that can be extensively interpreted. The corpus linguistic approach makes use of methodological innovations that allow scholars to ask research questions across many cross-cultural settings. The findings these questions generate produce important perspectives on language variation from those taken in traditional, ethnographic studies (BIBER, REPPEN, & FRIGINAL, 2010; McENERY, XIAO, & TONO, 2006). Corpora have provided a strong support for the view that language use in cross-cultural, workplace communication is systematic, yet nuanced, and can be described more extensively using empirical, quantitative methods. One important contribution of the digital humanities to communication studies, therefore, is the documentation of the existence of cultural constructs that may strongly (i.e., statistically) influence language variation and use (FRIGINAL & LEYMARIE, 2020).

The word *corpus* has been used to refer to datasets comprising written and (transcribed) spoken texts. Instead of just being used to describe any collection of information, corpora are seen as systematically collected, naturally occurring samples of texts. It is important to emphasize that a logical corpus design attempts to fully represent the range of target language features in spoken and written texts necessary for users to come up with sound conclusions and interpretations. Over the years, the number of publicly available corpora online continues to increase exponentially, which researchers around the world can study and analyze (FRIGINAL & HARDY, 2014). Corpora of AE communication are still relatively rare or limited, especially those that are shared freely or publicly online. However, this is likely to change, given the

many online recordings, for example of pilot and ATC interactions available from various *YouTube* channels (e.g., VASAviation, accessible at: https://www.youtube.com/channel/UCuedf_fJVrOppky5gl3U6QQ).

Corpus linguistics is not, in itself, a model of language but is primarily a methodological approach that can be summarized according to the following considerations (BIBER, CONRAD & REPPEN, 1998, p. 4):

- It is empirical, analyzing the actual patterns of use in natural texts;
- It utilizes a large and principled collection of natural texts, known as a corpus (pl. corpora), as the basis for analysis;
- It makes extensive use of computers for analysis, employing both automatic and interactive techniques;
- It relies on the combination of quantitative and qualitative analytical techniques.

It is important to remember that, although corpora offer measurable, frequency-based descriptions of texts and cultural groups (depending on the nature and composition of the corpus), the researcher and subsequent readers of these studies must still interpret these corpus-informed findings qualitatively using nuanced interpretive techniques. Hence, corpus methodologies are often utilized in tandem with register-based methods in interpreting data based on contextual information, role-relationships, target audience, and other situational characteristics. This means that frequency and statistical distributions from corpora will have to be functionally and accurately interpreted. In an interview that I conducted with Douglas Biber, who I consider as the father of corpus linguistics in the U.S. (FRIGINAL, 2013, p. 119), he emphasized the importance of functional interpretation of corpus-based data:

> Quantitative patterns discovered through corpus analysis should always be subsequently interpreted in functional terms. In some corpus studies, quantitative findings are presented as the end of the story. I find this unsatisfactory. For me, quantitative patterns of linguistic variation exist because they reflect underlying functional differences, and a necessary final step in any corpus analysis should be the functional.

Corpora and corpus tools, therefore, provide various options to answer a wide range of our questions in researching the discourse of global aviation. Corpus-based analysis is “a methodology that uses corpus evidence as a repository of examples to expound, test or exemplify given

theoretical statements" (TOGNINI-BONELLI, 2001, p. 10). The development and now relatively easy access to computational tools (e.g., concordancers, part-of-speech taggers and parsers, linguistic data visualizers) that readily process huge volumes of texts make it possible to investigate prominent discourse characteristics of aeronautical talk and compare their distributions across various corpora and/or other communicative domains (FRIGINAL & LEYMARIE, 2020).

## 4. What's next for GEIA? Corpus-based analysis of Aviation English

There is an increasing number of published corpus-based studies of AE discourse especially focusing on pilot-ATC talk, although clearly, we do need to produce more. A seminal study using Biber and Conrad's (2009) framework for register analysis was conducted by Bieswanger (2016), demonstrating that the varieties of speech often referred to interchangeably as AE Standard Phraseology (SP) and "plain Aviation English," are in fact two distinct, specialized registers of spoken radiotelephony. A situational, contextual analysis revealed that in terms of speakers or participants, relations between participants, production, channel, and setting, the two varieties share significant similarities. However, analysis of communicative purpose (routine and non-routine) and the drivers of lexical choice dictated by topic, strongly suggested that these varieties are distinct registers. Linguistic and functional analyses determined that standardized phraseology, with its precisely prescribed vocabulary, grammatical structure, and pronunciation constraints designed for frequently occurring, routine communicative tasks, represents one end of a register continuum with conversational English on the opposite, unrestricted end. "Plain Aviation English", then, is characterized by topic and situationally restricted vocabulary and more flexible grammatical structure and pronunciation necessary in non-routine contexts. Thus, this register would fall somewhere between SP and conversational English, though it is situated closer to SP than to conversation (FRIGINAL et al., 2020).

Investigating the function of questions in pilot-ATC communication, Hinrich (2008) compiled a corpus of 24.5 hours of air traffic communications at the Toronto and Dublin airports. The aim of this dissertation was to examine how questions are used by air traffic controllers and pilots to repair and find or clarify miscommunications. Hinrich found that controllers do the majority of question asking to seek, repair, confirm, or clarify information or misunderstood or incomplete messages. Both pilots and ATCs relied mainly on syntax-interrogative forms such as WH-words (e.g., *who, what, where, etc.*) to query information. When rising intonation was utilized, it was frequently accompanied with the verbs *request*, *confirm*, or *verify*. Hinrich concluded that even though ICAO phraseology standards advocate for restricted syntax and intonation, in actual communication pilots and ATC the use of questions deviate from this recommendation. This study highlighted the need for corpus discourse analysis to more accurately identify which linguistic aspects constitute

successful communication in AE. Ferrer, Empinado, Calico, and Floro (2017) analyzed transcripts of pilot-ATC radiotelephony (RTF) communication in the Philippines from the country's Civil Aviation Authority and also conducted follow-up interviews with Filipino pilots and ATCs for qualitative analyses and comparisons. The researchers found that the lexical items *hold short, go ahead, affirm*, and *priority* have both standard and non-standard definitions in Philippine English, and, if misunderstood during interactions, could result in serious safety consequences. Both pilots and ATC participants in the study indicated that these items are used in non-standard phraseology most frequently in Route Clearance situations. The study concluded that trainees in the Philippines should be instructed on the importance of always using standard phraseology in all RTF communications involving these lexical items.

So, *what's next?* This 8th GEIA Seminar proceedings volume definitely addresses the global call for us to do more - conduct research across contexts, share our methods and findings in seminars and conferences, and focus on disseminating our studies extensively across platforms and venues. Although my *bias,* as I discussed here, is with corpus-based studies, we do need a combination and successful merging of all possible approaches in applied sciences and education. We have to work together, collaborate, and exchange ideas from multiple cultures and perspectives. That's what I experienced during my first GEIA Seminar in 2021 and I am excited to be back with the team again soon!

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## ABOUT THE WRITER

**Eric Friginal** is Professor and Head of the Department of English and Communication at the Hong Kong Polytechnic University. Before moving to Hong Kong, he was Professor and Director of International Programs at the Department of Applied Linguistics and ESL, College of Arts and Sciences at Georgia State University. He specializes in applied corpus linguistics, quantitative research, language policy and planning, technology and language teaching, sociolinguistics, cross-cultural communication, discipline-specific writing, and the analysis of spoken professional discourse in the workplace. His recent publications include The Routledge Handbook of Corpus Approaches to Discourse Analysis (2020), co-edited with Jack Hardy; Advances in Corpus-based Research on Academic Writing: Effects of Discipline, Register, and Writer Expertise, co-edited with Ute Römer and Viviana Cortes (2020); English in Global Aviation: Context, Research, and Pedagogy, with Elizabeth Mathews and Jennifer Roberts (2019); and Corpus Linguistics for English Teachers: New Tools, Online Resources, and Classroom Activities (2018). He is the founding co-editor-in-chief of Applied Corpus Linguistics (ACORP) Journal (with Paul Thompson).

# CONTENTS

# Aviation English Language Description and Analysis

PART I

# CHAPTER 1

# REPLACING PHRASEOLOGY AND PLAIN LANGUAGE WITH TECHNICAL VOCABULARY TO INFORM LANGUAGE TRAINING IN AVIATION

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**ABSTRACT –** The International Civil Aviation Organisation (ICAO) divides radiotelephony communication and the instructors who teach it, into two elements: standard phraseology taught by content instructors and plain language taught by language instructors. This divide means that it is unclear what language instructors should teach as plain language that would be beneficial in the workplace. This paper uses the Tower Aviation Radiotelephony Technical Vocabulary List (TARTVL) developed by Drayton and Coxhead (2022) to examine radiotelephony transmissions. The analysis shows that standard phraseology and plain language are situational constructs. The TARTVL provides a technical vocabulary lens for lexical analysis of radiotelephony transmissions. A matrix of language used in radiotelephony communication is presented and identifies standard, non-standard and relational language. The matrix and TARTVL are useful for language training to reduce variation in language use, especially in multilingual workplaces. Such training draws on the skills and knowledge of content and language instructors to provide training that helps reduce miscommunication in the workplace and ultimately, contributes to safety in aviation.

**KEYWORDS:** Aviation industry language training; Aviation technical vocabulary; Aviation communication; Aviation radiotelephony; Air traffic control.

## 1. INTRODUCTION

Radiotelephony language in aviation is divided into standard phraseology and plain language in International Civil Aviation Organisation (ICAO) documents (ICAO. 2007, 2010, 2016a, 2016b, 2018). This paper examines the consequences of that divide on language research and training in aviation. One consequence is that it is difficult to examine language use because communication cannot be neatly categorised into standard phraseology and plain language. Another consequence is that it is difficult to know what should be taught as plain language that meets the communicative needs of the aviation industry.

An alternative tool for examining language use is to identify technical vocabulary used in communication. The purpose of this paper is to highlight how a technical vocabulary lens can be used to better understand radiotelephony communication for training purposes in aviation. The paper describes the Tower Aviation Radiotelephony Technical Vocabulary List (TARTVL) that was developed by Drayton and Coxhead (2022a). The current paper is an extension of that research and analyses radiotelephony transmissions using the list. This analysis shows that standard phraseology and plain language are situational constructs rather than lexical constructs. Further, the lens shows that there is a difference between standard and non-standard language use in aviation and this is important because non-standard language is cited as a cause of miscommunication in aviation accidents and incidents. A matrix of language use, according to a technical vocabulary lens, is presented that clarifies the terms, standard and non-standard. The matrix also touches on relational language. Finally, how the examination of radiotelephony examples described in this paper can be used in aviation language training is described. This training would be useful in multilingual workplaces, since differences in language use that result in miscommunication are more likely in such a context.

## 2. LANGUAGE DIVISION AND TRAINING IN AVIATION

The division of language into standard phraseology and plain language applies, not only to the language, but also to those who work with it. ICAO states that standard phraseology is the preserve of operational personnel only. Since the remainder of the same document discusses language proficiency requirements and plain language in aviation, the implication is that plain language is the preserve of linguists and language instructors who must not teach, research or test standard phraseology:

> While standardized phraseology is a linguistic phenomenon and thus susceptible to linguistic analysis, it is also important to acknowledge that it represents a set of operational procedures. The linguistic analysis of phraseology must therefore recognize these operational constraints, whose adequate description belongs solely in the hands of qualified operational personnel (ICAO, 2010, p. 3.5).

This division appears to be the consequence of the same political process that negatively impacted the language proficiency requirements which underpin language testing in aviation (MODER & HALLECK, 2009).

In practice, dividing communication and personnel along these lines appears also to have negatively impacted language training in aviation.

One consequence is that the language used in aviation radiotelephony (two-way radio) communication is a relatively unexplored area of language training that requires better understanding (TOSQUI-LUCKS & SILVA, 2020; TRIPPE & BAESE-BERK, 2019). For language instructors, there is a lack of clarity around what they should teach as plain language to help improve communication over the radio (BULLOCK, 2015). Part of the problem in distinguishing plain language is definition. It is not well defined or understood (TRIPPE & BAESE-BERK, 2019) and appears to share two characteristics with standard phraseology. It is highly technical (ESTIVAL & FARRIS, 2016; ICAO, 2010) and should also be clear, concise and unambiguous (ESTIVAL & FARRIS, 2016; ICAO, 2016a). To complicate matters, the nature of standard phraseology is not well understood either (TOSQUI-LUCKS & SILVA, 2020). Essentially, the division is not useful for language training in aviation (TOSQUI-LUCKS & SILVA, 2020). In contrast to ICAO language policy, Tosqui-Lucks and Silva (2020) suggest that standard phraseology and plain language should be fundamental to language training (and testing) that addresses radiotelephony communication. Further, such training should draw on and combine the skills of operational (content) instructors and language instructors (BULLOCK, 2015; DRAYTON & COXHEAD, 2022A; TOSQUI-LUCKS & SILVA, 2020).

The objective of language training in aviation is to reduce miscommunication, so that it does not cause incidents or accidents. ICAO (2010) identifies three causes of miscommunication that have been a factor in aviation accidents. The first two are relevant to this paper:

a) incorrect use of standardized phraseologies;

b) lack of plain language proficiency (p. 1.1).

Lack of plain language proficiency underpins the language proficiency requirements set out in ICAO (2018). The incorrect use of standard phraseology has received less attention in the literature, yet was a cause in both the Cove Neck (ESTIVAL, 2016) and Tenerife disasters (AIRLINE PILOTS ASSOCIATION [ALPA], n.d.).

Intriguingly, the division between types of language and personnel also means causes of miscommunication are addressed separately in training. That is, standard phraseology is the preserve of content instructors and this is where incorrect use of standard phraseology would be addressed as a cause of miscommunication. Language proficiency is addressed by language instructors to remedy lack of plain language proficiency as a cause of miscommunication. In this way, the causes of miscommunication in aviation are also addressed by different instructors and treated, in language policy documents, as if they are separable and separate aspects of communication.

## 2.1. Impact on Research

In practice, categorising language use into standard phraseology and plain language is difficult. The first aspect of radiotelephony communication that creates difficulty is the scope of standard phraseology. It is written for routine standard operating procedures (MITSUTOMI & O'BRIEN, 2003) such as a phrase that clears an aircraft for take-off *(cleared for take-off).* Beyond the words to be used, the procedures also determine when and how the phrase should be used. For example, the word *take-off* can only be used when an aircraft is authorised to take-off or when cancelling a take-off clearance (ICAO, 2016b). There is no standard phraseology for non-routine situations that do not have standard operating procedures, e.g., although there are emergency procedures (ICAO, 2007), there are no procedures or standard phraseology that deal specifically with an engine fire emergency such as the one presented in Prado and Tosqui-Lucks (2019). Their study examines transcripts from a spoken Radiotelephony Plain English Corpus (RTFPEC) of aeronautical communication between air traffic controllers and pilots in non-routine situations. They were unable to determine where standard phraseology ended and plain language began, so opted to categorise the language that exceeds the limits of standard phraseology as plain language. This decision is in keeping with the mandate by ICAO that states: "Only when standardized phraseology cannot serve an intended transmission, plain language shall be used" (ICAO, 2016a, p. 5.1). Consequently, the following phrases, in the engine fire transcript, were categorized as plain language: *'We'll keep this heading for a while'* and '*we will … perform a normal circuit for runway zero three'* (PRADO & TOSQUI-LUCKS, 2019, p. 115).

I experienced similar issues when trying to divide a single radio transmission into standard phraseology and plain language. The transmission is from the spoken corpus of emergency simulator training in the United Arab Emirates (UAE) that was part of Drayton's (2021) research into the language air traffic controllers use in emergencies. The emergency was a medical one in which the co-pilot became incapacitated very soon after take-off and the aircraft had to return to the aerodrome. The controller is talking to the pilot who has just landed and is on the runway. Here is the transmission, broken down into two sentences:

(1) *You can ah* ***taxi*** *and* ***exit*** *at* ***Kilo****.*

(2) *Do you just want to* ***hold*** *on* ***taxiway bravo*** *then?*

We can choose to label the transmission plain language since it occurred within the context of a non-routine situation and there is no standard phraseology for use in a medical emergency such as this one. However, as language instructors, we may want to know how we can use this 'plain language' in our teaching. Should we present it, uncritically, as an example of

language use in aviation radiotelephony? Should we highlight the relational language *Do you just want to* or *you can?* (LOPEZ ET AL., 2013; MODER, 2013). Can we go further?

Instead of categorising the entire transmission as plain language, should we, instead, stray into an examination of standard phraseology? We could try to identify what parts of it are standard phraseology. In doing this, we first note that neither sentence matches phrases in *ICAO Document 9432 Manual of Aviation Radiotelephony* or *ICAO Document 4444 Procedures for air navigation services: Air traffic management*. However, the words *taxi, exit, delta, hold, taxiway* and *tango* (highlighted in ***bold italics*** above) are content words that convey meaning (NATION, 2013). Should we count these single words as standard phraseology, since they have specialist aviation meanings? Standard phraseology is presented as a series of phrases related to routine standard operating procedures (ICAO, 2007, 2010, 2016; MITSUTOMI & O'BRIEN, 2003), so can single words be standard phraseology? If single technical words (those with a specialist aviation meaning) are standard phraseology, why is plain language described as highly technical (ESTIVAL & FARRIS, 2016; ICAO, 2010)? Just as Prado and Tosqui-Lucks (2019) found, it is difficult to identify the limits of standard phraseology and plain language. Further, the process highlights a lack of clarity around what constitutes standard phraseology despite the fact that standard phraseology is clearly defined (TRIPPE & BAESE-BERK, 2019), at least in terms of what language matches a particular standard operating procedure. The constructs of standard phraseology and plain language do not provide a practical tool for examining language use in aviation. Consequently, we are no closer to our goal of identifying what to teach in an aviation radiotelephony language course.

## 3. APPLICATION OF A TECHNICAL VOCABULARY LENS

An alternative approach is to use a technical vocabulary lens to examine language use. Technical vocabulary is specific to a field and conveys essential information in that field (For more information, see: COXHEAD, 2018; COXHEAD et al, 2020; NATION 2023, 2016; NATION and WEBB, 2011; SCHMITT, 2010). A paper by Drayton and Coxhead (2022a) gives a detailed description of technical vocabulary found in ICAO standard phraseology. They used corpus analysis to create the Tower Aviation Radiotelephony Technical Vocabulary List (TARTVL). Their corpus consisted of ICAO standard phraseology exemplars contained in the *ICAO Document 9432 Manual of Radiotelephony* (ICAO, 2007) and the United Arab Emirates General Civil Aviation Authority (GCAA) *CAAP 69 UAE Radiotelephony Standards* document (GCAA, 2018). The list is not exhaustive, but contains five categories of technical vocabulary contained in ICAO standard phraseology. This vocabulary forms the TARTVL and includes: 219 words e.g. *proceed*, 17 number classifications e.g. *squawk codes*, 16 multiword units e.g. *say again*,

11 proper noun classifications e.g. *aircraft type* and 11 acronyms e.g. *VFR (visual flight rules)* (DRAYTON & COXHEAD, 2022a).

We can apply the list to the engine fire emergency discussed above. Here are the transmissions with the technical vocabulary highlighted in bold: *'We'll keep this* ***heading*** *for a while'* and '*we will … perform a normal* ***circuit*** *for* ***runway zero three****'.* This shows that the same technical vocabulary can be found in standard phraseology and in plain language. That is, the same words and numbers are used to convey meaning in routine and non-routine situations. In other words, standard phraseology and plain language are situational constructs rather than lexical constructs. It is little wonder that, in grappling with these concepts, linguists have found it difficult to establish what should be taught (and tested) as plain language in aviation. The identification of technical vocabulary may provide a simple solution to this problem.

The medical emergency transmission from Drayton's (2021) study, can also be examined using a technical vocabulary lens. The analysis presented here was in consultation with an air traffic control colleague. We were able to identify technical vocabulary and non-standard language use in the transmission. In standard phraseology, the word *taxi* is used to direct a pilot to move an aircraft from one part of the aerodrome to another using taxiways since aircraft *taxi*, but vehicles *proceed* (ICAO, 2016b). However, in standard phraseology, the word for instructing an aircraft to leave the runway is *vacate.* The word *exit* is used as a noun in standard phraseology to describe a position, *at Exit Kilo* (ICAO, 2007, p. 5.2), but in the example it is used as a verb. To direct an aircraft to stop on a taxiway, standard phraseology uses *hold position* (ICAO, 2007, 2016b), but in sentence (2) this was shortened to *hold*. *Confirm* is used in standard phraseology to find out what the pilot wants to do and replaces *Do you just….* Communication that uses the correct technical vocabulary would differ from the original transmission as follows:

(1) ***Vacate*** *at* ***kilo.***

(2) ***Confirm*** *you will/want to* ***hold position*** *on* ***taxiway bravo*** (Peter McCrostie, Air Traffic Controller, personal communication).

Table 1 provides a simple matrix to demonstrate language use in aviation according to a technical vocabulary lens. The table examines language use discussed in this paper, but it is incomplete, since an examination of the use of general English to clarify communication, when required, is beyond the scope of the current paper. As shown in Table 1, standard language use occurs when the technical vocabulary (*vacate, confirm, hold position*) is used in circumstances for which it was designed. In other words, the term **standard (language)** applies to the correct use of technical vocabulary. Table 1 shows that non-standard language use occurs when technical words are used incorrectly and/or other words replace the technical vocabulary. *Taxi* and

*hold* are both technical words found in the TARTVL, but were used instead of *vacate* and *hold position. Confirm* was replaced by *do you just*. The term **non-standard (language)** applies to non-use or incorrect use of technical vocabulary. As we saw above, the incorrect use of standard phraseology is a cause of miscommunication in aviation accidents and incidents (ICAO, 2010). Put another way, not using/ incorrect use of technical vocabulary is a cause of miscommunication. Further, this example shows that the use of technical vocabulary contained in the TARTVL would also have made the message more concise which is one objective of radiotelephony communication (ICAO, 2016). One further point is that the technical vocabulary is essential for conveying meaning regardless of whether it occurs in a routine or non-routine situation (DRAYTON & COXHEAD, 2022a).

**Table 1.** Matrix of Language Use in Aviation Radiotelephony Communication

| Nature of language use | How language is used |
|---|---|
| Standard | Technical words are used to convey their aviation radiotelephony meaning e.g. *vacate, confirm* |
| Non-standard | Technical vocabulary is used incorrectly or other words replace technical vocabulary e.g. *taxi and exit, do you just* |
| Relational | Use of personal pronouns; courteous language e.g. *you can; do you just* |

Author, 2022

The development of a relationship with pilots through the use of relational language (see Table 1) is another aspect of communication examined in research. Aviation personnel maintain cooperative relationships (HANSEN-SCHIRRA, 2013; LOPEZ et al., 2013; MODER, 2013) through the use of politeness markers (INTEMANN, 2008; MODER, 2013) or language that courteously conveys authority such as the use of modals including 'could', 'should', 'may' and 'might' as well as 'you can' (LOPEZ et al., 2013), used in the above example. However, another study shows that the further from standard phraseology that *communication* strays, the more likely it is that miscommunication will occur (HOWARD, 2008). In fact, Howard (2008) identifies relational language as a factor that causes miscommunication. The key here, is that technical vocabulary is essential to communication that is clear, concise and unambiguous. It should not be replaced with relational language as it does in the transmission presented here. As a consequence, *do you just* is both relational and non-standard, since it replaces *confirm.* In this transmission, relational language is prioritised over the use of technical/ standard vocabulary. If relational language is more likely to cause miscommunication, then it should not be prioritised ahead of standard language. However, it might be possible to use courteous language with

technical vocabulary to satisfy both standard and relational communication requirements. Such a transmission might be said: *You can* ***vacate*** *at* ***kilo****. **Confirm** you want to/ will **hold position** at **taxiway bravo**.* In this case, the use of technical/ standard language is at the forefront of communication and means that safety is less likely to be compromised, since the technical vocabulary should be universally understood.

## 4. TECHNICAL VOCABULARY IN LANGUAGE TRAINING

Training that identifies technical vocabulary and its use in aviation radiotelephony communication is essential for multilingual workplaces. Miscommunication in these workplaces is likely to occur more often than in monolingual workplaces (TRIPPE & BAESE-BERK, 2019). In one study, controllers that worked in multilingual workplaces held contradictory beliefs about language use in aviation that were a reflection of similar contradictions in ICAO documents (DRAYTON & COXHEAD, 2022b). These contradictions are likely to lead to differences in language use between aviation personnel that could ultimately lead to miscommunication. Further, these beliefs are perpetuated in training, thus perpetuating differences in language use and increasing the likelihood of miscommunication (DRAYTON & COXHEAD, 2022b). To help address this problem native English speakers (NES) need to be trained to use more standard phraseology in their communication (CLARK, 2017; MODER & HALLECK, 2009). This requirement could be rephrased to say that NES training needs to encourage standard language use i.e. the correct use of technical vocabulary (see Table 1). It seems that language training is needed to close the communication gap created by differences in language use, especially in multilingual workplaces.

The objective of this training is to reduce variation in language use in communication and to ensure that the meaning is understood by all participants. Just as in the analysis above, the training should combine the skills of content and language instructors to identify the language used and how it could be used more effectively. The TARTVL and matrix presented in Table 1 also provide useful tools to aid this process. In their paper, Drayton and Coxhead (2022a) demonstrate how the TARTVL could be used with a radiotelephony extract to address the training needs of experienced NES as well as ab initio NES and non-native English speakers (NNES) in aviation. The medical and engine fire transmissions above could also be used for similar purposes. They could be used with ab initio trainees to identify technical vocabulary and demonstrate the importance of its role in communicating precise and consistent meaning in aviation. For all aviation personnel (regardless of language background), the medical emergency transmission could be used to highlight the difference between standard and non-standard language use. Further, the transmission demonstrates how standard language should be prioritised over relational language, but that relational language could still be used. Other extracts would be equally useful to meet training needs for

greater standardisation of language. For example, Drayton and Coxhead (2022a) identified how colloquial language in a radiotelephony extract could be replaced with technical vocabulary such as *you will let me know* with *say/ request intentions*.

## 5. CONCLUSION

Currently, radiotelephony communication is artificially divided into standard phraseology and plain language with each element (mostly) addressed separately in training by content instructors and language instructors. Further, the causes of miscommunication should be addressed separately according to this division. The analysis in this paper demonstrates that the divide is unsatisfactory and does not contribute to industry aims for greater safety in aviation. The divide has created a lack of clarity in policy documents around language use and training. In the interests of safety, it may be time to re-examine this division in favour of a position that combines the talents and skills of operational and linguistic experts (KNOCH, 2014) to enable richer language analyses and consequent training. A more holistic view of aviation communication is needed. The Tower Aviation Radiotelephony Technical Vocabulary List presented by Drayton and Coxhead (2022a), and briefly outlined here, provides a lexical tool for language analysis that may contribute to a holistic lens. Use of a technical vocabulary lens also resulted in a matrix of language use in radiotelephony communication that describes standard, non-standard and relational language use. A technical vocabulary lens presents a unifying way to examine aviation radiotelephony communication in order to meet the language training needs of aviation personnel.

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# CHAPTER 2

# CORPUS SYSTEMATIZATION: A DISCUSSION ON VALIDATION OF AERONAUTICAL METEOROLOGY TERMINOLOGY AT INSTITUTIONAL SETTINGS[1]

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**ABSTRACT –** Standardizing terminology is very important to maintain the accuracy of information being disseminated, mainly in specialized fields and at institutional settings. In the case of Aeronautical Meteorology, it is a very specific domain in the Aviation broader area, and it could comprise distinct classifications of the same term (PEIXOTO, 2020). In addition to that, there is scarce literature on Aeronautical Meteorology in Portuguese language. In light of this, the use of corpora may pose very positive influence to best relate normative and descriptive use of language. Taking this into account, this work is based on terminology (PAVEL; NOLET, 2001; CABRÉ, 1999, 2003) and corpora (SANTOS, 2008, 2014; TOGNINI-BONELLI, 2001; TAGNIN, 2013, 2015) theoretical foundations, and it aims at discussing definitions and translation to Portuguese of expressions and terms contained in Table 4678, concerning the main meteorology codes, as prescribed by the World Meteorological Organization (2011). As a result, a systematization for terminological procedures is proposed, by using corpora with set validation standards. In this way, this paper intends to be a contribution to avoid misunderstandings regarding the criticality level of meteorological situations being communicated during air traffic operations.

**KEYWORDS:** Corpus linguistics; Terminology; Aviation; Aeronautical meteorology.

## 1. INTRODUCTION

Corpus linguistics is a very resourceful methodological approach to assess language in several contexts, as it enables broader systematization to identify linguistic patterns and parameters, in both general and specialized language.

As applied to the specialized field of aviation, corpus linguistics could be used to identify and validate aeronautical meteorology terminology, especially when used at

[1] This paper is a shortened and revised version of Peixoto (2021).

institutional settings.

This idea of systematization takes into account what a given pattern of language use means, and how it can be evaluated in terms of typicity in a given system. In other words, language features have to be understood as the probability to happen in a general context or in a certain domain, not as a "fatalistic" evaluation of occurrences, of happening vs. not happening at all. As Tognini-Bonelli (2001, p. 57) points out, "presence or absence is one thing, but frequency is another", which prompts the understanding of making efforts on how to analyze language patterns in a more contextualized way, also taking into consideration how a given corpus is compiled (TAGNIN, 2015).

When it comes to specialized fields, establishing a normalized terminology is one of the most relevant elements to ensure information is being disseminated as most accurately as possible. In this sense, in the field of aviation, a safety-critical environment, the broad use of corpora may pose very positive influence to best relate normative and descriptive use of language, especially in the Aeronautical Meteorology subfield, which even comprises possible other classifications of a term within the same field (PEIXOTO, 2020).

By taking those assumptions into consideration, based on terminology (PAVEL; NOLET, 2001; CABRÉ, 1999, 2003) and corpora (SANTOS, 2008, 2014; TOGNINI-BONELLI, 2001; TAGNIN, 2013, 2015) theoretical foundations, this paper aimed at discussing definitions and translation to Portuguese of expressions and terms contained in the Table 4678 (WMO, 2011), concerning the main aeronautical meteorology codes, in order to highlight nuances of meaning which could interfere in proper communication of content.

This mentioned table is relevant because it is used as a reference in the Aeronautical Meteorology field, as prescribed by the World Meteorological Organization (2011). As detailed later in this paper, Table 4678 is organized in two parts — qualifiers and the phenomenon itself —, so as to combine different aspects of a given weather phenomenon, represented by letter codes, in addition to a positive or negative sign sometimes.

The proposed analysis is based on a systematization for terminological procedures, by using corpora with set validation standards, as the discussion on corpora has reached more sophisticated levels throughout the years, especially in terms of how computer tools may help the terminologist to process large amounts of specialized discourse.

However, this paper follows the approach that corpora must be used as a process of systematization, to help the researcher with weighing options regarding validation. It is not a strict process of quantification, whether established previously or later in the elaboration of a terminological database, but a process of evaluating how relevant the corpus is and, especially, how to set specific parameters for each intended use. In the particular case of Aeronautical Meteorology, it contributes to avoiding misunderstandings regarding the criticality level of meteorological situations being communicated

during air traffic operations.

## 2. SPECIALIZED TRANSLATION AND TERMINOLOGY AT INSTITUTIONAL SETTINGS

One of the main concerns of specialized translation is standardization, in order to enable easy reference to "objects" being discussed in discourse in technical fields. In that sense, it is important to note that different institutions might have different perspectives on a same given object, considering, for example, if they are targeted to national or international audiences. In terms of terminology, that could be seen in different meanings, different contextual usage or just different spellings of specialized terms.

With regard to the definition of 'institutional', it may itself imply different contexts, also taking into account translation and interpretation applications. In general, three main meanings need to be considered: (1) communication with legal purposes (MERKLE, 2013); (2) communication exchanged in the public service context (TAIBI, 2011); and (3) communication in general, held in government bodies and private companies (KOSKINEN, 2011; KANG, 2020).

While the first meaning is focused on the translation of certified and notarized translation, as opposed to other types of translation, the second meaning considers translation held in contexts of dealing with people in high vulnerability or with low literacy, generally in the case of refugees or other sorts of migrants. In the latter, translation would be considered as a way of empowering this population, as it entails "written translation of informative texts, addressed by authorities or institutions to people who do not understand texts in the language of the text producer" (NISKA, 2002, p.1).

The last meaning attributed to 'institutional' would stem from a sociological stance (KOSKINEN, 2011), and refers to levels of governance at national and supranational tiers, as part of a continuum, where

> The division between institutional and non-institutional kinds of translation is not clear-cut; translations can rather be placed on a continuum or a cline of increasing institutionality. While all translations are affected by some kinds of institutional constraints, 'institutional translation' refers to those occupying the extreme end of the continuum.
>
> Prime examples of institutional translation include: official documents of government agencies and local authorities of bilingual or multilingual countries; translating in the European Union, the United Nations and other international or supranational organizations, and international courts of law (KOSKINEN, 2011, p.57).

Within this context, terminology should consider the standardizing nature of publications, especially as a reference to replicate linguistic variations and how it is suited to the field of knowledge to which it refers. In that sense, terminology may also be considered in terms of a continuum, where different applications may be taken into account when evaluating whether or not to use a specific variation. For that work, the analysis of a terminologist would be highly important, as this professional would be capable of properly evaluating the suitability of terms used (THELEN, 2015; TAGNIN, 2013).

Based on those assumptions, the support of a corpus-linguistics approach to systematization provides methodological tools to contribute to the designing of glossaries and dictionaries. The next section will provide more information on the theoretical perspective of this systematization.

## 3. A CORPUS-LINGUISTICS APPROACH TO SYSTEMATIZATION

There has been an exponential improvement of corpora resources since the first ones were developed. At the beginning, electronic corpora used to have about 1 million words, such as the one created by the Brown University in 1967, then computational advances allowed words to be added to online databases to a greater extent: the Birmingham University developed a corpus with 10 million words in 1987; the British National Corpus was created with 100 million words in 1994; and nowadays corpora commonly have a quantity of words on the order of billions (LEW, 2009).

During that period, there have been changes in theoretical perspectives, as Tognini-Bonelli (2001) very well describes, from corpus-based approaches to corpus-driven approaches and, still today, new insights are triggered depending on more and more specialized target audiences, which started to comprise professional linguists, translation specialists and specialists from other fields.

Although these two approaches seem to be compared in a more dichotomic way, they are actually part of a continuum of linguistic possibilities of analysis, as mentioned earlier. In other words, the corpus-based approach was not limited in its conceptualization but had the purpose to make best use of corpora available at the time, which were much shorter. Therefore, it was not possible to define language patterns, as representativeness was a major issue: it was more common to use only text samples, not full texts. When computational tools became more available, language processing developed into so many possibilities, also based on statistical analysis, and it was possible to refine the so-called corpus driven methodology (TOGNINI-BONELLI, 2001; KILGARRIFF, 1997), and focus on systematization taking into consideration the compilation process.

The validation process of terminological work is one of the most important aspects of such work, especially when considering sensitive areas, as in the case of aviation. In this way, the productivity of corpus research,

when it comes to such a validation process of terminology data, is directly related to frequency issues.

At first, it is necessary to highlight that a major number of occurrences do not necessarily mean a major level of terminological expressiveness. Although the well-known statistical logic indicates that “big data is good data”, the occurrence (or not) in a corpus may not be considered irrefutable evidence because the value or validity of a corpus is not restricted to the size of this corpus, but to the purpose and type of information which may be extracted from it.

In the case of terminology work, as discussed by Thelen (2015) when comparing a theory-oriented terminology vs. a translation-oriented terminology, a theory-oriented approach will help the terminologist to define his/her strategy, also comprising the use of corpora assessment, instead of using only a translation-approach, mostly based on practice.

It is certainly necessary to have a high standard when compiling texts which may be relevant for a specific field, to avoid bias. This is not an easy task, not just because it requires strategical planning but also due to the fact more practical computational issues may arise when dealing with the compiled data, as discussed in the following item.

## 4. METHODOLOGY

The methodology of this research was based on a systematization by using corpora, to set validation standards for the proposed analysis, considering both quantitative and qualitative parameters, i.e. corpus-based and corpus-driven premises for this intended objective.

Generally speaking, the basic distinction between those two approaches relies on the theoretical perspective adopted: having a previous assumption to be confirmed by corpus evidence or having a freer analysis to find language patterns, i.e. create categories. Santos (2008) offers a more flexible standpoint, by proposing an approach named “Linguistics with Corpus” (Linguistics supported by corpora), focused on the compilation process. As a result, Santos (2008) defended that “a corpus is a collection of classified linguistic objects to be used in the Natural Language Processing / Computational Linguistics / Linguistics fields” [2] (SANTOS, 2008, p. 45), created for specific purposes, to assist in the linguistic study, and analysis of occurrence of words and syntactical structures, among other structures, which may be counted and categorized, but not in a very strict methodological pattern.

From that theoretical stance, this paper aimed at analyzing the weather phenomena specified in Table 4678 (WMO, 2011), a reference in the

[2] In the original: “um corpo é uma coleção classificada de objetos linguísticos para uso em Processamento de Linguagem Natural / Linguística Computacional / Linguística” (SANTOS, 2008, p. 45).

Aeronautical Meteorology field, by investigating meanings and nuances found in the compiled comparable corpora (TAGNIN, 2015), in order to discuss and validate the nomenclatures in Portuguese.

For that, publications from six categories were selected for the Aeronautical Meteorology (AER MET) corpus, taking into consideration AER MET publications are much scarcer than general aviation ones, especially in the case of Portuguese documents. As a result, it was possible to find many institutional publications in English, whereas in Portuguese it was necessary to search for more academic studies, in order to comprise a broader range for the AER MET field. Therefore, the balance of the corpus was a bit different for the English and Portuguese languages.

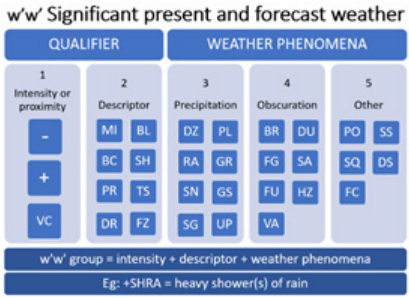
The corpus architecture of this research comprised the following categories: (a) terminological databases, with glossaries and dictionaries in print, online or in .pdf format; (b) institutional publications, comprising regulations and technical reports; (c) commercial documents, from companies selling meteorological instruments; (d) institutional didactic instructions, regarding training material published by institutional organizations and publications for proficiency purposes; (e) academic publications, i.e. theses, dissertations and books; and (f) publicity documents, comprising journals for general dissemination of information.

In the case of this research, although the aim is analyzing terminology used by official institutions, language used by the professional community in other institutions and companies were also taken into account, as they rely on official guidelines.

## 5. TERMINOLOGY OF AERONAUTICAL METEOROLOGY CODES: VALIDATION BASED ON CORPUS DATA

As meteorology is part of our daily lives, it is common for us to make use of some specialized words in a more general sense. When it comes to aeronautical meteorology, as a more specialized segment, those distinctions are even more marked. Therefore, to try to avoid misunderstandings during pilot-controller communication, the main weather phenomena, in terms of impacts to aviation procedures, were represented in codes in English in tables 4677 and 4678 (WMO, 2011), and the equivalent codes in Portuguese were published in ICA 105-16 (BRAZIL, 2017). The following figures show the structural organization of weather phenomena codes, as prescribed by WMO (2011), and what those codes mean in English (WMO, 2011) and in Portuguese (BRAZIL, 2017).

**Figure 1:** Structural organization of weather phenomena codes (Table 4678)




Source: Adapted from WMO (2011)

**Figure 2:** Code nomenclatures in English and in Portuguese

| Code | Nomenclature in English | Nomenclature in Portuguese |
|---|---|---|
| - | Light | Leve |
| | Moderate (no qualifier) | Moderada (sem sinal) |
| + | Heavy: well developed in the case of dust/sand whirls (dust devils) and funnel clouds | Forte (bem desenvolvido para redemoinhos de poeira/areia e nuvens funil) |
| VC | In the vicinity | Na vizinhança |
| MI | Shallow | Baixo |
| BC | Patches | Bancos |
| PR | Partial (covering part of the aerodrome) | Parcial (cobrindo parte do aeródromo) |
| DR | Low drifting | Flutuante baixo |
| BL | Blowing | Soprada |
| SH | Shower(s) | Pancada(s) |
| TS | Thunderstorm | Trovoada |
| FZ | Freezing (supercooled) | Congelante |
| DZ | Drizzle | Chuvisco |
| RA | Rain | Chuva |
| SN | Snow | Neve |
| SG | Snow grains | Grãos de neve |
| PL | Ice pellets | Pelotas de gelo |
| GR | Hail | Granizo |
| GS | Small hail and/or snow pellets | Granizo pequeno e/ou pelotas de neve |
| UP | Unknown precipitation | [no translation in Table 4678 published in ICA 105-16 (BRAZIL, 2017a)] |
| BR | Mist | Névoa úmida |
| FG | Fog | Nevoeiro |
| FU | Smoke | Fumaça |
| VA | Volcanic ash | Cinzas vulcânicas |
| DU | Widespread dust | Poeira em área extensa |
| SA | Sand | Areia |
| HZ | Haze | Névoa seca |
| PO | Dust/sand whirls (dust devils) | Poeira/areia em redemoinhos |
| SQ | Squalls | Tempestades |
| FC | Funnel cloud(s): tornado or waterspout | Nuvem(ns) funil: tornado ou tromba d'água |
| SS | Sandstorm | Tempestade de areia |
| DS | Duststorm | Tempestade de poeira |

Source: Adapted from WMO (2011) and Brazil (2017).

The way those codes should be used, in terms of combinations, formats and situations is detailed in Doc 782 – *Aerodrome Reports and Forecasts: a user's handbook to the codes* (WMO, 2019).

The way those weather phenomena are described in publications in the corpus, mainly the institutional and the academic ones, help expand understandings on nuances and proper contexts of usage. For example, some of the major aspects of Aeronautical Meteorology nomenclatures are the nuances regarding fog, mist and haze, and the precipitation scale to define intensity of weather phenomena. As those aspects pose a real impact on visibility, it is deemed very hazardous to aircraft operations (Cf. GULTEPE et al, 2009).

Regarding 'fog' (FG), 'haze' (HZ) and 'mist' (BR), the classification depends on humidity and visibility issues. 'Fog' is reported when the air is at about 100 per cent humidity and the visibility is less than 1000 m (Cf. ICAO, 2005), while 'mist' presents visibility ranging from 1000 m and 5000 m, and relative humidity above 90 per cent. (Cf. ICAO, 2005). On the other side, 'haze' is "extremely small particles invisible to the naked eye and sufficiently numerous to give the air an opalescent appearance [...], usually only a few thousand feet thick, but may extend upwards to 15,000 feet (4,600 meters) [...]" and visibility may vary "greatly, depending on whether the pilot is facing into or away from the sun" (FAA, 2016, p. 16-5). Concerning those terms, although "mist may be considered an intermediate between fog and haze" *(ibidem)*, identifying those phenomena may be critical, as "there is no distinct line between any of these categories" (*ibidem*). In Portuguese, fog (FG), haze (HZ) and mist (BR) are translated as 'nevoeiro', 'névoa seca' and 'névoa úmida', respectively.

The occurrence of fog, haze and mist may be full or localized (in patches or bank), especially regarding 'fog'. While the nomenclature specifies patch(es) (BC) as the descriptor, to be used in a structure like 'patch(es) of ____', this word is used in the AER MET literature in a more general sense, with other sorts of combinations, such as 'patches of blue sky', 'patches of cloud', 'patches of convection', 'patches of light', 'patches of anomalous structure', 'patches of dry snow', 'patches of foam', 'patches of greater or lesser development [such as clusters of apartments, shops, factories or parks, open areas or water]', patch(es) of ground, and 'patches of heavy rain'.

As qualifiers used before the noun 'patch(es)', words such as 'snow', 'ice', 'wet', 'water, 'grease' are largely used, as well as 'great', 'large', 'small' and 'circular'. In addition to that, 'patch' itself in a qualifier form ('patchy') was also found in the corpus, with a varied range of collocates, as 'patchy band of convective cloud', 'patchy cloud', 'patchy fog', 'patchy grey', 'patchy ground', and 'patchy ice'.

Concerning 'precipitation', it may occur in a sort of uniform way (intermittent or continuous) or suddenly (as showers). While the nomenclature mostly uses 'shower' when mentioning the strong and short duration of a weather phenomenon, generally associated to convective clouds (Cf. ICAO,

2005), there is a grading scale for the characteristics and types of precipitation. As described in United States (2003, p. 2-14),

The three characteristics of precipitation are:

> 1. Showers - Characterized by a sudden beginning and ending, and abruptly changing intensity and/or sky conditions. Showers are associated with cumuliform clouds.
>
> 2. Continuous - Also known as steady (not showery). Intensity changes gradually, if at all. Continuous or steady precipitation is associated with stratiform clouds.
>
> 3. Intermittent - Stops and restarts at least once during the hour. Intermittent precipitation may be showery or steady, and therefore may be associated with cumuliform or stratiform clouds. (United States, 2003, p. 2-14).

Precipitation can take the form of drizzle; freezing drizzle; rain; freezing rain; hail or graupel; ice pellets or sleet; snow; or snow grains (UNITED STATES, 2003, p. 2-14). In the case of 'shower', specifically, the AER MET nomenclature may be composed of the terms and expressions 'shower', 'showery precipitation' or 'showers in the vicinity'. In accordance with WMO (2008), 'shower' is strongly associated with hail, as "hail always occurs in the forms of showers and is generally observed during heavy thunderstorms" (WMO, 2008, p. II.4-21] and never associated to 'snow grains', as "they [snow grains] usually fall in small quantities, mostly from stratus or from fog and never in the form of a shower" (WMO 2008, p. II.4-21).

The term 'unidentified precipitation' is particularly interesting because there is no translation to Portuguese in ICA 105-16 guidelines (BRAZIL, 2017). The ICAO classifies 'unidentified precipitation' as cases "where intensities are very low (<0.1 mm/h), [and] precipitation type is not well identified" (ICAO, 2011, p. 6-4). In such cases, "the code 'unidentified precipitation (UP)' is often used and is preferable to an identification error" (*ibidem*).

In Portuguese, the equivalents for 'shower' or 'showery precipitation' would be 'pancada de ___', while 'precipitation' is translated as 'precipitação'. It is important to note that there could be a slight difference in terms of intensity between 'shower' and 'showery precipitation' but this is not transferred to the nomenclature in Portuguese as it could sound less natural.

Another interesting point to mention is the difference between 'hail' (GR) and 'graupel', not contained in Table 4678, which seems to make 'graupel' equivalent to 'small hail and/or snow pellets' (GS), in a more simplified way.

'Hail' and 'graupel', translated to Portuguese, within a general AER MET context, as 'granizo' and 'graupel' respectively, appear in the academic literature in Portuguese, where 'graupel' is considered to be a prior stage of

hail formation (MEDINA, 2015) or light hail (HALLAK, 2007), and 'hail' is also considered a high intensity 'graupel' (RAMIREZ, 2018); and in the corpus in English, where 'graupel' occurs very few times, mostly in academic and institutional training references, and a WMO publicity document, not intended to be used as a guideline.

The term 'hail' is strongly associated with 'thunderstorm', to the extent the ICAO (2016) defines that thunderstorm without hail should be classified as 'thunderstorm' only, and thunderstorm with hail should be referenced as 'thunderstorm with hail'.

The term 'thunderstorm' is translated in the Portuguese nomenclature as 'trovoada', in ICA 105-17 (BRAZIL, 2017, p. 114), explained in the following way: "a thunderstorm is a succession of electric discharges and thunders, generally accompanied by precipitation and always associated with CB clouds [cumulonimbus clouds]". [3]

The definitions of Table 4678 nomenclatures highlighted here intend to shed light on some critical terms which may impact the reporting of weather phenomena in the Aeronautical Meteorological (AER MET) field, due to the fact specialized terms certainly have different uses in a daily situation and, in the case of AER MET, even in different contexts of this same field.

## 6. FINAL CONSIDERATIONS

As discussed in this paper, having a more systematized use of corpora may help improve the contribution of resources available, so this paper aimed at presenting a research methodology with set validation standards and debating nomenclatures of Aeronautical Meteorology codes.

By assuming categorization is key for an in-depth analysis, a systematization was carried out, based on linguistics with corpus assumptions (SANTOS, 2008), aimed to find patterns of usage in the compiled comparable corpora (TAGNIN, 2015).

Then, relying on a terminological theoretical foundation aligned with Pavel and Nolet (2001) and Cabré (1999, 2003), this research considered a more functional approach to terminology, based on context of usage and categories of documents compiled in the corpus. In this way, the proposed corpus architecture systematized the data in six categories and used set validation standards, applied "manually", to account for the "level of authoritativeness" of each category of sources for the intended research.

This was particularly relevant due to the fact the Aeronautical Meteorology field is very specific and does not have many publications available, especially in Portuguese. So, a broader scope of sources had to be considered for this research, aimed at analyzing terminology used by official institutions, also considering language used by the professional community in

[3] "Trovoada é a sucessão de descargas elétricas e trovões, acompanhada, geralmente, de precipitação, sempre associada à nuvem CB" (BRAZIL, 2017, original).

other institutions and companies, which also rely on official guidelines.

By using this methodology, this paper intended to draw attention to specificities of some Aeronautical Meteorology terms, particularly on nuances regarding fog, mist and haze, and the precipitation scale to define intensity of weather phenomena. However, as the scope of this research was limited to terminology used in Table 4678, discussions were not intended to be exhaustive but only provide better understanding on the scope of usage in the field, and contribute to avoid misunderstandings in communication operations.

In addition to that, this paper emphasizes the understanding that terminology work should be based on a theory-oriented approach to define the best strategy of compilation and analysis, and not just a translation-approach, mostly based on practice (THELEN, 2015; TAGNIN, 2013). Along with this perspective, having a high standard when compiling specialized texts and setting validation standards for a customized specialized corpus will enable proper systematization, by means of a scientific strategic perspective, not just a practical one.

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# CHAPTER 3

# REPORTED SPEECH IN AVIATION ENGLISH: AN ANALYSIS THROUGH TWO SPECIFIC *CORPORA*

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**ABSTRACT -** Aviation English is a specialized language and, as such, features some specific structures that should be carefully analyzed to be dealt with appropriately. Reported Speech (RS) constitutes an essential communicative function for pilots and controllers because they must often relay information to different parties in complex communication scenarios. Regarding the teaching and learning of RS, the most traditional orientation is that it should observe tense backshifting - the possibilities of not shifting back the tense seem to be treated as exceptions, even in specialized coursebooks. This study discusses the use of RS in aeronautical communications by analyzing the occurrences of this structure in two specialized corpora – CORPAC, the Corpus of Pilot and ATC Communications and RTPEC, the Radiotelephony and Plain English Corpus, examining reporting verbs used in actual conversation samples and strictures after the verbs 'said' and 'told'. The main findings show the most used reporting verbs and suggest that around 50% of the indirect reported clauses in aviation maintain the original tense, which seems to be evidence that pilots and ATCs choose to report no changes in the scenario when relaying information in a similar proportion to choosing to backshift. Accordingly, teaching and learning resources like specialized coursebooks or tailor-designed materials should factor the real communication features in their activities.

**KEYWORDS:** Reported Speech; Aviation English; Corpus-based analysis.

## 1. INTRODUCTION

Reported Speech (RS) is a relevant function in human communication as it informs the hearer about a piece of information not uttered at the time of speaking by the speaker, in a direct or indirect way. Direct RS is naturally easier to be comprehended as it displays the exact uttered words. Indirect RS can be trickier as the structure is usually more robust and contains more information. English as a Foreign Language (EFL) teachers may be challenged with the task of working

with it. The structural means by which you can perform the communicative functions of reporting or relaying information can be discussable, depending on different perspectives.

Coursebooks and Grammars usually focus on backshifting, the mechanical transformation of the structure using one tense back. This is a limited approach as it may not reflect the actual way that speakers make speech reports (BARBIERI; ECKHARDT, 2007; McCARTHY, 1998). In high-stakes industries such as aviation and oil and gas, communication efficiency is paramount, and miscommunication may easily emerge from mismatches between the language that has been taught (within the normative grammar patterns) and the language that is actually used.

Aviation English, the specialized language used in aviation, features specific aspects which have to be taken into account in teaching, training and testing. Regarding RS, it is pivotal that pilots and air traffic controllers know how to manage relaying information as efficiently as possible in aeronautical communications. To optimize that, curriculum design should, ideally, reflect the language that is actually used. Grammars, EFL textbooks and even specialized coursebooks tend to approach RS in a more traditional way, both in terms of orientations towards lexical choices – "say" and "tell" being preferred as reporting verbs and structural guidelines, and backshifting, the mechanical movement of inflecting the verb to one tense back in the subordinate clause.

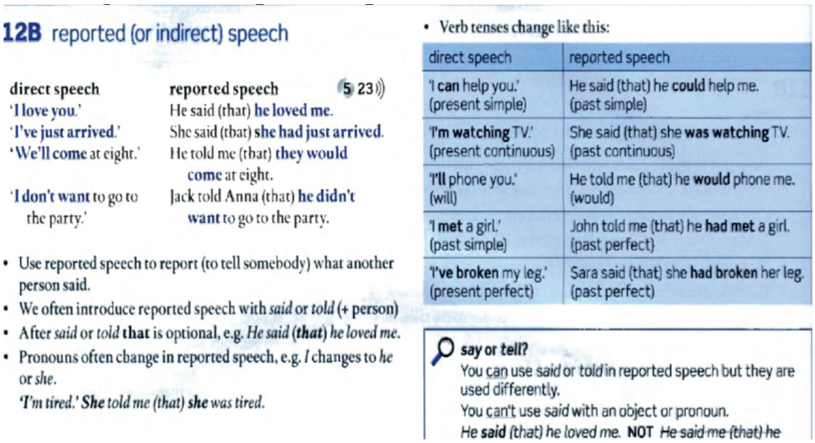
Barbieri and Eckhardt (2007) present a case study illustrating how corpus-based findings on RS can be integrated into a form-focused model of instruction. The authors discuss the great divide that there is between grammar or EFL coursebooks and real language use. They attribute the lack of fit of these materials to factors such as (i) textbook descriptions that often rely on the writers' intuitions, not on empirical data; (ii) no information of empirical evidence about the relative frequency of occurrence of linguistic features; and (iii) grammatical and lexical patterns presented as equally generalizable and equally important communicatively, disregarding information about register-specific or discourse-context specific use and simplified real language use for pedagogical purposes.

Corpus Linguistics is an empirical approach that can be used to address this gap as it offers tools that enable the assessment of real language. (PACHECO, 2010; PACHECO, 2021; PRADO; TOSQUI-LUCKS, 2019). This chapter is intended to offer introductory reflections on Reported Speech in Aviation English based on Corpus research. We briefly examine some resources (coursebooks, grammars, official documents) feature RS prior to analyzing how this structure is portrayed in Aviation English based on real conversation examples extracted from two specific corpora, namely CORPAC (PACHECO, 2021) and RTPEC (PRADO; TOSQUI-LUCKS, 2019). As we will see, it is of utmost importance to take into account data from real communication contexts when teaching specialized languages.

## 2. LITERATURE REVIEW

Reported speech is broadly understood as the act of reporting the words someone else has spoken. It is an indirect utterance governed by a reporting verb (a verb indicating this operation) with the changes of person and tense. Coursebooks designed to teach English for general purposes usually approach this structure in a way referred to as the "traditional orientation". That is, towards the use of tense backshifting, as shown below.

**Figure 1:** Reported Speech in an EFL Coursebook



**12B** reported (or indirect) speech

| direct speech | reported speech |
|---|---|
| 'I love you.' | He said (that) **he loved me**. |
| 'I've just arrived.' | She said (that) **she had just arrived**. |
| 'We'll come at eight.' | He told me (that) **they would come** at eight. |
| 'I don't want to go to the party.' | Jack told Anna (that) **he didn't want** to go to the party. |

- Use reported speech to report (to tell somebody) what another person said.
- We often introduce reported speech with *said* or *told* (+ person)
- After *said* or *told* **that** is optional, e.g. *He said* ***(that)*** *he loved me.*
- Pronouns often change in reported speech, e.g. *I* changes to *he* or *she*.
  *'I'm tired.' **She** told me (that) **she** was tired.*

- Verb tenses change like this:

| direct speech | reported speech |
|---|---|
| 'I **can** help you.' (present simple) | He said (that) he **could** help me. (past simple) |
| 'I'**m watching** TV.' (present continuous) | She said (that) she **was watching** TV. (past continuous) |
| 'I'**ll** phone you.' (will) | He told me (that) he **would** phone me. (would) |
| 'I **met** a girl.' (past simple) | John told me (that) he **had met** a girl. (past perfect) |
| 'I'**ve broken** my leg.' (present perfect) | Sara said (that) she **had broken** her leg. (past perfect) |

**say or tell?**
You can use *said* or *told* in reported speech but they are used differently.
You can't use *said* with an object or pronoun.
*He **said** (that) he loved me.* **NOT** *He said me (that) he*

Source: Latham-Koenig, Oxenden & Seligson (2012)

The idea is to change the original verb into one tense back in order to show the hearer that this indirect sentence corresponds to what was said some time in the past.

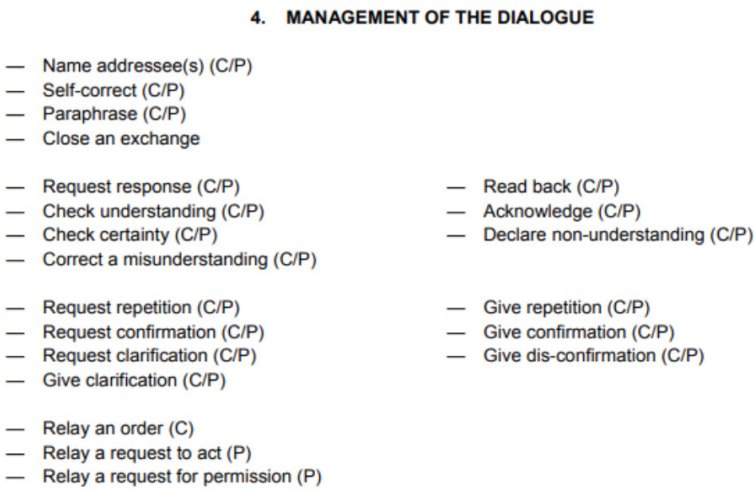
Some sources mention exceptions to this rule. In Swan's Practical English Usage (2005), "If somebody talked about a situation that has not changed, a reporter can often choose whether to keep the original speaker's tenses or change them" (p. 505). The British Council website presents the traditional orientation, a list of reporting verbs, questions in indirect speech and mentions that no backshift is necessary if what the speaker has said is still true or relevant.[1]

When we teach English for Specific Purposes, or ESP, we are supposed to observe the behavior of certain linguistic structures in a given domain in order to have tools to teach it appropriately. ICAO Document 9835, the Manual of Language Proficiency Requirements, is a reference material for Aviation English. It features communicative functions and structures that should be approached when teaching and testing Aviation English. Some

[1] https://learnenglish.britishcouncil.org/grammar/intermediate-to-upper-intermediate/reported-speech-1-statements, accessed on January 22nd, 2022.

of the communicative functions that comprise the structure of RS relate to Sharing Information concerning present/immediate/recent past events[2]. The figure below depicts the display of these functions in the Manual and shows some specific functions that require the use of RS structures.

**Figure 2:** Examples of Communicative Functions



**4. MANAGEMENT OF THE DIALOGUE**

- Name addressee(s) (C/P)
- Self-correct (C/P)
- Paraphrase (C/P)
- Close an exchange

- Request response (C/P)
- Check understanding (C/P)
- Check certainty (C/P)
- Correct a misunderstanding (C/P)

- Read back (C/P)
- Acknowledge (C/P)
- Declare non-understanding (C/P)

- Request repetition (C/P)
- Request confirmation (C/P)
- Request clarification (C/P)
- Give clarification (C/P)

- Give repetition (C/P)
- Give confirmation (C/P)
- Give dis-confirmation (C/P)

- Relay an order (C)
- Relay a request to act (P)
- Relay a request for permission (P)

Source: ICAO Document 9835 (2010)

As seen, the document assumes that pilots and air traffic controllers have to be linguistically proficient as they relay an order and a request to act, describe a state, request an explanation of a past action/event etc. To perform these communicative functions, RS structures can be used. The Manual, on pages B-13, also brings examples of complex structures used in aviation, and RS is illustrated as “They promised that they would help him the next day; He told me it wasn’t going to be ready by Friday”. These examples use verbs “promise” and “tell”, respectively, in the past and backshifting is observed in the subordinate clause.

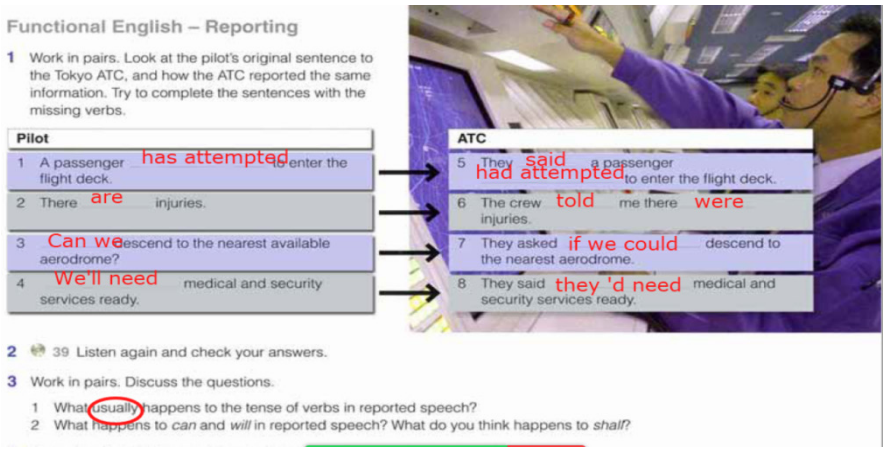
There are a few commercially available coursebooks designed to Aviation English teaching by some of the major publishers worldwide and they have been incredibly helpful as they offer public resources in service of specialized language teaching. In this chapter, three excerpts were selected to illustrate how RS is pedagogically addressed. The books have been crafted by highly experienced professionals in times when accessibility to research and information was probably more complex. The purpose of this analysis is to highlight what they have positively made available so far and build on that

[2] More details can be found on pages B-1 to B-4, ICAO Document 9835, 2010.

from more specific research data.

Book 1 approaches RS in unit 12, within the topic "Unlawful Interference", through a very well-designed exercise. Students are firstly asked to listen to the audio and fill in the gaps.

**Figure 3:** Reported Speech in an AE Coursebook (Book 1)

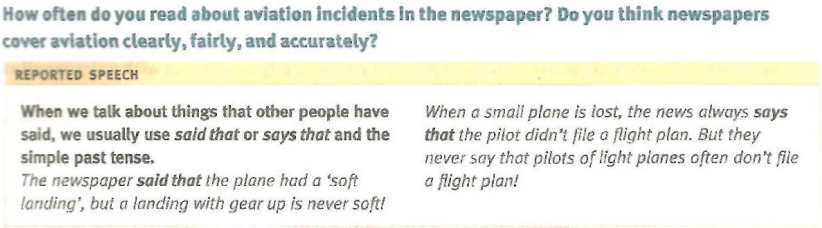



Source: Emery & Roberts (2008)

As shown above, it clearly sets the "reporting" scenario and uses tense backshifting as the structure orientation. It emphasizes the need to change the tense based on the fundamental premise that time changed, so tense must change. The concept questions are also driven to this idea, as well as the instructions and answers in the Teacher's Book. There, we find a remark about the possibility "not to change the tense of the verb particularly when the speech is reported a short time afterwards and the situation reported is still true" (KENNEDY, 2008, p. 125).

Book 2 formally approaches RS in Unit 7, page 55, when working with landing and accident reports. As shown below, the language orientation is limited to pointers on talking about what someone else has said using "says/ said that" (one reporting verb only) and "the past tense", with examples and no exercise.

**Figure 4:** Reported Speech in an AE Coursebook (Book 2)



**How often do you read about aviation incidents in the newspaper? Do you think newspapers cover aviation clearly, fairly, and accurately?**

REPORTED SPEECH

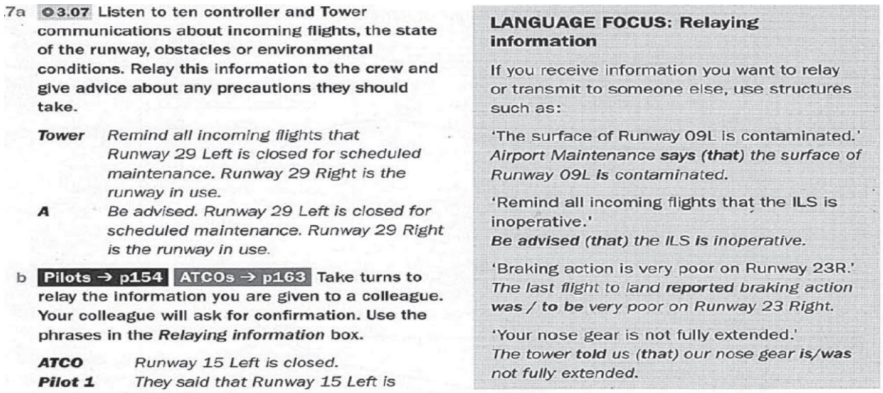
**When we talk about things that other people have said, we usually use *said that* or *says that* and the simple past tense.**
*The newspaper **said that** the plane had a 'soft landing', but a landing with gear up is never soft!*

*When a small plane is lost, the news always **says that** the pilot didn't file a flight plan. But they never say that pilots of light planes often don't file a flight plan!*

Source: Ellis (2008)

Book 3 addresses "Relaying Information" in Unit 8, as illustrated in the next figure.

**Figure 5:** Reported Speech in an AE Coursebook (Book 3)



7a 3.07 **Listen to ten controller and Tower communications about incoming flights, the state of the runway, obstacles or environmental conditions. Relay this information to the crew and give advice about any precautions they should take.**

***Tower*** *Remind all incoming flights that Runway 29 Left is closed for scheduled maintenance. Runway 29 Right is the runway in use.*
***A*** *Be advised. Runway 29 Left is closed for scheduled maintenance. Runway 29 Right is the runway in use.*

b **Pilots → p154** **ATCOs → p163** **Take turns to relay the information you are given to a colleague. Your colleague will ask for confirmation. Use the phrases in the *Relaying information* box.**

***ATCO*** *Runway 15 Left is closed.*
***Pilot 1*** *They said that Runway 15 Left is*

**LANGUAGE FOCUS: Relaying information**

If you receive information you want to relay or transmit to someone else, use structures such as:

'The surface of Runway 09L is contaminated.'
*Airport Maintenance **says (that)** the surface of Runway 09L **is** contaminated.*

'Remind all incoming flights that the ILS is inoperative.'
***Be advised (that)** the ILS **is** inoperative.*

'Braking action is very poor on Runway 23R.'
*The last flight to land **reported** braking action **was / to be** very poor on Runway 23 Right.*

'Your nose gear is not fully extended.'
*The tower **told** us **(that)** our nose gear **is/was** not fully extended.*

Source: Shawcross (2011)

The plan starts with a listening test, followed by a speaking activity based on specific clues regarding the language target. As we can see, this coursebook presents a different approach towards the communicative functions reporting/relaying information. It mentions four possibilities: (i) says that + present, (ii) Be advised that + present; (iii) through the verb reported + past or infinitive; (iv) told us that present + past. It seems to make a clear point about relaying information, as it approaches traditional verbs say and tell, and additionally structures that indicate reporting/relaying, such as "be advised that" or "reported".

The Teacher's Book gives insightful orientations about RS, such as the one regarding backshifting, which says that it is possible where a reported statement may or may not be true but could cause ambiguity. The example used is the sentence "The runway is contaminated". If reported by

using backshifting rules, the sentence will be “They said the runway was contaminated”, which might lead the hearer to assume that the runway is not contaminated anymore. It says that “Backshifting is most appropriate in situations where the speaker disagrees with a statement, or the statement is no longer true” (SHAWCROSS; DAY, 2011, p. 167).

## 3. METHOD

In order to check how the aforementioned communication functions are actually performed in terms of preferred lexical and grammatical structures, a corpus investigation was conducted. Corpus-based research has been helpful as it deals with real language data. For specialized languages such as Aviation English, having access to real-life communication is especially relevant as both teaching and testing practices should follow real-life communication needs.

In this study, two specialized corpora were used: CORPAC, the Corpus of Pilot and ATC Communications and RTPEC, the RadioTelephony and Plain English Corpus. Both are compilations of communication exchanges between pilots and air traffic controllers. CORPAC (PACHECO, 2021) has around 35.000 words and RTPEC (PRADO; TOSQUI-LUCKS, 2019), around 120.000 words. The registers are specific oral communications between pilots and air traffic controllers compiled by researchers and the main purpose was to investigate the structures used to perform the communicative functions of relaying and reporting information in the context of aeronautical communications. The corpora were uploaded to WordSmith Software and the tools used were Wordlists and Concordance.

A list with 57 verbs[3] was organized, based on the grammar books and coursebooks previously mentioned. The selected verbs were considered “reporting” verbs in the sources because their preferred intended meaning may be associated to indicating the act of relaying information.[4]

The verbs were analyzed first quantitively – as for their frequencies, the number of times they occurred. The considered forms were bear infinitive, past and present (third person singular inflection). For example, “say, said, says” or “report, reported, reports”. Next, the investigation expanded to the context of the sentence, that is, to see the if they expressed a reporting function and to check if the structure following the verb featured backshifting. The next section presents the results.

[3] The verbs were: warn, advise, beg, decide, demand, expect, guarantee, hope, insist, promise, prefer, propose, recommend, request, remind, inform, notify, clarify, verify, know, brief, declare, explain, indicate, add, admit, agree, announce, answer, argue, ask, claim, comment, complain, confirm, consider, deny, doubt, estimate, fear, mention, observe, persuade, propose, remark, remember, reply, report, reveal, say, state, suggest, suppose, tell, think, understand, repeat.

[4] It should be noted that we must be aware of the multiple meanings that these items can carry and that they may not necessarily feature reporting meanings in all the contexts in the corpora.

## 4. RESULTS AND ANALYSIS

The first search shows the occurrences of the main reporting verbs in the corpora. Through Concordance, the search was for these verbs in the infinitive and past tense forms. Below, a table with the ten most frequently found.

**Table 1:** Most frequent Reporting Verbs in the corpora

| RANK | VERB | CORPAC | RTPEC | TOTAL |
|---|---|---|---|---|
| 01 | SAY | 71 | 206 | 277 |
| 02 | KNOW | 0 | 191 *(46=let me know) | 191 |
| 03 | ADVISE | 30 | 138 | 168 |
| 04 | REQUEST | 45 | 107 | 152 |
| 05 | CONFIRM | 46 | 105 | 151 |
| 06 | REPORT | 55 | 93 | 148 |
| 07 | UNDERSTAND | 26 | 93 | 119 |
| 08 | THINK | 20 | 79 | 99 |
| 09 | EXPECT | 30 | 64 | 94 |
| 10 | TELL | 14 | 48 | 62 |

Source: Author (2022)

"Say" tops the rank, which confirms what most coursebooks aim to teach. "Know" appears in second place, though in one corpus only -46 occurrences within the expression "let me know", are observed which we understand as a request for confirmation. "Advise", "request", "confirm" and "report" feature close frequencies, whereas "tell" ranks in tenth (out of 57).

Interestingly, the findings in Barbieri and Eckhardt (2007, p. 10) reveal that the reporting verbs "say" and "tell" are more frequent in News than Conversation - in the latter context, "speakers rely overwhelmingly on say and tell to introduce IRS".

"Say" and "Tell" are usually taken as the most traditionally known verbs for reporting or relaying information. Yet, the corpora show that in Aviation English there are other more frequently employed verbs that seem to carry relevant meanings to aeronautical communications. Only Book 3 considered "report" and "advise" in the specific language orientations.

"Advise" is the third most used totaling 168 occurrences – 101 in the infinitive form and 67 in the past form. Book 3 works with "Be advised that", which features 2 times only in the corpora. "Report" seems to be a direct option for pilots and controllers: it carries the intended meaning and does not demand a more complex structure. "Reported" occurs 43 times (14 in CORPAC and 29 in RTPE) – it is largely used as a transitive verb, as in

"reported something", with a few occurrences in a subordinate sentence (in the past or present tense), as we can see in the examples.

**Figure 6:** Examples from CORPAC and RTPEC

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 20 | // November one one five whiskey fox / Falcon just | reported | a gain of twenty knots / use caution for | 81.199 | 01...7 | 01...7 | 01...7 |
| 21 | at the approach end of runway two two right just | reported | a large amount of fuel that appears to be | 86.443 | 03...1 | 03...1 | 03...1 |
| 22 | six three eight / uuh be advised / passengers have | reported | that our left hand engine cowling has uh | 93.571 | 03...9 | 03...9 | 03...9 |
| 23 | has came off? // Yes / that?s what the passengers | reported | and the flight attendants as well // so uh | 93.694 | 03...2 | 03...2 | 03...2 |
| 24 | // Balloon // Uh United hundred eight / traffic ahead | reported | balloon at five hundred feet / use caution / | 98.865 | 03...3 | 03...3 | 03...3 |
| 25 | twenty // Was that severe? // Yeah aircraft final | reported | severe turbulence at uh descending to | 110.943 | 0 1... | 0 1... | 0 1... |
| 26 | eleven point five kilos // Rescue vehicles // aircraft | reported | three souls and fuel eleven point five // | 116.409 | 0 1... | 0 1... | 0 1... |
| 27 | eighty // MesaAir thirty-two thirteen / lightning strike | reported | roughly six miles ahead / an Airbus / | 117.410 | 0 1... | 0 1... | 0 1... |
| 28 | Jetblue one eighty / the vehicle Truck one has | reported | that they saw a line by the fuselage / and | 118.565 | 0 1... | 0 1... | 0 1... |
| 29 | // Roger / it?s on the port side / that?s what?s being | reported | to me // Is it on the nose / or the belly or | 118.692 | 0 1... | 0 1... | 0 1... |
| 30 | - Endeavor forty-sixty, previous arrival - a CRJ2 - | reported | uh- fair to good braking action. LGA TWR | 2.981 | 02...9 | 02...9 | 02...9 |
| 31 | forty-thirty-four, previous arrival - a CRJ2 - | reported | fair to good braking action. AWI 4034 - | 2.999 | 02...7 | 02...7 | 02...7 |
| 32 | Ninety-one, correction. Fair to good braking action | reported | by a CRJ2. EDV 4060 - Tower, Endeavor | 3.081 | 03...9 | 03...9 | 03...9 |
| 33 | one-three. And braking action good to medium, | reported | by a CRJ2. TFC 3391 - Alright. Runway | 3.162 | 03...0 | 03...0 | 03...0 |
| 34 | in position runway one-three. Braking action good | reported | by a CRJ2. EDV 3811 - A?ight. Cleared to | 3.263 | 03...1 | 03...1 | 03...1 |
| 35 | with a sweeper in tow and a blower. This will be | reported! | JZA 8319 - OK. That?s fine. We?ll do our | 7.447 | 07...5 | 07...5 | 07...5 |
| 36 | : previous arrival - the one that?s ahead of you - | reported | a drone at the uh- Floyd Bennett Field | 10.455 | 03...3 | 03...3 | 03...3 |
| 37 | one-sixty-four, use caution: previous arrival | reported | a drone uh- in the vicinity of the Floyd | 10.507 | 03...5 | 03...5 | 03...5 |
| 38 | one-six. Use caution: one of the previous arrivals | reported | a drone in the Floyd Bennett-Canarsie | 10.613 | 03...1 | 03...1 | 03...1 |
| 39 | one-one. Use caution, one of the previous arrivals | reported | a drone in the Floyd Bennett Canarsie | 10.893 | 03...1 | 03...1 | 03...1 |
| 40 | GND) ? Baron 62S, be advised Rescue 10 just | reported | you had some fluid UH I guess leaking | 18.242 | 03...0 | 03...0 | 03...0 |
| 41 | ? Qantas 7335, Center, roger MAYDAY. There?s no | reported | IFR traffic for descent to 10000?. (QFA | 30.903 | 03...1 | 03...1 | 03...1 |
| 42 | , leave control airspace on descent to 8000?. No | reported | IFR traffic. (QFA 7335) ? Leaving 10000? | 31.056 | 01...4 | 01...4 | 01...4 |

Source: Pacheco (2021)

Based on these data, these two verbs seem to be relevant for aeronautical communications and, because of that, should be considered in curriculum design.

The frequencies of "say" and "tell" add to 23,1% within the ten most used verbs – they are 338 out of 1460 total occurrences. Despite being an important amount, it does not correspond to a significant number that justifies some kind of exclusivity in teaching materials of Aviation English. That is – other verbs should be considered given the specificity of the language. Looking into backshifting, the investigation shows that it accounts for a small amount of the occurrences following "say" and "tell"[5] .

**Table 2:** Occurrences of Say and Tell

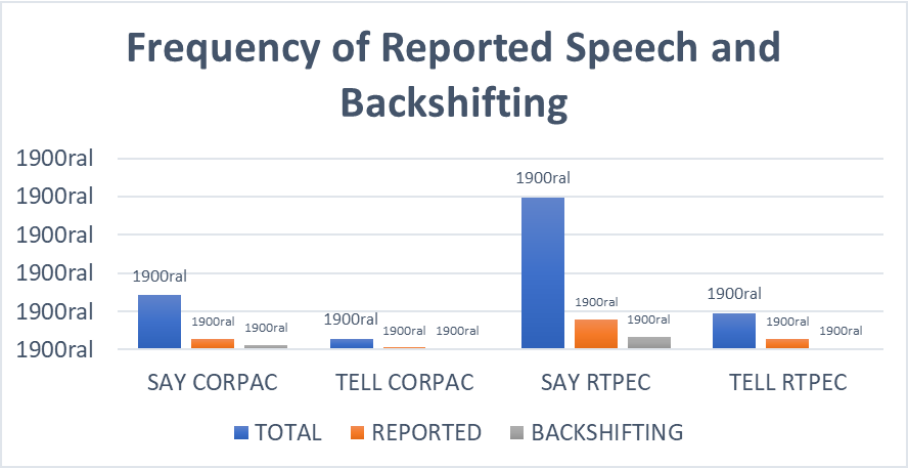
| | SAY | TELL |
|---|---|---|
| **Total** | 277 (100%) | 62 (100%) |
| **Reported** | 54 (19,5%) | 17 (27,4%) |
| **Backshifting** | 23 (8,3%) | 04 (1,4%) |
| **Original tense/Infinitive** | 31 (11,2%) | 13 (4,7%) |

Source: Author (2022)

[5] The forms included were say, says, said, tell, tells and told – bear infinitive and inflections in the present simple third person and past simple forms.

The table above shows that from the total occurrences of “say” in the corpora, 19,5% were in a reporting context, out of which 8,3% were followed by backshifting and 11,2% by a verb in the original tense/infinitive forms. The occurrence of backshifing is even smaller in contexts with “tell”: from all the frequencies, 27,4% were of reporting information and only 1,4% used backshifting, against 4,7% used infinitive or the original tense forms. The graph below illustrates the frequencies of “say” and “tell” in each corpus regarding total occurrences, reported speech contexts and backshifting.

**Figure 7:** Backshifting in Reported sentences following “Say” and “Tell”




Source: Pacheco (2021)

As seen, backshifting is not the most used structure following “say” or “tell” in reporting contexts extracted from the corpora. Pilots and Air Traffic Controllers seem to prefer to maintain other structures – infinitive with TO or the original tense, after a reporting verb so to avoid ambiguity. The next chart shows each form regarding total occurrences, reporting context, backshifting or the use of the original tense/infinitive TO.

**Chart 1:** “Say” and “Tell” in CORPAC and RTPEC

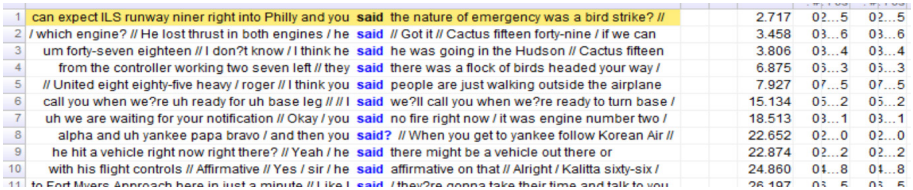
| | CORPAC | RTPEC |
|---|---|---|
| SAY | 56 Total<br>04 Reported Speech<br>• 03 Backshifting<br>• 01 Original Tense or Infin TO | 159 Total<br>12 Reported Speech<br>• 04 Backshifting<br>• 08 Original Tense or Infin TO |

| | | |
|---|---|---|
| SAYS | 01 Total<br>01 Reported Speech<br>• 00 Backshifting<br>• 01 Original Tense or Infin TO | 08 Total<br>05 Reported Speech<br>• 00 Backshifting<br>• 05 Original Tense or Infin TO |
| SAID | 14 Total<br>09 Reported Speech<br>• 03 Backshifting<br>• 06 Original Tense or Infin TO | 39 Total<br>23 Reported Speech<br>• 13 Backshifting<br>• 10 Original Tense or Infin TO |
| TELL | 11 Total<br>01 Reported Speech<br>• 01 Backshifting<br>• 00 Original Tense or Infin TO | 32 Total<br>03 Reported Speech<br>• 00 Backshifting<br>• 03 Original Tense or Infin TO |
| TELLS | 00 Total<br>00 Reported Speech<br>• 00 Backshifting<br>• 00 Original Tense or Infin TO | 00 Total<br>00 Reported Speech<br>• 00 Backshifting<br>• 00 Original Tense or Infin TO |
| TOLD | 03 Total<br>02 Reported Speech<br>• 01 Backshifting<br>• 01 Original Tense or Infin TO | 16 Total<br>11 Reported Speech<br>• 02 Backshifting<br>• 09 Original Tense or Infin TO |

Source: Author (2021)

Narrowing the analysis and looking into specific examples, “say” (infinitive form) occurs 215 times is mostly used in the imperative form, e.g., say again, say intentions, say your position. “Says”, in the present tense, 3rd person, as highlighted by some coursebooks, is used 9 times and seems to clearly indicate the action is relevant to present time, in sentences like “He says he has no wing tip clearance” or “a physician on board who says this is a serious matter”. “Said” is the reporting verb that shows the most backshifting structures in the corpora –32 out of 53, which seems natural as a choice for past simple in the whole reporting structure. We can see it in sentences 3 and 4 below. However, we can see examples that stick to the original tense, like numbers 5 and 6, which seem to comply with best communication practices as they intend to convey an unambiguous meaning.

**Figure 8:** Examples of “Said” from CORPAC and RTPEC

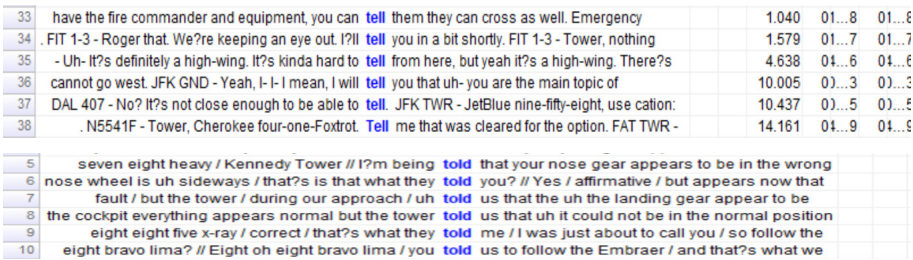


| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | can expect ILS runway niner right into Philly and you | **said** | the nature of emergency was a bird strike? // | 2.717 | 02…5 | 02…5 |
| 2 | / which engine? // He lost thrust in both engines / he | **said** | // Got it // Cactus fifteen forty-nine / if we can | 3.458 | 03…6 | 03…6 |
| 3 | um forty-seven eighteen // I don?t know / I think he | **said** | he was going in the Hudson // Cactus fifteen | 3.806 | 03…4 | 03…4 |
| 4 | from the controller working two seven left // they | **said** | there was a flock of birds headed your way / | 6.875 | 03…3 | 03…3 |
| 5 | // United eight eighty-five heavy / roger // I think you | **said** | people are just walking outside the airplane | 7.927 | 07…5 | 07…5 |
| 6 | call you when we?re uh ready for uh base leg // // I | **said** | we?ll call you when we?re ready to turn base / | 15.134 | 05…2 | 05…2 |
| 7 | uh we are waiting for your notification // Okay / you | **said** | no fire right now / it was engine number two / | 18.513 | 03…1 | 03…1 |
| 8 | alpha and uh yankee papa bravo / and then you | **said?** | // When you get to yankee follow Korean Air // | 22.652 | 02…0 | 02…0 |
| 9 | he hit a vehicle right now right there? // Yeah / he | **said** | there might be a vehicle out there or | 22.874 | 02…2 | 02…2 |
| 10 | with his flight controls // Affirmative // Yes / sir / he | **said** | affirmative on that // Alright / Kalitta sixty-six / | 24.860 | 01…8 | 01…8 |
| 11 | to Fort Myers Approach here in just a minute // Like I | **said** | / they?re gonna take their time and talk to you | 26.197 | 03…5 | 03…5 |

Source: Pacheco (2021)

As for “tell” and its inflections, occurrences show to be much less frequent, and slightly different in tendency: reported sentences occur the most with the original tense or to, even with the past form “told”; we can see that in sentences like 5, 6,10 below.

**Figure 9:** Examples of “tell” and “told” from CORPAC and RTPEC



| | | | | | | |
|---|---|---|---|---|---|---|
| 33 | have the fire commander and equipment, you can | **tell** | them they can cross as well. Emergency | 1.040 | 01…8 | 01…8 |
| 34 | . FIT 1-3 - Roger that. We?re keeping an eye out. I?ll | **tell** | you in a bit shortly. FIT 1-3 - Tower, nothing | 1.579 | 01…7 | 01…7 |
| 35 | - Uh- It?s definitely a high-wing. It?s kinda hard to | **tell** | from here, but yeah it?s a high-wing. There?s | 4.638 | 01…6 | 01…6 |
| 36 | cannot go west. JFK GND - Yeah, I- I- I mean, I will | **tell** | you that uh- you are the main topic of | 10.005 | 03…3 | 03…3 |
| 37 | DAL 407 - No? It?s not close enough to be able to | **tell.** | JFK TWR - JetBlue nine-fifty-eight, use cation: | 10.437 | 03…5 | 03…5 |
| 38 | . N5541F - Tower, Cherokee four-one-Foxtrot. | **Tell** | me that was cleared for the option. FAT TWR - | 14.161 | 01…9 | 01…9 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 5 | seven eight heavy / Kennedy Tower // I?m being | **told** | that your nose gear appears to be in the wrong | | | |
| 6 | nose wheel is uh sideways / that?s is that what they | **told** | you? // Yes / affirmative / but appears now that | | | |
| 7 | fault / but the tower / during our approach / uh | **told** | us that the uh the landing gear appear to be | | | |
| 8 | the cockpit everything appears normal but the tower | **told** | us that uh it could not be in the normal position | | | |
| 9 | eight eight five x-ray / correct / that?s what they | **told** | me / I was just about to call you / so follow the | | | |
| 10 | eight bravo lima? // Eight oh eight bravo lima / you | **told** | us to follow the Embraer / and that?s what we | | | |

Source: Pacheco (2021)

Barbieri and Eckhardt (2007) bring other constructions found to RS, such as “be like” and “go like”, which were frequently found in conversations in their study (American English, informal contexts, teenager conversation). The authors point to the development of these expressions in their discourse-pragmatic functions. That is, an extended use of a structure which speakers are supposedly familiar with and that will facilitate communication. In this line, the use of a wider variety of reporting verbs other than “say” and “tell” in aeronautical communications could be also understood as a compliance with discourse-pragmatic functions through the use of common terminology in AE.

Additionally, regarding the results that show backshifting, pilots and air traffic controllers seem to be aware of the fact that inflecting the subordinate cause to a “past” tense may cause different interpretations and this is probably why they prefer to use other more direct structures such as infinitive (To + verb) or keeping the original tense.

As for teaching, Barbieri and Eckhardt (2007, p. 14) maintain that:

> It is neither necessary nor desirable to teach RS as a

> transformation mechanism from DRS to IRS. Rather, these two different linguistic constructions should be taught as separate constructions, because they have different lexico-grammatical and discourse functions in different situational contexts or registers.

They suggest consciousness-raising tasks (CRT) as an alternative teaching approach -opposite to focus on form tasks only, as it is a means to develop awareness in the level of understanding, through comprehension and production tasks. To clearly illustrate their point, they present tasks based on corpus-based form-focused treatment of RS which they designed based on the corpus findings: "the first unit focuses on the grammatical patterns of IRS; the second unit focuses on the patterns of register variation with IRS; finally, the third unit focuses on the grammatical and sociopragmatic aspects of DRS" (BARBIERI; ECKHARDT, 2007, p. 17).

Book 3 used the sentences "The surface of Runway 09L is contaminated" as the original sentence, and "Aircraft maintenance says (that) the surface of Runway 09L is contaminated" as a suggestion of reported structure. In this line, it might be helpful if AE teachers, when approaching RS, could promote reflections based on the multiple language possibilities such as displayed below:

| | | | | |
|---|---|---|---|---|
| *The controller* | *tells us that*<br>*told us that*<br>*says that*<br>*said that* | *the runway* | *is*<br>*was* | *contaminated* |

The sentence above features the need to relay information previously given – a communication function, reporting information. In order to convey this meaning, the speaker needs to use a reporting verb and the information he needs to relay in a subordinate clause. The speaker will pick a reporting verb that best suits his/her communicative purpose and inflect it as he finds most appropriate: present or past. The subordinate clause may feature a verb inflected in the present or in the past, and the choice for that will be based on what the speaker understands to be less ambiguous to the hearer. It should be noted that each choice entails multiple meanings that trigger different interpretations and impact communications.

According to the traditional normative approach, the preferred form would be "The controller told us/said that the runway was contaminated". The hearer could understand that the action is still true or not, whereas if the speaker uttered "The controller told us/said that the runway is contaminated", the hearer would not be doubtful in interpreting the action as still true.

Specialized languages feature peculiarities such as this one which must be discussed with learners, and not only the options given by traditional orientations from normative grammar. In accordance with the suggestions in Barbieri and Eckhardt (2007) as for task design, CRT activities, encouraging both comprehension and production skills, could be offered.

## 5. FINAL CONSIDERATIONS

It is mandated by ICAO that aeronautical communications be clear, concise, and unambiguous (ICAO DOC 9835, 2010). In light of the corpus investigation proposed in this study about Reported Speech, pilots and air traffic controllers seem to be following that as they tend to prefer the use of more direct language to relay information, lexically and structurally. The results showed that "say" and "tell" do not solely account for the reporting contexts as reporting verbs: other items such as "report" and "advise" are significantly frequent and should be considered when a class is being designed to a particular purpose such as Aviation English. Moreover, backshifting – a traditional approach to teaching RS for general purposes, should also be revisited as it is not the most used form in the real-language aeronautical communication extracts investigated in this study. As stated elsewhere, examples from corpora are not meant to be taken as correct language forms that should be used in teaching as reference material.

Corpus-based studies provide valuable information as they are a possibility to bridge the gap between what has to be taught and what professionals actually use in terms of language. When working with ESP, teachers must mind that gap. Aviation English is a specialized language and has peculiar features that need to be taken into account when addressed in curriculums.

An alternative for that would be the elaboration of taylor-designed activities based on real-life communication examples. Such tasks should encourage the reflection about different possibilities both in terms of communicative functions such as reporting or relaying information and specific structures that are used to express these functions – the reasons for that and possible implications. Pilots and Air Traffic Controllers must be aware of the ambiguity that may result from their language choices.

Teaching ESP entails more than vocabulary associated with a given context. It requires careful attention to the communicative functions required in a specific context and the structures actually used to perform those functions. For instance, teaching RS in Aviation English through the use of "traditionally correct" sentences such as "The flight attendant said that the passenger was not feeling well", probably displayed in aviation-like aids, can be helpful, but not enough. This study showed that professionals involved in the area need to be aware of the communicative implications of following normative grammar as a mandatory rule. In this case, clear communications can be compromised

by ambiguity, and ultimately, safety, our most important goal, can be affected.

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# CHAPTER 4

# "*WHEN I LAND - IF I EVER LAND*": EXPLORING IF-CLAUSES IN AERONAUTICAL ENGLISH

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**ABSTRACT -** Conditional sentences are listed in the complex structure glossary of Doc 9835 (ICAO, 2010). Recent research has found that expressions with if are relevant in the plain aviation English used in R/T communications (PRADO, 2019) but has not examined these fully. Following Prado (2019, 2021a), the present study investigates if-clauses in a corpus of radio communications in abnormal situations (PRADO; TOSQUI-LUCKS, 2019), with a view to identifying the functions they perform in plain aviation English (BIESWANGER, 2016) and how they can inform aviation English teaching and assessment. A corpus-based analysis revealed that of the 310 occurrences of if in the corpus, 60% were employed in requests and orders, 22% in indirect questions, and only 18% expressed conditionality such as "When I touch down / if I ever touch down / do I just kill the throttle or what?" Then, for each of the three functions, we examined the structures in which the conjunction if was used and compared them with traditionally taught conditional structures so as to inform aviation English pedagogical materials and resources from a pragmatic perspective and in the light of real language use (ISHIHARA, 2022).

**KEYWORDS:** Conditionals; If; Corpus linguistics; Pragmatics; Aeronautical English.

## 1. INTRODUCTION

Research has shown that the grammar of spoken language has different characteristics from that of written language. First, the core of the sentence, the verb, does not appear in 37% of utterances (CRESTI, 2014). This alone justifies a change in perspective on the grammar traditionally dealt with in textbooks. However, to date, research does not appear to have reached the classroom as studies of pragmatics and corpus linguistics have shown through the analysis of language use (BARDOVI-HARLIG et al., 2015). According to communicative approach principles (GILMORE, 2007), the input, or the materials that serve to trigger or

model uses of language (BARDOVI-HARLIG, 1996) should be authentic. Nevertheless, despite the growing use of a variety of technological tools (videos, tutorials, Moodle, smart boards) we have witnessed in recent years, content remains largely unchanged.

One example is conditional sentences, which are listed as complex structures in Doc 9835 (ICAO, 2010) and are expected to be produced by Level 5 speakers since the ICAO Proficiency Scale lists complex structures under Level 5. However, the *if* conjunction is highly frequent in radio communications, even in abnormal situations, including expressions such as *if you can*, *if you want*, or *if you'd like* employed in requests and offers (PRADO, 2019). In addition to having a different function, this high frequency should justify the inclusion of this conjunction in lower-level materials (O'KEEFE et al., 2007).

Aviation English exam preparation videos on social media often describe conditional sentences as important, as in "You need to use *if I were the pilot in this situation, I would* to reach level 5 in the test," or "In this video, you will learn the three types of conditionals." While the intention here is not to underplay the relevance of these structures, these videos highlight grammar over vocabulary. Even when one of them presents hypothetical scenarios that use aviation English such as "*Minutes after takeoff, you have problem xxx. How would you handle this problem*?" they are followed by a full explanation of the second conditional.

Like many of us, instructors have been teaching grammar based on structures, not linked to real speech because this is how most of us learned the language or because pedagogical materials do not offer usage-based examples. In addition, courses in English for Specific Purposes (ESP) such as aviation English courses often present the same structures as those found in grammar books and adapt them to the specific context simply by changing the vocabulary to a more superficial level. This means that these courses use written grammar structures such as zero conditional (simple present + simple present), first conditional (simple present + *will*), second conditional (simple past + *would*), and third conditional (past perfect + modal perfect), but instead of using an example such as "If I were rich, I would buy a car," they teach students to say "If I were the pilot in this situation, I would abort the take-off."

The above-mentioned study that revealed expressions with *if* as highly frequent adopted a pragmatics stance in the analysis and, therefore, should be prioritized in the teaching of aeronautical English (PRADO, 2019). To analyze how *if* occurs in aeronautical English, this paper further investigates its occurrences and functions in pilot-controller radio communications in abnormal situations with a view to understanding the reasons why it was found to be so frequent in Prado (2019). To this end, it attempts to answer the following questions:

(1) What are common uses of *if* in pilot-controller radio communications in abnormal situations?

(2) How comparable are these uses with written grammar structures (zero, first, second, and third conditionals)?

## 2. LITERATURE REVIEW

Numerous investigations of grammar reveal how users employ rules differently in spoken and written registers (McCARTHY, 2020; RÜHLEMANN, 2006). However, materials used in language teaching do not appear to consider this important difference, as demonstrated by Conrad and Biber (2009), who compared textbook content to corpus studies, observing that the items and categorizations commonly dealt with are not in fact used or are exempted from contextual clues. Instead, Rühlemann (2006) advocates the use of conversational grammar rather than traditional grammar as a means of defining what rules we are dealing with: spoken or written.

This holds true for a variety of structures dealt with in textbooks, including conditionals. Examples can be found in studies such as Ferguson (2001), which shows that only 18% of instances of the *if* conjunction in his data correspond to the *if*-conditional types traditionally studied in English teaching materials. Gabrielatos (2006) observes that EFL textbooks fail to present a real usage-based approach of *if*-conditionals and lists uses of *if*-conditionals that do not correspond to the three commonly taught *if*-conditional types (first, second, and third conditionals). In fact, Carter and McCarthy (2006) found more than 30 possible patterns of conditional structures. In a study based on the Contemporary Corpus of American English (COCA), beside uncovering 20 alternative types, Phoocharoensil (2014) notes that the conventional three *if*-conditional types account for less than 50% of the data. Among alternative types is the collocate *if* + *would,* which, according to Farr and O'Keefe's (2002) investigation of a teacher training corpus, is normally used for mitigated instructions given by the teacher and is far more common than in a general English corpus. Such findings demonstrate the importance of register, just as certain situations call for certain actions, tasks, or functions. In the aviation context, the study by Tuccio and García (2020) reaches a similar conclusion to that of Farr and O'Keefe (2002), confirming that *would* is frequently used in initial flight training by the instructor when flight safety is not a concern and the injunction does not require immediate attention. Instead, instructors employ it when calling the student's attention to actions that should have been taken or when creating learning opportunities through scenario-making (*if… the first thing I would do…*) (TUCCIO; GARCIA, 2020, p. 63).

Tuccio and García (2020) conclude that trainers intervene pedagogically through hypothesis making by allowing students to develop autonomy in decision-making. Despite the different domains (flight and classroom), Tuccio and García (2020) mirrors Farr and O'Keefe (2002): the functions that emerge in instruction are similar, as well as the various ways in which these functions are expressed. These studies demonstrate the importance of the professional settings or of the communities of practice

(LAVE; WENGER, 1991) students are—or will be—members of, suggesting that grammar may play a secondary role since it is in fact governed by the tasks and functions of real life (ISHIHARA, 2022).

Functions, or speech acts (AUSTIN, 1962), such as hypothesizing, requesting, complaining, and refusing are not always clearly stated through grammar. As O'Keefe et al. (2011, p. 2) observe, "form is often very different from content". That is, people do not always mean what they say. Therefore, when we first focus on functions and then on the grammar used to perform those functions, we may see a different picture from what is usually described in grammar books. In fact, the studies by Farr and O'Keefe (2002) and Tuccio and García (2020) illustrate important uses of *if + would* not predicted in grammar books.

Nonetheless, like grammar, functions cannot be isolated from real contexts. In real settings, facework (GOFFMAN, 1967) also plays a role, especially in face-threatening acts (BROWN; LEVINSON, 1987), or acts that expose the face[1] of the interlocutor. When teachers use *would* to hypothesize scenarios students might encounter, they mitigate a face-threatening act, or the illocutionary force of the imperative or instruction, to avoid giving orders or imposing ideas. By mitigating what they say, speakers may also be attempting to relate to the participants in the interaction (CAFFI, 1999), as demonstrated by a study conducted in pilot simulator training, in which crews with better results mitigated more often as a means of enhancing the relationship between the pilots operating the machine (LINDE, 1988). Another way of preserving face is through indirect speech acts, that is, utterances which may be interpreted as having an intended meaning that goes beyond a more literal interpretation, such as *Would you mind opening the door?,* a request to open the door rather than a question to learn whether the interlocutor minds doing something; or the use of *if+would* described by Farr and O'Keefe (2002) and Tuccio and García (2020), which is also intended as a polite request. In addition, more implicit indirect speech acts such as *It's hot in here* imply that the speaker requests that someone should open a window (BROWN; LEVINSON, 1987).

## 3. METHOD

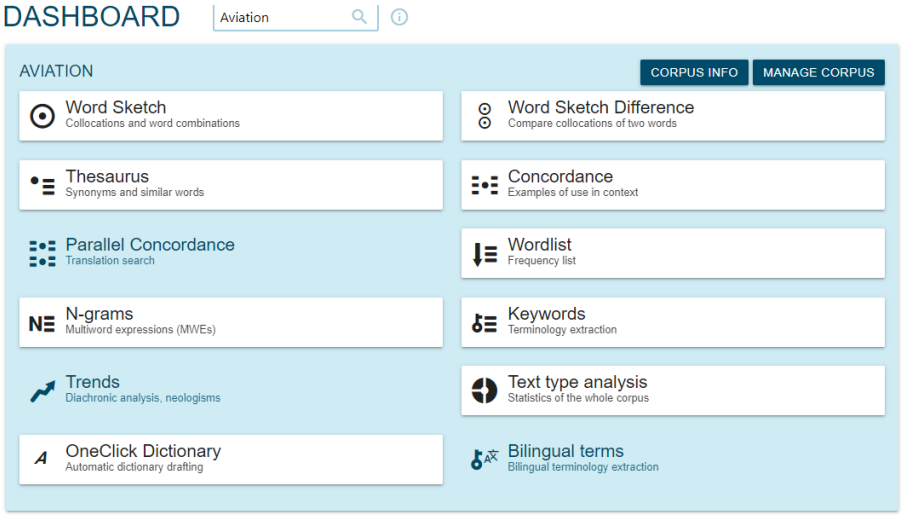
To investigate the language used when pilots' and controllers' Aeronautical Phraseology does not suffice, we examined the RadioTelephony Plain English Corpus (RTPEC; PRADO; TOSQUI-LUCKS, 2019), a corpus of transcribed radiotelephony communications taken from 130 abnormal situations totaling 110,737 words. This corpus was compiled and used in Prado's (2015) study of lexico-grammatical patterns of plain aviation English and later in Prado (2019), which initially investigated fluency and interaction in plain aviation English but concluded by highlighting the role of pragmatics

[1] The use of "face" is intended here as "the positive social value a person effectively claims for himself by the line others assume he has taken during a particular contact" (GOFFMAN, 1967, p. 5).

in the teaching of aeronautical English. The compilation was informed by Bieswanger's (2016) understanding of plain aviation English as a register used alongside Aeronautical Phraseology in radio communications, each with their objectives. As these studies focused on patterns emerging in this community of practice, the corpus had not been tagged by part of speech (POS) and therefore did not enable investigations based on grammatical hypotheses.

For the present study, however, as searches targeted grammar structures, the corpus was POS-tagged. SketchEngine was chosen because of its practicalities: not only could we tag the corpus automatically, but we could also use tools such as its Complex Query Language (CQL) to search for patterns such as *if* + *modal verb*), lemmatizer (to group word inflections into one single word), and Word Sketch (to extract collocates according to their function in the sentence) (KILGARRIFF et al., 2014). Some of these tools can be seen in Figure 1.

**Figure 1:** SketchEngine tools.




Source: https://app.sketchengine.eu

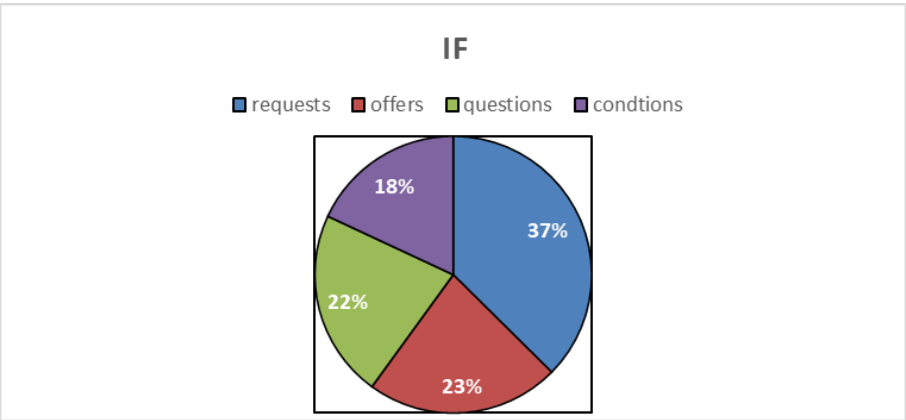
To guide our investigation, we used the Glossary of Complex Structures in Appendix B of Doc 9835 (ICAO, 2010). A broader picture of the data collected based on a raw analysis of percentages and functions of the extracted patterns can be found in Prado and Porcellato (2021), which shows that of all structures listed in the Glossary, only 16% were frequent in the corpus while 45% were rare. Each grammatical structure was then analyzed through concordance lines and co-text (the original transcript). In this paper, we perform a qualitative analysis of one of the most frequent items in the corpus: structures with *if*. To this end, we retrieved all concordance lines in which *if* was found.

Using filters and annotations available among the software tools, we grouped the various functions of *if*. We manually investigated concordance lines, turns, and how the participants co-constructed their communications while also looking for indirect speech acts. We initially filtered all uses by grammar + functional profile, which yielded three initial categories: requests and offers (or speech acts), indirect questions, and conditionals. Our presentation at the 8th GEIA Seminar in 2021 focused on this first categorization. However, a second analysis revealed some differences, mainly in the category of offers, which we highlight in the next section.

## 4. ANALYSIS

Searches for *if* in the corpus revealed 310 occurrences, which were examined in context to identify their functions, classified into four categories: a) offers (70 occurrences, or 23%); b) requests (116 occurrences, or 37%); c) indirect questions (68 occurrences, or 22%); and d) conditions or foreseeing future problems (56 occurrences, or 18%) (Figure 2):

**Figure 2:** Occurrences of *if* by function.




Source: Authors, 2022

This graph shows that most occurrences (60%) correspond to requests and offers. This is in line with Prado (2019; 2021a), which identified clauses such as *if you can* and *if you need* as very frequent in the corpus and mostly performing the same functions (offers and requests). The second most frequent occurrences were related to indirect questions, which we will only briefly touch upon as the topic is more thoroughly investigated in another study (PACHECO, 2022[2]). The third most frequent occurrence regards conditions or foreseeing future problems, with only 18% of total occurrences. We will now

[2] Pacheco's chapter is also available in this e-book.

examine each function in more detail.

### 4.1. *If* in requests and offers

As we show in Figure 2, *if* appears most often in the realization of speech acts such as requests and offers. In the case of requests, which can be seen as face-threatening acts from a pragmatics standpoint (BROWN: LEVINSON, 1987), *if* is used as a softener, that is, as a device that mitigates the illocutionary force of the request. This use of *if* confirms that when resorting to plain aviation English (BIESWANGER, 2016), pilots and air traffic controllers make regular use of strategies that connect the speakers (pilots and controllers), who share responsibility over the problem in hand (PRADO, 2019, 2021a).

Cases of mitigation can also be found in offers, a type of speech act commonly uttered by controllers as a means of assisting an endangered aircraft. A common cluster for offers is *Would you like,* as in "*Would you like to land at Victoria airport*?" (PRADO, 2021b, p. 79), a cluster mitigated by the use of a modal verb. However, *if* also appears to mitigate more general offers, in which the controller shows empathy toward the problem the pilots are facing, demonstrating not only a need for connection, as seen in Linde's (1988) findings, but also for sharing responsibility over a problem (PRADO, 2019, 2021a). Below is a selection of concordance lines illustrating the use of *if* in requests and offers (Table 1):

**Table 1:** Concordance lines with *if* in requests and offers

| No. | Concordance Lines |
|---|---|
| 1 | Aircraft fifteen oh nine / runway three three / taxi via sierra // Yes sir uh / if able / we would like to request runway six for Aircraft fifteen zero nine (request) |
| 2 | We're coming around down the corner here and then we'll come to a stop / if he can look at it that d be great // (request) |
| 3 | things are deteriorating here / I'd like to arrange a divert straight to East Midlands if I may / please // (request) |
| 4 | No uh I if if / if there's anything you need from me sir / just uh just advise // (offer) |

Source: RTPEC (Prado; Tosqui-Lucks, 2019)

Taking a closer look at the examples above, we see that, as noted in the Introduction, *if* does not follow the traditional conditional structures usually taught in textbooks, grammar books, or aviation exam preparation. In (1), we observe the use of *would* in the main clause, which usually signals a second conditional; however, instead of the expected past tense, there is

no verb in the subordinate clause. Since *would* is used in (2) and (3) in the main clauses, we would also expect a second conditional; instead, we see the use of the modal verbs *can* and *may* in the subordinate clause. In (4) we see the simple present in the main clause followed by an imperative in the subordinate clause, which is an example of the zero conditional, but one that does not follow the more traditional structure, with the simple present in both the main and the subordinate clauses. Such mitigations are not in the prescribed Aeronautical Phraseology; however, we should emphasize that the focus of the corpus is abnormal situations, in which speakers are dealing with problems that require language not predicted by Aeronautical Phraseology. In the cases here described, as pilots and air traffic controllers resort to plain English, their interactions are governed by conversational grammar (PRADO, 2019; 2021a), which explains the occurrence of structures that do not match the canonical *if*-conditionals found in grammar books.

### 4.2. *If* in indirect questions

Although direct questions are common in the corpus, they adopt a more objective style that follows the principles of Aeronautical Phraseology (cf. PRADO, 2015). Although not as common, indirect questions are also present. However, they do not follow the principles of Aeronautical Phraseology, which call for objectivity, clarity, and conciseness. Rather, they come across as too sophisticated and wordy in the congested environment of radio telephony. Below are selected examples of such wordings (Table 2).

**Table 2.** Extracts of pilot-controller communications with indirect questions

| No. | Concordance Lines |
|---|---|
| 1 | of four right // And for uh Aircraft one eighty / we're at fox alpha <break> fox bravo / can we have someone take a look to see if we have any smoke or fire? // Aircraft one eighty / roger / it's very difficult to understand you on that radio / you can hold |
| 2 | what information do you want or do you need sir? // Uh the nature of the emergency / the age of the passenger / the gender and also if it's uh what kind of assistance you will need / whether it's a regular ambulance or a cardiac ambulance // |
| 3 | it doesn't look like we're gonna be able to fix the light / we don't know if it's the gear or not / we're still checking it here / we'll get back to you in a couple of minutes on that if that's alright // |
| 4 | I don't know if you are able to see it but uh the traffic at 10 o clock had a nose gear indication / it appeared to be down from our perspective // I don't know if you're able to tell us if it appears to be down from up there // |

| | |
|---|---|
| 5 | Aircraft Two seventy-one / I don't know if you know the answer to this question but do you happen to know what the N-number is on your aircraft? // |

Source: RTPEC (Prado; Tosqui-Lucks, 2019)

Unlike reported speech, in which speakers need to inform what other professionals have said (PACHECO, 2022), indirect questions are used in two different ways: to mitigate questions to the interlocutors, and to indicate uncertainty regarding the problem at hand (*I don't know if*, *I'm not sure if*). Example (1) above is a request directed to a third party (emergency personnel). Talking to professionals other than pilots and controllers requires switching the radio to another frequency, which needs to be asked for and / or informed. Since it is faster to ask the controller to relay the message, the question in (1) becomes a request to the controller and is therefore paralleled with reported speech. Example (2) starts from an utterance by the pilot in the form of a direct question related to information needed by the controller. The controller starts by listing objective answers, and *if* becomes part of a false start, quickly fixed by a direct question. The controller then goes back to the construction in the utterance that became a false start and uses *whether,* a substitute for *if*, indicating that this list is part of a construction started in the pilot's question (i.e., the information needed is…). Yet this co-construction of the communication is commonly disregarded in textbooks, which often require students to give complete answers, with all clauses in a sentence included.

Examples (3), (4), and (5) all refer to the second case, indicating uncertainty. Uncertainty is frequent in radio communications, especially when the problem is external to the aircraft or pilots need to confirm hazards (such as tire debris on the runway) or aircraft problems (such as fire coming from the engine). It is also important for controllers to understand what problem(s) pilots are facing when the aircraft is not in sight so as to better accommodate it.

### 4.3. *If* in foreseeable future problems

In our corpus, *if* was used in structures closer to those found in written grammar in only 18% of all cases. In such cases, *if*-clauses take on the function of conditionals for foreseeing future problems. Given that the corpus we analyzed is composed of R/T communications occurring in abnormal situations, the total number of these occurrences was lower than would be expected in such situations.

If we look at the structure in the examples below (Table 3), we find traditional conditional structures.

**Table 3.** Radio communication extracts with *if clauses*.

| No. | Concordance Lines |
|---|---|
| 1 | there is an emergency inbound to runway two two right / if he does come in soon / more than likely / you won't be landing / you will be overflying runway two two right |
| 2 | from here in the cockpit but eventually we'll probably like to do that // Okay / just <break> the heading I gave you and then if I have to send you around again that will be fine / no problem // |
| 3 | we'll need a bus // we don't want to taxi in our current condition and I don't want to blow the slides if I don't have to // Okay / we'll coordinate with them and try to get some buses out there for you and a tug // |
| 4 | Okay / gear going down // When I touch down / if I ever touch down / do I just kill the throttle or what? // That's correct // When you touch down slowly kill the throttle // |
| 5 | Aircraft seventy ninety seven / I don't know if you uh if you wanna do this but / an option we have available for you / we'd give you a low approach and you uh / you could go right down the runway |
| 6 | have any idea what the alternate might be? // Say again please? // Uh / you have any idea what the alternate / it might be? / if you're uh not gonna go uh out over the water // We will uh let you know / we are not in that uh position at the moment |

Source: RTPEC (Prado; Tosqui-Lucks, 2019)

In (1), we can see an *if*-clause with the simple present (*if he does come in soon*) followed by the future in the main clause (*you won't be landing*), which corresponds to the first conditional. The same structure can also be observed in (2), with the simple present in the subordinate clause (*if I have to send you around*) and the future in the main clause (*that will be fine*). In the other two examples (3 and 4), we can see what is usually referred to as zero conditional, with the simple present being used in both the subordinate clause (*if I don't have to, if I ever touch down*) and in the main clause (*I don't want to blow the slides, do I just kill the throttle*?). The last two examples demonstrate features of spoken language; in terms of structure, (5) could be seen as zero conditional (present + present) (*I don't know if you wanna*), and then a presentation of hypothesis through *would* and *could*. In this hypothesis, there might be an implicit message such as *if you wanted do to this*. When seen from another perspective, (5) starts with an uncertainty but to state an offer (*I don't know if you wanna do this but an option we have available for you*), which is presented through a contingency plan with the use of *would* and *could* (*we'd give you a low approach… you could go right down the runway*). The last concordance line (6) presents similar features to (5): the main clause appears first with the modal verb *might*, followed by *if* with *going to.* The

message is split within utterances and turns, starting from the controller asking *[Do you] have any idea what the alternate might be?*, not understood by the pilot, who asked for clarification: *say again please?.* The controller repeated the message but split it into three utterances: *you have any idea what the alternate / it might be? / if you're uh not gonna go uh out over the water.* The last part refers to the contingency plan presented earlier by the pilot (found in the complete transcript); this information was important to the controllers as they could prepare the chosen airport for a possible emergency landing. The pilot did not need to repeat the plan that had just been stated by the controller and responded with two utterances: *we will let you know* and *we are not in that uh position at the moment*. These two utterances imply conditions such as *if we have to divert to another airport* and *we cannot make that decision since the first contingency is yet to be confirmed*. Such conclusions can only be drawn when the data is analyzed within the transcript, revealing the co-construction of the communication between pilots and controllers. These concordance lines reflect our difficulty deciding which function *if* performs in many of the utterances.

These examples show a feature specific to aviation, namely planning for contingencies. Even though emergencies are rare, pilots and controllers are trained to expect and deal with them. Moreover, pilots are supposed to brief one another on the flight deck, listing their actions if something happens and hypothesizing scenarios. For example, pilots inform one another about what to do if they have an engine failure or any other problem after take-off. These contingencies are part of their routine and are expressed in briefings, manuals, and other documents.

In the corpus, traditional conditional sentences, which are considered complex structures in aviation Language Proficiency Requirements (LPR), appear only when these structures are used to state conditions or express foreseeable future problems, a function considerably less frequent compared to other uses.

## 5. CONCLUSION

In line with Carter and McCarthy (2006) and Proocharoensil (2014), our analysis shows that structures with *if* go far beyond the three traditional conditional types usually presented in textbooks. This supports Gabrielato's (2006) suggestion that conditionals that do not follow the traditional patterns should not be regarded as exceptions or special cases.

Corpora should address criteria such as language variety, functions, and contexts similar to those end users of pedagogical materials need to learn (McCARTHY, 2020). By doing so, corpora can also be a source of input from which teachers can collect material. Furthermore, corpora also enable us to investigate the frequency of language items so as to make choices, following O'Keefe et al.'s (2007) claim that more frequent structures should

be prioritized in initial instruction while less common structures may be dealt with later as part of exposure to input. Either way, focusing on clusters relieves speakers of the burden of coming up with new structures at each time of speaking (WOOD, 2006). Our study demonstrates that such clusters need to be guided by functions (BARDOVI-HARLIG ET AL., 2017).

The analysis reveals that specific combinations with *if* are frequently used in speech acts such as requests and offers following patterns not necessarily as complex as the traditional structures presented in LPRs. Due to their high frequency, such combinations should be prioritized in aviation English courses (O'KEEFE AT AL., 2007). Although *if* in conditionals appears less frequently than in requests and offers, it is used especially when pilots and controllers address foreseeable problems and reinforce contingencies. Such uses, which may or not follow the traditional grammar patterns usually taught in textbooks, should also be addressed earlier in aviation English teaching and dealt with in contextualized examples.

Even though the present study started from grammar, it confirms the need for pragmatic instruction focused on functions (ISHIHARA, 2022) in aviation English materials and classes. This means that structures such as *if-clauses* should not be taught through isolated sentences, as it often happens, but by looking at contextualized language, in which students can see how speakers negotiate their intentions and share responsibilities in the interaction. Only by having access to real-life communication will learners be able to fully grasp the meaning(s) and function(s) of the structures they will need in order to communicate effectively at work.

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# Aviation English Teaching

PART II

# CHAPTER 5

# A CORPUS-DRIVEN APPROACH TO AVIATION ENGLISH IN PILOT FLIGHT TRAINING

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**ABSTRACT** - Radio-telephonic communication between professional pilots and air traffic controllers has been the topic of numerous corpus research projects in the field of Aviation English (AE) in recent years (see BARSHI; FARRIS, 2013; BOROWSKA, 2017; FRIGINAL et al., 2020). Notably, Bieswanger (2016), following Biber and Conrad's (2009) framework for register analysis, identified two distinct, specialized, and highly restricted registers of AE in use by professional aviation personnel: Standard Phraseology and "plain" AE. Similar corpus-driven register analyses of discourse between student pilots and their flight instructors in training program contexts is scarce. The Corpus of Flight Training (CFT) monitor corpus developed in this study currently covers 53 hours of transcribed audio and video recordings of one-on-one, instructional communication in AE between flight instructors and student pilots. Authentic linguistic data was collected in three key contexts of flight training operations: oral instructional activities, Flight Training Devices (FTDs), and in-air flight. This paper discusses the results of a quantitative, exploratory multi-dimensional analysis (MDA) (BIBER, 1988; FRIGINAL, 2013) comparing preliminary CFT data between the aforementioned three flight activities to other spoken and written registers of English. Preliminary findings suggest a strong overlap of flight training activities with the English registers related to involved persuasion and information interaction. Linguistic features between the CFT and the Brown and LOB corpora as well as language use based on activity type will be discussed. These initial results can help further refine target language usage for Aviation English assessments and inform curricula for ab initio pilots.

**KEYWORDS:** Corpus linguistics; Flight training; Multi-dimensional Analysis; Register analysis; Aviation English.

## 1. INTRODUCTION

With global demand for new pilots soaring and not enough in-country capacity to meet needs, the United States has become the

training grounds for English second language ab initio pilots. Aviation English language proficiency is a requirement both within the United States (FEDERAL AVIATION ADMINISTRATION, 2017) as well as amongst all member states within the International Civil Aviation Organization (INTERNATIONAL CIVIL AVIATION ORGANIZATION, 2007). These policies were implemented specifically for use in radio telephonic interactions. However, the registers associated with Aviation English in flight training contexts have yet to be examined.

Moder (2013, p. 227) broadly defines *Aviation English* (AE) as:

> (…) the language used by pilots, air traffic controllers, and other personnel associated with the aviation industry. Although the term may encompass a wide variety of language use situations, including the language of airline mechanics, flight attendants, or ground service personnel, most research and teaching focus on the more specialized communication between pilots and air traffic controllers, often called radiotelephony.

We can see from this interpretation of Aviation English that how we describe the function and use of the English language in aviation contexts largely depends upon the people who use it. These groups include *pilot-controller communications* (MORROW et al., 1993), *air traffic controller (ATC) English* (PHILPS, 1991; TAJIMA, 2004), or the locations of use such as *control tower language* (FRICK; SUMBY, 1952). Estival, Farris, and Molesworth (2016) note that *aviation communication*, which includes the aspects of the definition above can also include non-linguistic interactions such as light guns, specific coding used for weather reports (i.e. METAR), hand signals for tow truck positioning, and so on. Other researchers choose to coin new terms altogether such as *airspeak* (ROBERTSON, 1988).

For the purposes of this paper, we will focus on two branches under the Aviation English tree. One is the well-established area of radio communications between pilots and controllers, referred to as *aeronautical English,* which has two further delineations: Standard Phraseology (SP) and Plain Aeronautical English (PAE) (BOROWSKA, 2017; TOSQUI-LUCKS; SILVA, 2020). The other branch, which has yet to be researched, is the register of Aviation English used by student pilots and their instructors during the course of flight training. Depending on the context of the flight training environment, this variety of aviation communication can be a hybrid of flight training English between instructors and students and either aeronautical English roleplay or real-time communication with ATC. In order to examine this spoken register, it is first necessary to construct a corpus of language from this flight training environment, then compare its language to that of other known spoken and written registers of English.

## 2. LITERATURE REVIEW

### 2.1. Corpus linguistics in English for Specific Purposes Contexts

Corpus linguistics is broadly categorized as "dealing with some set of machine-readable texts which is deemed an appropriate basis on which to study a specific set of research questions" (MCENERY; HARDIE, 2012, p. 1). In the case of spoken language, texts can be derived from spoken output in the form of transcribed (i.e. written) spoken language, and more recently can be multimodal (*e.g.* video, audio recordings). These corpora can be also be examined for a variety of linguistic and contextual variables (FRIGINAL; HARDY, 2014) as shown below:

*Linguistic variables:*

1. Sounds, words, and grammatical features of a language: pronunciation, intonation, syntax.
2. Discourse: spoken and written style, formality, cohesive devices, interruptions, overlapping speech.
3. Pragmatics: politeness, hedging, boosting, aggression (profanity), gratitude.
4. Specific communication features: speech acts, pauses, backchannels and pauses (as it relates to relationship management).
5. Paralinguistic features: non-verbal communications (e.g., hand gestures); laughter, silence, use of visuals.

*Contextual variables:*

1. Social: demographic information.
1. Situational: settings and locations with registers of language use.
2. Attitude and relation: identity, power, solidarity.
3. Temporal: diachronic analyses.
4. Geographic: linguistically demarked rather than politically.
5. Other. (cited in ZHANG, 2019)

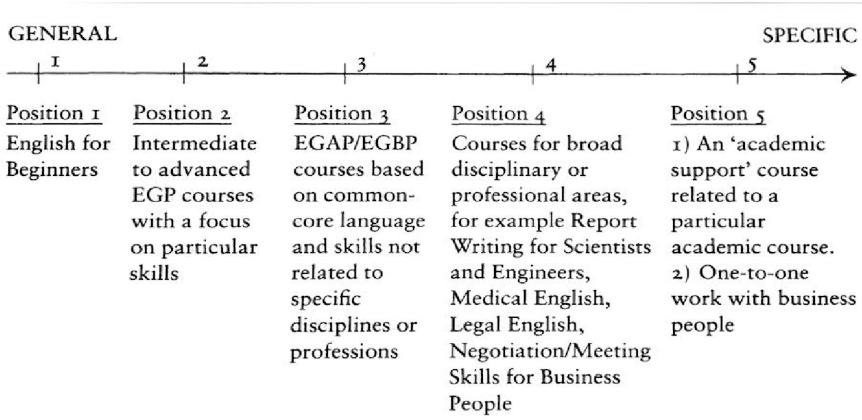
Corpus tools allow researchers to quantitatively investigate frequencies of words and multi-word units, to identify and "tag" various parts of speech, and to conduct multidimensional analyses (BIBER, 1988) that explore how different parts of speech combine in patterns to create the various characteristics of a linguistic register. Larger corpora (1 million words +) are often designed to be *representative* of a group, register, or language variety, whereas smaller corpora (< 1 million words) designed to focus on specific contexts are considered *specialized corpora* (FRIGINAL et al., 2017). Gilquin (2015) notes that spoken corpora allow researchers to analyze a wealth of oral language features (e.g., phonetics, prosody, intonation), but these benefits are often offset by time and resource constraints due to the labor-intensive

efforts of transcription. Additionally, transcribers must interpret the conceptual intentions of the speaker – a task made even more difficult when dealing with developing language forms produced by learners of a second language.

Ballier and Martin (2015) observe that while written learner corpora are readily available, spoken corpora are scant, especially those which provide actual audio recordings instead of transcript-only "mute spoken data". Generally, written transcriptions of spoken texts follow dictionary-type standards which can bely the phonetic realization of spoken language. Conversely, if words such as *going to* are realized and transcribed as *gonna* or *goin'*, then there could be residual issues when the language is processed in a part-of-speech (POS) tagger. A variety of software programs are available designed to annotate, tag, and analyze spoken features such as disfluencies and phrasing (e.g. *CLAN*), phone substitutions (e.g., *Phon*), acoustical analysis, prosody, formant analysis, and prosodic morphing (e.g., Praat), and multimodal analysis (e.g., *ELAN*, *EXMARaLDA, WinPitch*) (BALLIER; MARTIN, 2015). Next we will turn to how corpus linguistics has been applied to subfields of English language teaching.

Dudley-Evans and St John (1998) view the field of English language teaching on a spectrum from more general language courses, typically suited for lower-level learners, to more advanced English instruction designed to cater to the specific needs of the academic specialized subfield (Figure 1).

**Figure 1:** Continuum of English Language Teaching course types (in Dudley-Evans & St John, 1998, p.9)




Source: Author (2022)

English for Specific Purposes (ESP) is a specialized subfield within English language teaching which focuses on highly technical fields and typically caters to adult learners. Within the ESP umbrella, English for

Academic purpose (EAP) covers such areas as English for academic science and technology, medical purposes, management, finances, and economics (DUDLEY-EVANS; ST JOHN, 1998). This is distinguished from English for occupational purposes (EOP) under which we would find Aviation English.

Dudley-Evans and St John also identify that grammar (i.e., verbs and tense, passive/active voice, modals, articles, nominalizations, and logical connectors) technical vocabulary, lexical phrases, and understanding of the discourse and genre of the academic subfield is a priority for language instruction. Indeed, Flowerdew's (2014) review of ESP science and technology corpora textbooks found high frequencies of technical and sub-technical (e.g., *wall, energy, structure*) vocabulary and verbs (e.g., *consider*) as well as nominalizations and complex nominals. Specifically focusing on spoken dialogic interaction, the authors note that learners in ESP will need to develop active listening skills, question formation, adjusting interaction length based on verbal and non-verbal cues, paraphrasing, and summarizing.

Examining the difference between spoken and written academic texts in EAP, Biber's (2006) corpus analysis of the T2K-SWAL corpus revealed that in academic settings, modal verb usage depended largely on the register of use. Prediction and violation modals such as *will* and *would* were highly frequent in spoken classroom management; modals such as *can, could,* and *may* were more evenly spread across spoken and written registers. However, necessity modals like *must* or *should* were overall less present in EAP but when they did occur it was mostly in written academic registers. For adverb usage, certainty adverbs like *actually* and *in fact* were most frequent, followed by *possibly* and *probably* (adverbs of likelihood). These features seemed almost exclusively present in spoken texts and much less so in written. Stance clauses like *to want* or *to like* were also common to spoken language as well as verb+*that* clauses (e.g., *I know that, I think that*). Biber concludes that stance in spoken registers in EAP include language that expresses personal attitudes, student directives, and epistemic assessments.

Friginal, Lee, Polat, and Roberson's (2017) collection of EAP spoken corpora research offers many invaluable insights into learner language. In a comparison of students to teachers in a university intensive English program (IEP), not only did teacher speech dominate classroom time, but when students did speak, most utterances were only one or two words from most students. For usage of hedges and boosters, learners tended to use hedges (i.e. *think, maybe, just*) less frequently than their instructors and typically employed these hedges to express uncertainty in accuracy, reliability, or precision. Teachers' hedging, which was significantly greater than learners, included modals *could* and *would*. The authors theorize that instructor usage of hedging has the pragmatic function of mitigating perceived power distance between instructions and students in an EAP setting.

A similar pattern was also present in boosting language (i.e. *know, very, a lot/lots, always*). Students habitually used boosters to emphasize a statement

whereas teachers used boosters to amplify. Personal pronouns *I*, *you,* and *we* had different distributions and functions between teachers and students. *You* was utilized in the general sense by students to display knowledge, whereas teachers used *you* and *we* to create a more inclusive classroom environment. In terms of deictic markers (*this/these, that/those, here/there*), learners preferred to refer to their local space (*this, here)* and teachers, who used significantly more deixis in general, preferred the demonstrative *that*. Additionally, learners rarely used the plural form suggesting that learners at this English proficiency level may struggle with such syntax.

What the above studies highlight is that language in EAP is more lexically dense and syntactically complex and can differ on a number of variables. Text that is written tends to be more direct whereas spoken language hedges. Students tend to output less than their instructors and when they do speak, their utterances might be limited. Pragmatically, the usage of hedging is markedly different between students and their teachers both in word choice and in frequency. Discourse marker usage by this population of learners might also be influenced by their function in the L1 of the student.

In the case of Aviation English corpora, additional challenges exist because the language produced primarily occurs in safety-critical environments where permission to record or film is restricted. Nevertheless, there have been a number of corpus studies that can teach us about the nature of the language used between professional pilots and controllers examining aspects such as word frequency (MODER; HALLECK, 2021), interrogatives (HINRICH, 2008), pragmatics (HOWARD, 2008; LINDE, 1988), prosody (TRIPPE, 2018), pronunciation (SULLIVAN; GIRGINER, 2002), differences between standard and plain aeronautical English (C.A. PRADO; TOSQUI-LUCKS, 2017; FERRER et al., 2017), workload and language production (CORRADINI; CACCIARI, 2002), discourse analysis (FRIGINAL, ROBERTS, UDELL, & SCHNEIDER, 2020; TIEWTRAKUL; FLETCHER, 2010), speech acts (PRINZO; HENDRIX; BRITTON, 1995), and English language proficiency (PRINZO; HENDRIX; HENDRIX, 2008).

The most relevant study in the professional aviation arena to the corpus presented in this paper explores cross-corpora comparisons between Aviation English and other ESP registers. Friginal, Mathews, and Roberts (2020) compiled a specialized Aviation Corpus comprised of data from flight training and simulations texts from a South American airline with other texts from various Asian airlines, and combined the data with the Corpus of Pilot and ATC communications (CORPAC)[1].

Using Biber's (1988) multidimensional analysis framework (MDA), Friginal et al. compared Aviation language with call centers, maritime communications, the Call Home corpus, and the American English

[1] CORPAC is presumably the same data from Prado and Tosqui-Lucks 2017 which was created by transcribing data from YouTube videos derived from audio recordings on the website liveatc.net.

Conversation corpus. The findings indicated that in the 1st dimension (elaborated vs. involved language), politeness markers (e.g., *please/thank you*) and honorifics (e.g. *sir*) were less prevalent in Aviation English as well as narrativity. The 2nd dimensional analysis, planned vs. procedural talk, found aviation language was more instructional in nature which the authors attributed to the requirements for pilots to readback instructions to ATC. Temporal adverbs (*then, next,* etc.) were not present in Pilot-ATC communications, even though instructions from ATC typically follow an ordered command. Discourse markers such as *oh, well*, *anyway* were largely absent from the aviation texts. Dimension 3 analysis showed that ATC-pilot interactions do not use features typically associated with adjacent pairs (e.g., *ok, exactly, basically, actually, well*). In sum, Friginal found that Aviation English is distinct from other ESP registers in that the texts included did not have the rapport-building language typical to other spoken registers.

It is also worth mentioning that corpus researchers have investigated the differences between radio communication of L1 and L2 English speaking pilots and ATC. Notable differences between these populations include comprehensibility issues with L2 pilots in pronunciation and fluency for both L1 and L2 pilots (PRINZO et al., 2008). Prosody in the register of AE has also been found to be quantitatively different from other spoken registers in terms of increased speech rate, flat intonation, and reduced consonant duration (TRIPPE, 2018). In international settings, corpus data has shown that when prescribed SP vocabulary (i.e. *go ahead, hold short, priority,* and *affirm*) takes on alternate meanings in radio communications, it can lead to misunderstandings in professional pilot-ATC interaction (FERRER et al., 2017). Next, let us take a brief look at the specialized ESP register of Aviation English.

### 2.2. Linguistic registers of professional aeronautical English

Following Biber and Conrad's (2009) register identification framework, Bieswanger (2016) identifies two distinct sub-registers within aeronautical English[2]: standard phraseology (SP) and plain aeronautical English. SP is prescribed and governed by the International Civil Aviation Organization (ICAO) under *Annex 10* (INTERNATIONAL CIVIL AVIATION ORGANIZATION, 2007) and in the United States by the Federal Aviation Administration (FAA) *Aeronautical Information Manual* (FEDERAL AVIATION ADMINISTRATION, 2021). The aim of this phraseology is "to provide maxim clarity, brevity, and unambiguity in communications," and these regulatory bodies dictate that "phraseologies should always be used whenever they are applicable" and in scenarios where they are not, "that users also have sufficient 'plain' language proficiency" (INTERNATIONAL CIVIL AVIATION ORGANIZATION, 2007,

[2] Bieswanger uses the term *Aviation English* but to avoid confusion with other aspects of Aviation English listed above, for the purposes of this study the term has been changed to *aeronautical English*.

3-2). Most importantly, SP is markedly different from other general varieties of English in terms of phonology, lexis, semantics, discourse, and syntax (PHILPS, 1991).

Bieswanger (2016) outlines that SP lexis is unique from other registers of English in that homophony and polysemy have been prescriptively removed to avoid ambiguity and confusion. Bieswanger aptly notes that this lexis is not naturally occurring within the L1 English speaker's repertoire and "has to be learned by both native as well as non-native speakers of English with explicit instruction" (p. 76). This observation has shown to be true when non-pilot L1 English speakers failed to read back recorded authentic routine instructions from ATC in laboratory settings (TRIPPE, 2018). Discourse in aeronautical English typically follows easily identified phrase patterns and turn sequences within a narrow range of highly frequent communicative events or 'radio calls', making the discourse highly predictable to both pilots and ATC (SUMBY, 1960). Furthermore, radio frequencies are often shared by multiple pilots at the same time. As such, brevity is essential (FEDERAL AVIATION ADMINISTRATION, 2021).

While most communications between pilots and controllers fall into the realm of SP, in cases of misunderstandings, abnormal or emergency situations, pilots and ATC are permitted to deviate from SP and use plain aeronautical English (FEDERAL AVIATION ADMINISTRATION, 2015). Similar to SP, this plain language is lexically filled with aviation-related technical vocabulary which requires area-specific knowledge to understand. Because the mode of communication and potential congestion of radio traffic remains the same, conciseness and brevity are also expected.

### 2.3. Pre-professional aviation communication during flight training

Given the severity and high-profile nature of fatal aviation accidents due to miscommunication, most of the extant corpus research in the field of Aviation English has been dedicated to analyzing the language produced between pilots and ATC in professional settings (see BARSHI; FARRIS, 2013; KONRATH, 2019). However, as stated above, the uses and functions of aeronautical language in pre-professional, training environments are only beginning to be explored (TUCCIO; NEVILE, 2017; TUCCIO; GARCIA, 2020).

While we can assume that flight instructors will teach and student pilots will develop proficient use of both sub-registers of professional aeronautical English, we still know very little about aviation communication in flight training contexts. Analyzing mid-career professionals who are already fully proficient in aeronautical English tells us little about the developmental process they went through to attain such proficiency. Given that aeronautical English is native to neither L1 or L2 English speakers (TRIPPE, 2018), what is needed is a spoken database which captures the language between flight instructors and their students in the variety of flight training activities that students

encounter on their way to becoming certified commercial pilots. Thus, this study aims to determine how aeronautical language operates within the *pre*-professional, flight training context and with which known registers of English it most commonly can be associated.

To that end, the Corpus of Flight Training (CFT) was created as a means of collecting and analyzing authentic spoken language data. The aim of the CFT in this report is to answer the following research questions:

1. How does the language of flight training compare with other registers of English?
2. What are the linguistic features that characterize the spoken language used in flight training?
3. Are there differences in language use based on flight training activity types?

Following Biber and Conrad's (2009) MDA framework, the CFT will examine linguistic and functional aspects of this specialized register and then compare it to other established registers of English.

## 3. METHODS

Data for the CFT was collected at a large university-based flight training program in the Southeast United States starting in November of 2020 and data collection is still ongoing. The general population of the program consists of 80% domestic United States and 20% international students. Flight training activities include "orals", flight training devices (FTDs), and flights. Orals are a one-on-one lecture/Q&A session between flight instructors and students aimed to teach and assess declarative knowledge and then correlate it to flight scenarios. In FTDs, students apply the theoretical knowledge that they have learned in oral activities in a Level 6 flight simulator.

In this simulated environment, instructors run full flight scenarios (to include abnormal and emergency flight situations) and also repeat phases of flight that require further practice for the student. In flight activities, students apply all that they have learned in orals and FTDs to the real-world environment, now with authentic interactions with ATC.

Prior to engaging in the study, a thorough risk-assessment by the university's flight department safety, training, and maintenance heads was completed to mitigate risk to both students and instructors. After a trialing of potential recording equipment, the following devices were given approval for flight training activities:

- Orals: Aiworth E36 digital voice recorder (with line-in capability)
- Flights: Nflightcam Digital aircraft audio recording cable
- Flights: GoPro Hero 3 video recorders

Because of the recording capabilities of the FTDs, all intra-flight deck

audio was recorded via the FRASCA simulation software and then securely transferred to the researchers. A training video was made for flight instructors showing how to safely operate the flight recording equipment which was accessible via a QR code link to a private YouTube channel. Institutional review board approval was granted by both the research and university host institutions. All participants in the study gave written consent and also provided their demographic information as well as their language backgrounds. The researchers and the flight department instituted a policy which reserved the right to remove fully recorded activities if they were deemed to have sensitive information related to safety and/or professional misconduct. As such, one flight activity was expunged from the corpus.

All data were transcribed by licensed pilots from the host flight school with at least an instrument rating or higher so that all of the aeronautical English, technical, and procedural language would be intelligible. Additionally, transcriber applicants first underwent an assessment to ascertain their ability to transcribe flight data prior to selection of the final transcriber team. All transcribers were granted access to limited portions of the data in a password-protected storage drive.

While the initial intention was to have transcriptions follow CHAT protocols (MACWHINNEY, 2008), the additional training for non-linguist pilots was deemed impractical. Instead, a general orthographic transcription protocol was developed. For orals and FTDs the only speakers in the recordings were a single student with their instructor. For flight data, all intra-flight deck conversations were transcribed as well as communications between ATC and other pilots that was deemed to be relevant to the aircraft carrying the student and instructor. In other words, all radio communications on the broadcasting frequency which did not directly impact the movements of the participant aircraft were omitted.

The corpus currently consists of 53 hours 46 minutes of spoken data across the three types of flight activities in private pilot, instrument, and commercial single engine flight training courses (Table 1).

**Table 1:** Description of CFT Data

| Activity | Number of lessons | Range of tokens | Average tokens | Tokens | % of total corpus |
|---|---|---|---|---|---|
| Orals | 8 | 4910-19991 | 12495.38 | 99963 | 33% |
| FTDs | 9 | 2529-12642 | 6612.11 | 59509 | 20% |
| Flights | 19 | 3334-11404 | 7396.21 | 140528 | 47% |
| Total | 36 | 2529-19991 | 8834.56 | 300000 | 100% |

Source: Author (2022)

The corpus includes 21 students (mean age = 23.80, *SD* = 8.89) of which 12 identified as first language (L1) English speakers and 9 as second language (L2) English speakers. There were 16 flight instructors (mean age = 23.85, *SD* = 2.19) and their language background was 10 L1 English and 9 L2 English speakers.

Here is an excerpt from an in-flight activity:

**Instructor:** You have the flight controls. Uh, we are going to take it slow, there you go. (Well?[3]) do you remember like, we want to, we don't want to go below a certain RPM, there you go. Now today's a day that we really really have to talk to the wind, right. There you go.

**Student:** [airport[4]] Ground [callsign four sixty-one at romeo three, ready to taxi.

**ATC[5] Ground:** [callsign] four sixty-one [airport] Ground, runway three four taxi via echo, cross runway seven left at echo.

**Student:** [callsign] four sixty-one taxi runway three four via echo, cross runway seven left at echo. So, we are taxiing to runway three four via echo. So we'll cross runway seven left at echo, uhm there's one hotspot uh, (xxx[6]). Two runway crossings.

**Instructor:** So, how many spots?

**Student:** Uh, there's one (complex?) hotspot, and two runway crossing. So, yeah.

echo.

**Instructor:** I agree. Now imagine the ramp is a school zone, whereas right now it's like a highway, if you go a little too slow that also causes hazards, (correct?).

**Student:** Yep.

**Instructor:** And always your comfort level is the number one priority, right?

**Student:** Yep.

**Instructor:** And now, perfect, just like that, even in a thousand RPM, perfect. Now talking to the wind, even at a thousand RPM, the airplane will (be?) just fine. Remember, remember the sensations, small corrections, small tapping, right? (Flight activity_1, 2020)

The CFT is a monitor corpus and as such, data collection will continue at least until the initial collection of 30 hours of spoken texts per activity is obtained. As of now, flight activity data have surpassed the goal at 31 hours 70

[3] [ ] = Text that has been deidentified.

[4] ( ?) = Questionable transcriber interpretation of utterance due to poor audio signal or interference

[5] ATC = Air Traffic Control

[6] (xxx) = Unintelligible utterance

minutes of recordings. Both Oral and FTD activities still have a remaining 10 hours and 30 minutes remaining to complete the designed 90 hours of flight training activities. Ongoing challenges with collecting flight training data related to reliability of video recording equipment (the batteries running out during a flight), participant error (i.e., not recording properly), and the general pool of volunteers for the study being too rushed to start flight activities and fail to check out recording equipment. Regardless of all the challenges in collecting this one-of-a-kind corpus, to have audio and video data that includes 1) the learning process from knowledge to application, 2) learners at various stages of training, 3) rich contextual information related to radio communications and the response within the flight desk, and 4) radio communications during all phases of the same flight, is well worth the efforts.

While the CFT can certainly be used to examine a variety of linguistic and contextual variables surrounding flight training, this initial analysis on the data set listed above was conducted using the multidimensional analysis framework developed by Biber (1988). Barkaoui (2021) outlines that there can be two types of MDA: *additive* and *novel* (SARDINHA et al., 2019). The aim of conducting a novel NDA is to propose a new factor analysis which requires at least 300 or more texts (FRIGINAL; WEIGLE, 2014).

In an additive MDA, the goal is to compare data from a specialized corpus to data from previously established registers. While an MDA is typically conducted using Biber's POS-tagger and MDA tool, the software is proprietary and not publically accessible. As such, Nini (2019) has developed the Multidimensional Analysis Tagger (MAT), a comparable tool which replicates Biber's MDA process. The MAT analysis, following Biber's (1988) framework, tags 67 language features in a text which is then categorized along 6 established dimensions: Dimension 1, Involved vs. Informational Discourse; Dimension 2, Narrative vs. Non-Narrative Concerns; Dimension 3, Context-Independent Discourse vs. Context-Dependent Discourse; Dimension 4, Overt Expression of Persuasion; Dimension 5, Abstract vs. Non-Abstract Information; and Dimension 6, On-Line Informational Elaboration.

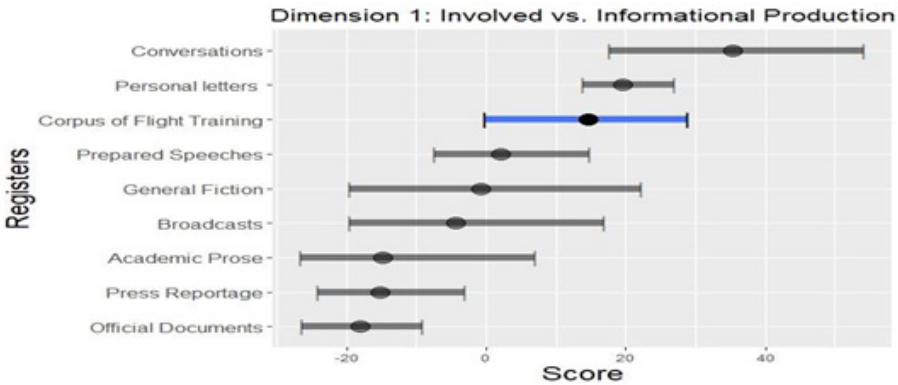
Based on the positive or negative loadings within each dimension, the texts are then qualitatively labeled under 8 different text types: intimate interpersonal interaction, informational interaction, scientific exposition, learned exposition, imaginative narrative, general narrative, exposition, situated reportage, and involved persuasion. Following the MAT analysis, more granular analysis was also conducted, zooming in to the individual 67 tagged language features to see which were most prevalent both between the CFT and the MAT reference corpora as well as what type of language feature distribution existed based on activity type.

## 4. ANALYSIS

The following analysis will compare the current CFT data with a

selection of Biber's (1988) previously identified registers of conversations, broadcasts, prepared speeches, personal letters, general fiction, press reportage, academic prose, and official documents across six dimensions of language. In Biber's work, the texts for these registers are drawn from the Lancaster-Oslo-Bergen (LOB) (JOHNSSON; LEECH; GOODLUCK, 1978) corpus which is a replication of the Brown corpus (FRANCIS; KUCERA, 1979).

**Figure 2:** Mean scores and ranges for Dimension 1, Involved vs. Informational Discourse

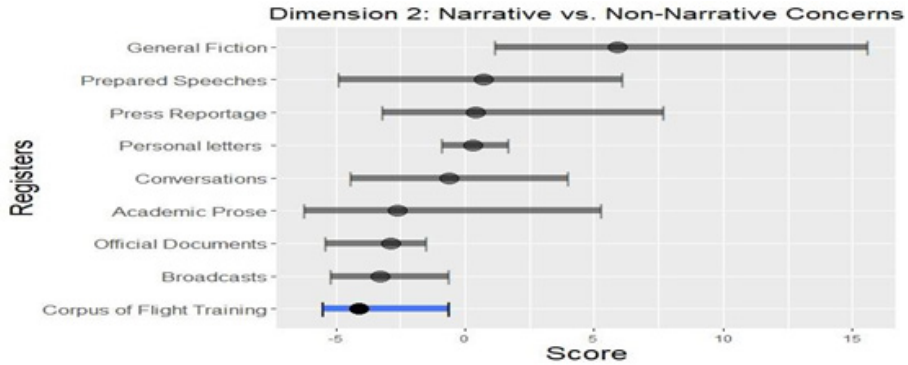



Source: Author (2022)

### 4.1. Dimension 1 – Involved vs. Informational Production

Biber (1988) describes a high score as being "interactional, affective, involved purposes [...] strict real time production and comprehension constraints" whereas a low score is indicative of a text that is "carefully crafted and highly edited" (p. 115). The CFT score (Figure 2) is quite high ($M$ = 14.69, $SD$ = 6.4) in this category which we can see closely aligns with the language features of texts from personal letters and conversations. High scores in dimension 1 include personal affect as evidenced in the CFT through pronouns (*I, you, we, they*), private verbs (*see, think, hear, know, check, remember*), emphatics (e.g., *really, just, such*), and Wh- questions. Also, the CFT high frequency of fragmented discourse seen in hedges (e.g., *sort of, kind of, maybe*), discourse particles (e.g., *now, well, anyway*), contractions (e.g., *what's, i'd, it's, don't*), 'be' and 'do' as main verb, and the pronoun 'it' load the score more positively compared to other registers. The CFT text also has high occurrences of verbs conjugated in the present tense, another feature of positive loading in dimension 1. On the other end of the spectrum, low scoring registers in Dimension 1 are texts from academic prose, official documents, and press reportage. These would contain more prepositions, nouns, and have a high type-token ratio.

**Figure 3:** Mean scores and ranges for Dimension 2, Narrative vs. Non-Narrative Concerns

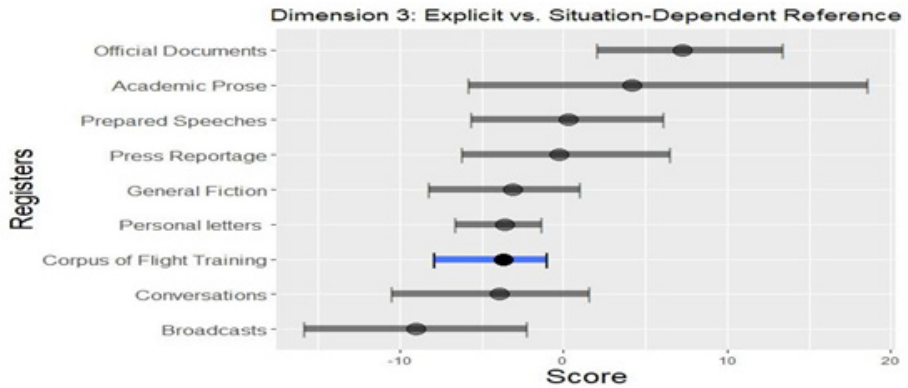



Source:Author (2022)

### 4.2. Dimension 2 – Narrative vs. Non-Narrative Concerns

Dimension 2 is more self-explanatory in its title. Registers with texts that have frequent use of the past tense and third person pronouns score highly. We can see in Figure 3 that the CFT (*M* = -4.1, *SD* = 1.0) contains more non-narrative language. This may be in part due to the real-time nature of flight training. In flight training, always maintaining situational awareness means that a pilot must be always focused on the actions which are happening in real time. This may explain higher prevalence of present and present progressive verb tense usage and thus a lower score in this dimension.

**Figure 4:** Mean scores and ranges for Dimension 3, Explicit vs. Situation-Dependent Reference



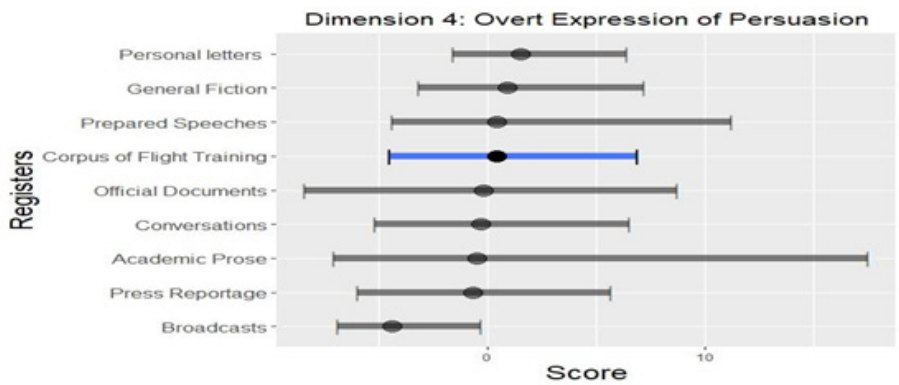

Source: Author (2022)

### 4.3. Dimension 3 – Explicit vs. Situation-Dependent Reference

In Dimension 3 (Figure 4), explicit texts are informational and contain elaboration. Situated texts have features that refer to the physical and temporal situation. A high score here has frequent usage of WH relative clauses (e.g., *an executive who is highly paid)*, pied piping constructions (e.g., *a table on which to work*), phrasal coordination and nominalization. A low score denotes texts with more adverbs and a lack of the aforementioned high scoring language. What is interesting here is the marked difference between the CFT data (*M* = -3.7, *SD* = *1.4*) compared to academic prose (*M* = 4.2, *SD* = *3.6*) and official documents (*M* = 7.3, *SD* = *3.6*). The CFT closely aligns to the register of personal letters (*M* = -3.6, *SD* = 1.8) and conversations (*M* = -3.9, *SD* = 2.1).

Looking at Biber's (1988) description of registers which score negatively, language in the CFT can be understood, "in terms of the internal physical and temporal situation developed in the text rather than any actually existing external context" (p. 148). Language in the CFT then would appear to be directly connected to either the immediate flight operations (in FTDs and flights) or explanations related to such operations (in oral activities).

**Figure 5:** Mean scores and ranges for Dimension 4, Overt Expression of Persuasion

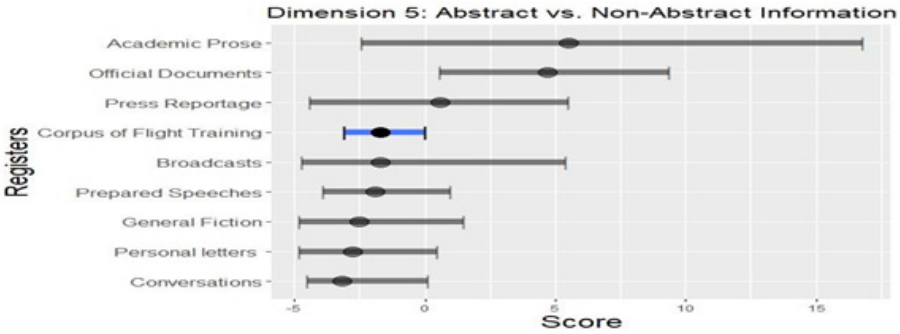



Source: Author (2022)

### 4.4. Dimension 4 – Overt Expression of Persuasion

Dimension 4 (Figure 5) deals with overt expressions of persuasion. High scores are marked by a large number of modal verbs (e.g., *will, might, should*). The CFT (*M* = 0.4, *SD* = 2.4) looks to be relatively unmarked in this category. Examples from CFT include modals of necessity (e.g., *we should not engage the autopilot*), prediction (e.g., *it will be a left crosswind*), and possibility (e.g., *we can go ahead and get the cruise checklist done*). Instructors appeared to use persuasive language as a type of softening, awareness raising, and coaxing mechanism to get students to comply with their teaching.

**Figure 6:** Mean scores and ranges for Dimension 5, Abstract vs. Non-Abstract Information

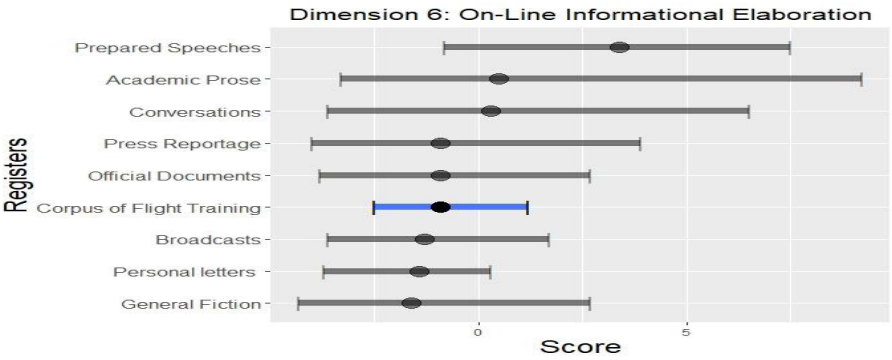



Source: Author (2022)

## 4.5. Dimension 5 – Abstract vs. Non-Abstract Information

Dimension 5 deals with abstract language. It contains features such as conjunctions, agentless and by passives, adverbial subordination, and WHIZ deletion. Language is used to represent information abstractly rather than associating it with a specific referent, typically a person. A lower score is also indicative of a low type token ratio. The CFT data (*M* = -1.7, *SD* = 0.9) in Figure 6 again shows a large gap between the genres of academic prose (*M* = 5.5, *SD* = 4.8) and official documents (*M* = 4.7, *SD* = 2.4) which may be due to students, instructors, and air traffic controllers directly addressing each other in communications.

**Figure 7:** Mean scores and ranges for Dimension 6, On-Line Informational Elaboration




Source: Author (2022)

## 4.6. Dimension 6 – On-Line Informational Elaboration

In Dimension 6, on-line informational elaboration, high usage of

features such as THAT clauses (e.g, *You might think that you are climbing*), demonstratives, and other post modifications of noun phrases positively load texts. Negative scores have lower presence of phrasal coordination. While the language used in the CFT (*M* = -0.9, *SD* = 1.1) (Figure 7) can be dense in terms of the length and frequency of aviation jargon noun phrases, *THAT* clauses in terms of elaboration are less common.

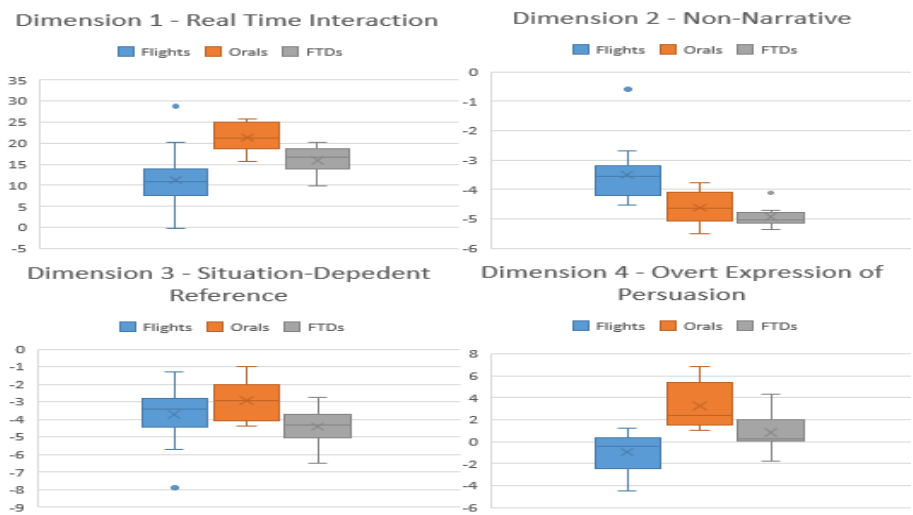
According to Biber (1988), in registers like prepared speeches (*M* = 3.4, *SD* = 2.8), the speaker expresses information relative to their own beliefs in real time whereas the low scoring registers make deference to an authority. In the CFT, most spoken procedures are standardized, codified, and heavily regulated. Both students and instructors appear to frame language in this rote manner.

### 4.7. Text Types

Returning to Biber's (1988) text types, according to the MAT output the CFT is most closely aligned with *involved persuasion* (24 texts) and *informational interaction* (13 texts). Texts types in these categories can be compared to registers of spontaneous speeches, letters, professional interview, face-to-face interactions, and telephone conversations. All of these are heavily bent towards both spoken and conversational registers and much less so in academic speaking and writing. Next, let's look at how the three activity types align according to each of these dimensions.

### 4.8. CFT Cross-Activity Dimensional Intra and Inter-Corpus Comparisons

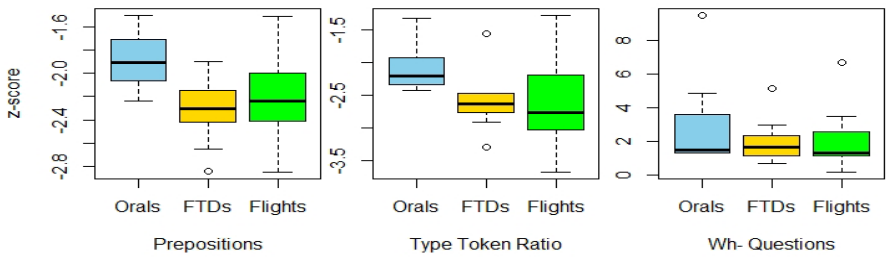
**Figure 8:** Dimensional Comparisons According to Activity Type




Source: Author, 2022

Some unexpected results are the differences between FTDs and flights (Figure 8). While flight training devices digitally replicate the flying experience, the fact that it is not bound by the same time constraints as an actual flight may explain why language used more closely resembles one-on-one, knowledge-driven oral activities. Particularly in Dimensions 4, 5, and 6, we can see that flight activities have language that is less persuasive (and likely more imperative) (*M* = -0.7, *SD* = 1.5), less abstract (*M* = -2.4, *SD* = 0.4), and less given to on-line-type elaborations (*M* = -1.7, *SD* = 0.7).

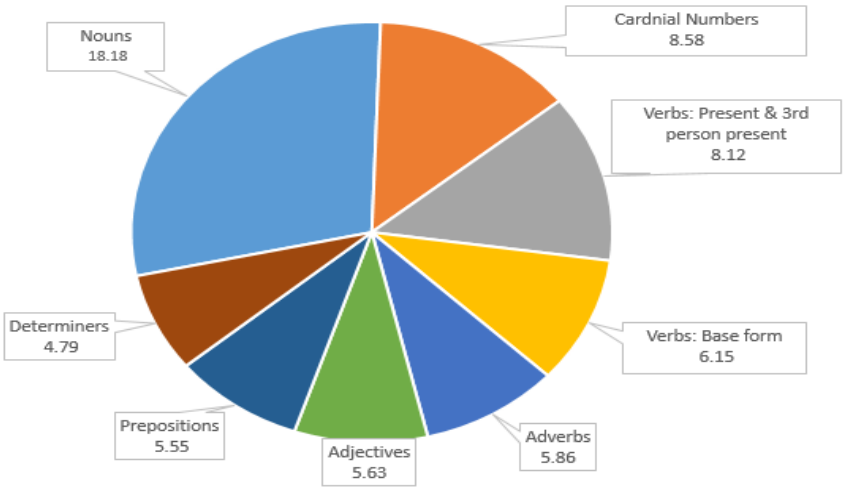
**Figure 9:** Unique Language Features between CFT, LOB, and Brown Corpora by Activity Type




Source: Author (2022)

When looking between the CFT, LOB, and Brown corpora (Figure 9), the CFT which is now expressed in z-score correction of 5 to -5, has a high presence of Wh-questions (*M* = 2.23, *SD* = 1.81) (e.g, *Alright. And,* ***what*** *time is it right now?,* Flight_11). Conversely, prepositions (e.g., *Riddle four seventy-six, turn left heading two one zero, contact departure*, Flight_8), especially in radio telephony, are underused in the CFT (*M* = -2.17, *SD* = 0.33). Finally, when looking at the type/token ratio (i.e., uniqueness of language) it was found that flight activities have very little variety in the language used (*M* = -2.45, *SD* = -2.45). This can likely be attributed to rote repetition of checklists in combination with the highly routinized speech of radio communication. When looking at split scores between the three activity types, the usage of Wh- questions was relatively even. Oral activities score higher in type/token ratio but only slightly so.

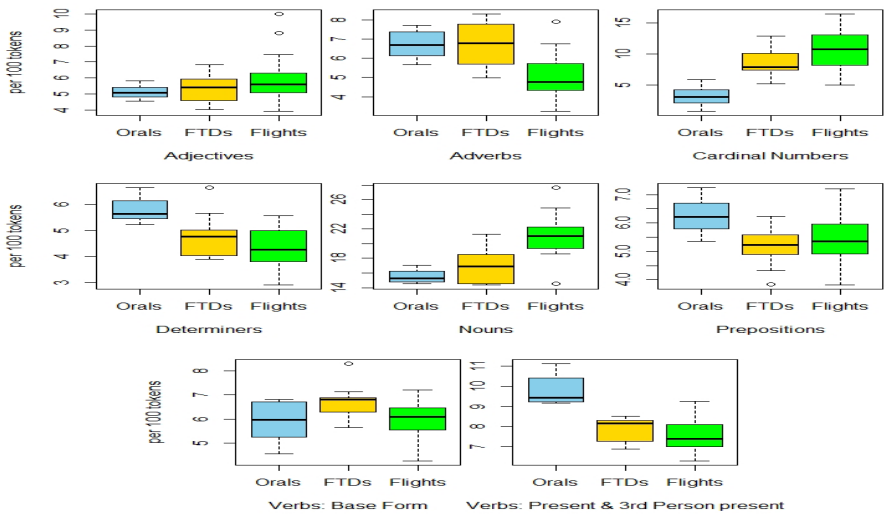
**Figure 10 -** CFT Most Frequently Occurring Language Overall




Source: Author (2022)

Figure 10 displays the language features in the CFT per 100 tokens. Nouns (*M* = 18.88, *SD* = 3.44), numbers (*M* = 8.58, *SD* = 4.04), and verbs in present and 3rd person (*M* = 8.12, *SD* = 1.16) make up the majority of the language present in across flight training activities. When dividing language usage by activity type (Figure 11), flights tended to have more nouns (*M* = 21.2, *SD* = 2.8) (e.g., *departure checklist, runway distance, airspeed, crosswind, gust factor, wind shear*) and cardinal numbers (*M* = 10.8 , *SD* = 3.2) (e.g., *Riddle **four fifty-eight**, RADAR contact **two** miles northeast, maintain VFR **two thousand**, heading **three four zero**, vectors to the RNAV **one six**, circle **seven** left)* and fewer adverbs (*M* = 5.1, *SD* = 1.1) . Oral activities favored a higher usage of determiners (*M* = 5.8 , *SD* = 0.5), prepositions (*M* = 6.3, *SD* = 0.6), and verbs in the present and 3rd person present (*M* = 9.8, *SD* = 0.7) (e.g., *I'**ve** got him in sight, **looks** like he'**s** still doing a steep bank, you, he'**s** mostly turned)*.

**Figure 11:** CFT Intra-corpus Most Frequently Occurring Language Features by Activity Type




Source: Author (2022)

## 5. DISCUSSION

### 5.1. RQ1: How does the language of flight training compare with other registers of English?

Thus far in this monitor corpus, the language used in flight training has the closest connection to spoken registers related to conversations and personal letters. Yet, when it comes to language related to narrativity (i.e., past events), the language of flight training diverges from those registers to reflect the events happening in the moment of the flight activities.

Comparing the Corpus of Flight Training to data from other EAP studies, we see that *that* clauses are not as prevalent in the CFT as they were found to be in academic spoken registers (BIBER, 2006). This is consistent with Friginal, Mathews, and Roberts (2020) in that past tense verb usage is not a linguistic feature of flight training. In other types of spoken interactions such as interviews, hedging is quite common. These initial findings are also congruent with Friginal et al. (2017) in that flight training language, like EAP classroom environments, used mitigating language to help manage power relationships through the use of modals.

### 5.2. RQ2: What are the linguistic features that characterize the spoken language used in flight training?

For the 2nd research question, three items stood out. First, the usage

of Wh-questions was uncommonly high in the CFT. Flight training is almost exclusively conducted by way of checklists, procedures, regulations, and various other pieces of codified policies. It is the responsibility of an instructor to continually assess the abilities of their students. Unlike traditional academic students in larger, lecture-driven classroom environments, when flight students have a question, they can take advantage of the one-on-one training environment to voice their misunderstandings.

Next, flight training activities in the CFT, especially FTDs and flights, tend to omit prepositions. While standard phraseology prescriptively cuts prepositions, the fact that oral activities also scored low in this category is worthy of deeper exploration as more data is added to the corpus.

Third, we can see across all activity types the impact of standardized training with flight instructors. It would seem that no matter who the instructor is, a flight training student can expect the same type of language used across flight activities which is evidenced by the extremely low type-token ratio. In addition to the homogenizing effect of standard phraseology on language usage during flights, the impact of rigorous training by both the flight training school as well as the regulations set forth by the FAA ensures that students can expect consistent teaching, no matter which instructor they are assigned.

### 5.3. RQ3: Are there differences in language use based on flight training activity types?

When comparing language based on activity type, flights and FTDs have fewer prepositions and a less unique language when compared to oral activities. We see alignment between flights and FTDs with regards to higher usage of cardinal numbers, and fewer prepositions, determiners, and verbs in the present and 3rd person present. One explanation for this distribution is likely the restricted register of standard phraseology as well as a heavy emphasis on reporting and reading back numbers to ATC as well as confirmation of those numbers between students and instructors. Instructors in oral activities frequently make reference to the standard operating procedures manual, FAA documents, flight deck posters which display instrumentation, images on the whiteboard which relate to aircraft orientation for maneuvers, and so on.

After referencing these documents, instructors will apply the knowledge to hypothetical situations to illustrate the concepts. These situations seemed to elicit verb usage in the present and third person present. For example, an instructor in the following excerpt has just finished outlining how to use a navigational aid to determine the aircraft's position and is now posing a hypothetical situation:

> **Instructor**: Alright so chart supplement, let me look up [airport] here.
>
> **Student**: Which we ***use*** [nav aid] VOR ***I'm*** assuming.
>
> **Instructor**: We do, yes, alright? So here ***is*** [airport], down here at the bottom, you would look up radio aids to navigate.

**Student**: Mhm.

**Instructor**: Okay? So, [nav aid] H, VORTAC, the H ***tells*** me ***that's*** a high VOR.

**Student**: Got you.

**Instructor**: And actually, i***t's*** a high VORTAC, so I ***get***, location, distance, and if I was military I would also ***get*** tactical air navigation. (Oral_8, 2021, emphasis added)

Throughout this interaction, order is sequenced not by adverbial usage (e.g., *first, then, next*) but rather by the use of *so* as a discourse marker. This appears to allow the student and instructor to collect all of the necessary information about this navigational aid.

Interestingly, FTDs and orals are similar in their less frequent usage of nouns and greater frequency of adverbs. One explanation for the increase in adverbs may lie in how the MAT tagger categorizes the word *so* as an adverb. When examining the data, the function of *so*, especially by instructors, tends to be used as a discourse marker allowing them to manage the topic, transitioning as well as connecting ideas as seen in the example text above.

### 5.4. Implications

The pedagogical implications and applications of this analysis, especially towards lower level L2 English speaking ab initio pilots, are quite promising. Friginal et al. (2020), Demirdöken (2021), and others have observed that often, highly trained language instructors are asked to teach or design Aviation English support courses even though they lack any amount of background in flight. Likewise, new and seasoned certified flight instructors wish to design language support materials, but they lack training in the best practices of language teaching. The preliminary results we have detailed here may prove helpful in both of these scenarios.

In addition to using a flight-related, content-based syllabus, language teachers still developing their aviation content knowledge could instead build instruction around a more generalized, task-based syllabus that targets preposition use, cardinal numbers, present tense verbs, and compound nouns. This approach is particularly suited to intensive English program instruction designed for students who plan to matriculate into flight training programs once they have achieved a high enough level of English language proficiency to ensure their success.

In the case of Aviation English language support courses for students who are already enrolled in flight training programs, this research suggests that students would benefit from instruction that focuses on spoken registers related to conversation. Specifically, learners should be instructed to notice variations in preposition use between the restricted register of radio telephony

used with ATC and more “plain” conversational English used with flight instructors. Likewise, students should practice listening for and using cardinal numbers in flight-related scenarios and develop mastery of the highly-technical compound nouns encountered in flight training instruction.

In both instructional situations – intensive English program or Aviation English language support course – this data suggests that all students would greatly benefit from instructional activities and practice exercises that require them to frequently answer Wh-questions. Finally, given the regularity and predictability of language used in flight training, Aviation English courses which feed into specific flight schools could also consider incorporating the language from that flight school in the form of standard operating procedure manuals, aircraft checklists, and other frequently sourced materials in which students will need to demonstrate oral proficiency.

These initial findings raise even further concern about the types of assessments that are being used to screen L2 English speakers. According to a survey conducted by Campbell-Laird (2008), of the 16 programs surveyed, several chose to use higher cut scores from the Test of English as a Foreign Language (TOEFL) to avoid offering in-house aviation English courses. Given that the stated use of the TOEFL test is to measure academic language, researchers have advocated for the application of corpus data related to flight training to better assess ab initio L2 English flight students (LYNCH; PORCELLATO, 2020). Indeed, this MDA of the CFT points to the spoken language of flight training being distinctly different from academic prose, a register which arguably is a better fit for a test like the TOEFL.

## 6. FURTHER RESEARCH

The current study merely scratches the surface with regards to the utility a language database like the CFT affords. For corpus linguistics in ESP and EAP, the CFT could be useful in identifying overlaps in language usage. For programs interested in development of Aviation English curricula, further studies into discourse analysis related to the use of pragmatics, interrogatives, and differences between standard and plain aeronautical English would provide invaluable insight.

The CFT also offers a means to better determine the target language usage of language used in actual flight training for test designers developing screening tools for L2 English speakers. From the perspective of flight training programs, data on how standard phraseology is learned by students and taught by flight instructors could prove valuable developing courses and other tools which more specifically target the areas in which students exhibit the lowest degree of proficiency. Future research which includes written materials related to flight training could also help to determine when and where the spoken register identified in this study converges or diverges from the language in texts from standard operating procedures, aircraft manuals, regulations, and

so forth.

If, indeed, language learned in flight training represents the foundations for the language used in professional flight, it is my intent that this study and the Corpus of Flight Training, can serve to advance our understanding of how to improve both the safety and efficiency of flight training as well as professional aviation.

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# CHAPTER 6

# FROM THE MICROPHONE TO THE CLASSROOM - ENSURING THAT REAL-LIFE COMMUNICATION IS AN INTEGRAL PART OF TEACHING ENGLISH TO PILOTS AND AIR TRAFFIC CONTROLLERS

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**ABSTRACT –** Communication between Pilots and Air Traffic Controllers is very dynamic, context specific, and technically referential. It is reliant on a variety of communicative skills and includes such skills as understanding of operational knowledge and cultural awareness as well as being mindful and accommodating the needs of the other person. This paper will highlight the need for teachers to carefully consider and identify student's real-life communicative needs in context when teaching English to pilots and Air Traffic Controllers (ATCOs). It will focus on adopting a more inclusive approach to understanding and using the broad range of communicative skills that both sets of students need for effective and efficient communication, including but not restricted to, a more traditional language pedagogy. Taking a lead from both theory and practice in this domain, the presentation will offer tips and guidance to help teachers by integrating real-life and scripted examples of communication in the classroom based on that used in real-life operational communication. It will show how practitioners can develop a much greater critical awareness of their students' real-life professional communication, which will ultimately help in curriculum planning, material development and classroom practice and offer learning to students that matches their real-life needs.

**KEYWORDS:** real-life; Communication; Competencies; Skills; Pilots; Air traffic controllers.

## 1. INTRODUCTION

The language used by aircraft pilots and Air traffic controllers when communicating via the radiotelephone is part of a specific domain of communication and one part of the many communicative competences required by both groups of speakers. The required language is highly technical and referential in nature and can be extremely challenging for those not fully conversant with such communication in an operational context (BULLOCK, 2015). This is particularly relevant for teachers involved in teaching operational aviation language to those who need to improve their skills and knowledge in order to be

proficient enough to communicate in real-life operational situations. ICAO themselves recognize that teaching, what has come to be known as 'Aviation English'[1], is a "professional activity that requires specialized training" and that the language is a complex blend of "skill, knowledge and cultural awareness, combining physical components with mental and communicative processes" (ICAO, 2010, p. 7-2).

For the same reasons that general purpose tests are not acceptable for assessing specific purpose domain communication, general purpose language teaching, such as in the operational world of aviation, should be adapted for specific purpose learning. This paper will investigate the role of language as a vital but interdependent, rather than isolated, part of the specific purpose domain of pilot/ATC communication. It shows how teachers can start to build up their own operational skills and knowledge to enable a more appropriate curriculum to be developed along with materials and activities best suited to their learners' goals and objectives. This in turn enhances teachers' own continued professional development (CPD).

## 2. SPECIFIC PURPOSE LANGUAGE

Specific purpose language can be seen as that used in a vocational, professional or occupational setting (DUDLEY-EVANS & ST JOHN, 1998; KIM, 2018). It can be seen to differ from that of a traditional language learning environment where specific goals, references and situational demands obligate a range of knowledge and communicative skills known and understood by few outside this domain. It can thus be seen to signify the world of language used in aviation communication between pilots and air traffic control (ATC) (PALTRIDGE & STARFIELD, 2013). Bachman and Palmer (1996) were one of the first exponents of recognizing specific communicative domains in their reference to Target Language Use (TLU). Douglas (2000) also indicates that teachers should have a clear understanding of the context and posits that language and technical knowledge are, in fact, not separable. Hedge (2000, p. 261) suggests that learners should be involved in real-life "purposeful communication" and (RICHARDS & ROGERS, 2001, p. 19) maintain that curricula and consequent learning stages are focussed on 'subject matter' of the learners. Language learning should be stimulated from material and activities that tap into a wide range of language resources and take into account the critical features of the TLU communication (HARMER, 2007; PALTRIDGE & STARFIELD, 2013; PARAMASIVAM, 2013; READ & KNOCH, 2009). More critically, learning should reflect the highly technical and safety specific domains of the learners and should not simply focus on absorbing

[1] The term 'Aviation English' is somewhat of a misnomer, as in other occupational domains such a title would refer to the entire domain inclusive of the many different professional roles and responsibilities, e.g.: medical English; legal English; maritime English; etc. In aviation this has evolved much more narrowly into a unique reference to the language in air/ground radiotelephony communication between pilots and air traffic controllers.

operational subject matter and its accompanying language (RICHARDS & ROGERS, 2001; UPPLINGER, 1997).

In his seminal paper on teaching English for pilots and ATCOs, Bullock (2015) argued for a move towards a more appropriate and valid teaching methodology for English learners in the aeronautical domain. He maintained that students' real-world needs should be addressed to develop an applicable and valid process for learning. His theory was underpinned by three of Brown's (2002) twelve principles for classroom practice, seen as key in ESP teaching. These included: *Meaningful learning* – addressing learners real-world communicative needs – leading to *intrinsic motivation* (that developed internally by the learner), and development, not simply of lexical & grammatical forms, but c*ommunicative competence* for their occupational environment. In summary, we can say that language is an intrinsic and interdependent part of communication which always takes place in a real-life social context. Such a context is specific and referential to all speakers dependant on many interactive skills of which language is but one.

## 3. COMMUNICATIVE COMPETENCIES

Much literature has been published on the subject of communicative competence in the last 50 years, and the very notion of this approach has been central to the discipline of communicative second language learning. Establishing a common theoretical base for each domain, however, and determining what actually constitutes communicative competence has proved more challenging. Hymes (1972) was one of the first writers to investigate the idea that the traditional approaches to language learning neglected the real communicative skills of learners and was thus, undermining real communicative competence. He suggested that the traditional perfectionist view of language neglected the fact that language use is never perfect and enmeshed in the sociocultural environment in which it is used. The predominant theory of communicative competence, however, remained anchored in the concept of 'ability', i.e.: modelled on psycholinguistic ability, focussing mainly on the individual linguistic skills of the person rather than in the co-constructed dynamic context of social communication.

Jacoby & McNamara (1999), Chaloub-Devcille (2003), and Young (2011), all attempted to broaden the debate further in searching for a more appropriate theory of interactional competence based on contextual use with all competencies working interdependently in what could be seen as an *ability* (of the language user) *in context,* in difference to ability as a separate entity. Jacoby & McNamara (1999), whose research in the specific purpose medical domain, suggested that language is only one factor in the communicative process. What was needed was a more thorough understanding of what they called "indigenous" assessment criteria taken from "naturally occurring […] socialization […] in professional settings" (JACOBY & McNAMARA, 1999, p. 214).

The challenge in finding a fitting ideology for communicative competence was appropriately summed up by Harding (2014) who firstly wondered whether a work sample approach based simply on replication of a professional communicative scenario was not actually supported by a theoretical background, whilst that the psycholinguistic approach which, although theoretical in approach, attempted to measure abilities and knowledge in isolation from the actual workplace task. Of course, both approaches remain problematic in that neither give a true version of what competences are evident and how they can be adapted and used to effect communication. One reasonable approach in attempting to define a specific domain's indigenous criteria for assessing communicative competence would therefore be to integrate a variety of specialist knowledge from a broad range of communication and operational experts, and aviation is no exception.

## 4. SPECIFIC PURPOSE COMMUNCATION IN AVIATION

If we accept that, in its most simple semantic form, communicative competence in professional environments is an important precursor for conducting work-related activities efficiently and effectively, then determining the skills and levels required to thus communicate requires a much clearer comprehension of the communicative traits and behaviours required, as well as the dynamic situations in which they are discernable. Communication in LSP domains requires not just language but professional knowledge (DOUGLAS, 2000; ELDER et al., 2017), awareness and management of context, and goals, negotiation of meaning, pragmatics, strategic skills and, increasingly, cultural and contextual awareness in multi-cultural settings (LEUNG, 2005; CANAGARAJAH, 2006; KRAMSCH, 2006; YOUNG, 2011; HARDING, 2014; WHYTE, 2019). This approach towards communicative competence as multi-skilled, multi-factorial and contextually interdependent, means that focusing learning solely on linguistic form and accuracy, at the expense of communicative skills in appropriate and varying contexts, will be unlikely to provide all the necessary skills and competencies required for communicating in real-world contexts for pilots and ATCOs (JACOBY & McNAMARA, 1999; CANAGARAJAH, 2006; HARDING, 2014; ELDER et al., 2017).

Of course, as laudable as this theory is, it does foreground a certain awareness and identification of competencies and elements that highlight the specificities of the communicative skills required for real-life communication. Even though the International Civil Aviation Organisation (ICAO) has published extensive documentation to support recommended practices for the Language Proficiency Requirements system (LPRs), empirical evidence for a more encompassing communicative content and related contexts is notable by its absence (ICAO, 2010).

The over reliance of linguistic accuracy in place of a much wider all-encompassing sphere of communicative competence with which to make the assessment, provides challenges for practitioners in language teaching

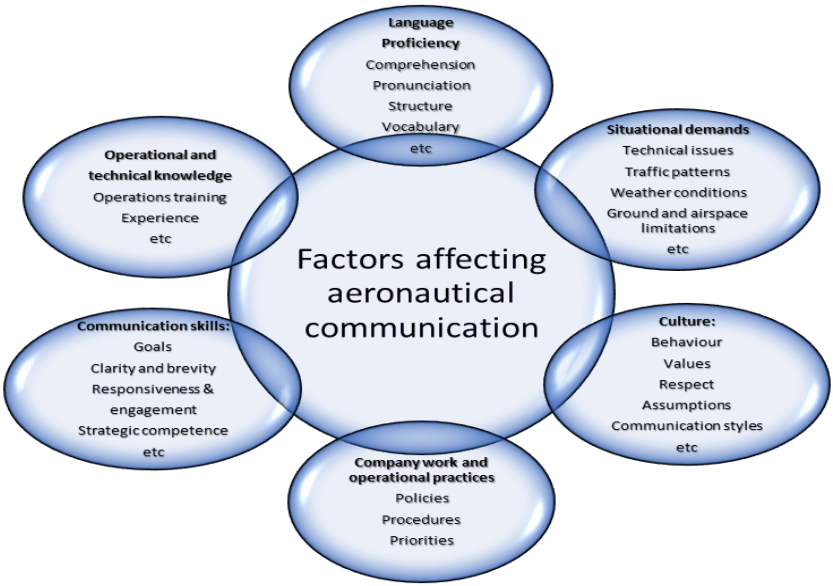
and can lead to an over-reliance on syllabi, material and activities that bear little resemblance to real-life communication, leading to low motivation and frustration on the part of the learner (KIM, 2013; BULLOCK, 2017). Only recently has research started to approach the notion of wider competencies of ability in context whilst taking account of indigenous criteria from the position of operational experts rather than that of a slightly detached purely linguistic background.

Bullock (2018) and Monteiro & Bullock (2020) provided one example in broadening communicative competencies, when they observed the contextual difference of factors between i) those that neither speaker nor listener can influence, e.g.: the weather, technical issues, etc. and ii) those that both speaker and listener *can* influence, e.g.: operational knowledge, language learning, etc. They suggested that these can all have a determined outcome on how successful or not communication is and that, as such, these elements must be taken into account for learning communicative skills, such as language. They concluded that:

> Aeronautical radiotelephony is a case of a highly technical and distinctive use of the language, which requires not only language ability, but also specific purpose background knowledge combined with an awareness of the multiple factors that may impact the outcomes of pilot/ATCO communications.

Such a theoretical approach can be extended further in observations by Bullock & Kay (2021), who identified six individual domains (See Fig. 1) and the varying but interdependent factors that make up pilot/ATC radio communication in each one. It shows that adoption of learning based on language in isolation, particularly where it relies on a more traditional teaching goal of *ability* and does not incorporate all elements of the communicative process, falls short of what the real communicative competencies in specific purpose domains are. This in turn results in learners not being taught the skills and awareness to communicate appropriately in the real-world.

**Figure 1:** Factors affecting aeronautical communication




Source: Bullock & Kay (2021)

## 5. COMMUNICATION IN CONTEXT

Such observations of a broader acceptance of communicative skills extend beyond the requirements of the ICAO language proficiency requirements, but do highlight the importance of defining a more appropriate construct for communicative competence that encompasses the language to be taught or assessed. Identifying a learner's real-world needs is critical in specific purpose language domains and the need to understand extralinguistic context, multiple factors, both affective and manageable, and the complex demands of radio communications must be considered when teaching language in an aeronautical context (BULLOCK, 2018, 2019; KIM, 2018; PARAMASIVAM, 2013).

Accepting that a learner's needs, goals and learning objectives come from those factors prevalent in the actual communicative context that such a learner is required to perform in, means clearly knowing what are the factors that make up that communication. Aeronautical radio communication needs to be effective and efficient, and it must be carried out by two or more parties. ICAO (2010, p. 7-2) note that Language Proficiency, as part of this process, is "A complex blend of skill, knowledge and cultural awareness, combining physical components with mental and communicative processes". If we theorise this idea further, we see that linguistic factors are of course important but that *pragmatic* skills – being aware of and using the right language at the right time – and *strategic* skills – clarification, paraphrasing and accommodation

are also of key importance. Not only that, but employing functional language and being able to communicate according to any given situation, add further layers of skills that are far more complex than simple decontextualized lexical and grammar items in isolation.

## 6. LANGUAGE AS AN INTERDEPENDENT COMPONENT OF COMMUNICATION

Such findings clearly highlight the need for teachers of aviation English to be fully conversant with the kind of communication their learners participate in, both in terms of content, context, ability, awareness and influential factors in the search for a clear as well as the relevant construct for communicative competence. It therefore follows that once we can better identify a communicative process, then more we are able to deconstruct the elements in order to focus on what it is we need to learn. Many of the areas referred to in the communication process, however, are part of a very complex process that cannot always be easily identified and may well come under the umbrella of such domains as Human Factors and Crew Resource Management (CRM). Psychology and socio-cultural awareness may also play large parts in helping to shape and drive the communication, and this will differ from speaker to speaker. Every person comes from differing socio-cultural backgrounds even where they may share extremely similar speech communities. Speakers will thus differ in their socio-cultural influences and will also share many during a given communication. Finding, therefore, standardized communicative practices can be challenging not only for those communicating but for those entrusted with teaching certain competencies of that communicative process, such as language. As the emphasis of this paper is primarily on language teaching, we will therefore maintain the focus of such communicative skills on what teachers need to achieve a more appropriate awareness of the language required for pilots and Controllers, by looking at what is actually being used.

Bullock (2015) clearly categorized common radiotelephony into three key areas which are detailed and explained below:

i) Standard phraseologies
ii) Plain technical specific purpose language
iii) Plain general purpose language

### 6.1. Standard Phraseologies[2]

Language used by pilots and ATCOs in routine and expected

[2] Standard ICAO phraseology is defined as – *a specialised code of restricted sub-language for use in routine situations ensuring efficient and safe communications* – and 2) 'Plain language' which is defined as the *spontaneous, creative and non-coded use of a given natural language, constrained by the functions and topics (aviation and non-aviation) that are required by aeronautical radiotelephony communication* (ICAO, 2010, p. 6-6).

situations is prescribed and standardised. As such, this language is a highly restricted code, initially adopted by ICAO in the 1960s in order to facilitate a standardised form of communication worldwide and reduce ambiguities and ineffective talk on radio frequencies. It is the core communication tool used by all pilots and ATCOs (ALDERSON, 2009) and can be seen as a "semi-artificial English-based sub-language" (BREUL, 2013, p.71). It formulates communicative functions "consistently and unambiguously' (FALZON, 2009, p. 3). Overall, these studies highlight the need for any teacher responsible for the teaching of aviation English to be at least conversant with radiotelephony, including usage of basic phraseologies and in part, familiar with the ICAO RTF manual - *DOC9432 manual of radiotelephony* (ICAO, 2007). A typical example of a routine situation communication using phraseologies is given below.

**Table 1:** Example of a routine situation communication using phraseologies

| | |
|---|---|
| **ATC** | *ABC234 remain this frequency wind 220 degrees 15knots Runway18 centre cleared for takeoff.* |
| **Pilot** | *R**unway** 18 centre cleared for takeoff ABC234* |
| **ATC** | *ABC234 airborne time 38 contact Departure 126.5.* |
| **Pilot** | *126.5 ABC234.* |
| **ATC** | *Departure ABC234 passing one thousand nine hundred for six thousand feet QNH.* |
| **Pilot** | *ABC234 climb FL130 expect further climb shortly.* |
| **ATC** | *Climbing FL130 roger ABC234.* |

Author (2022)

In this transmission, callsign letters are spoken according to the phonetic alphabet – "Alfa, Bravo Charlie". Numbers are generally spoken as individual figures so "Two two zero degrees" and "Flight Level wun-tree-zero" and according to pre-defined pronunciation, such as "tree" instead of "three". Companies will normally use their specific allotted callsign, for example Easy Jet Europe use the callsign "Alpine" plus the flight number or replacement alpha-numeric figures to avoid confusion with similar callsigns.[3] General aviation pilots normally use their aircraft registration "Delta Golf Alfa Lima Alfa" for the aircraft registered 'D-GALA'. This may be abbreviated by ATC to "Delta Lima Alfa" where required to avoid repeating the whole registration every time, and where no callsign confusion is likely. Military aircraft can use tactical callsigns, typically a mission/base name and numbers such as "King-

[3] A good list of company callsigns can be found at https://en.wikipedia.org/wiki/List_of_airline_codes For up-to-date information, teachers should consult ICAO and/or local documentation available from their students.

5-3" or "Leeming-1-5"

Potentially confusing figures are further specified by the inclusion of "heading" for specific compass direction, "feet" for altitude (above mean sea level) and distance/visibility (miles/km). Simple functional language is also expected to be used – *roger, wilco, say again, cleared, negative*. To those not versed in such restricted codes, it can be as challenging as learning any other new language. Even politeness markers such as "Good morning", "Hello", "Good-day" are not expected to be used. A simple listener callsign/speaker callsign introduction is required as an opening utterance for the listener to reply. The listener then invites the first speaker to return the communication by inverting the unit and aircraft callsign, sometimes with "Pass your message" (the once used "go-ahead" was discontinued following miscommunication for authorization to complete a task rather than simply "please reply". Such language use can be difficult to assimilate, for as humans we are used to much more natural spoken language with overlapping, affirmations, redundancy, ellipsis and much less clear boundaries between utterances. That said, standard phraseology is aimed at brevity, efficiency and standardization, which in such dynamic environments, is critical to flight safety.

## 6.2. Plain technical specific purpose language

Outside of the phraseologies mentioned above, communication in such a highly technical domain relies heavily on standard and recommended practices (SARPs) which in turn relies heavily on technical and very referential semi-coded language. This is no more apparent than in non-routine or unexpected situations, where phraseologies do not cover all eventual and likely situations. Both pilots and ATCOs will normally be able to decode any utterance which refers to an operational procedure, a technical movement or function of equipment or aircraft, as well as management of airspace, ground operations and other similar sub-domains of the aviation environment. The language used in such utterances may not be directly attributed to phraseologies, but it will normally be learned and acquired in training throughout the careers of the speakers. If a pilot asks "Confirm if the glideslope on RWY14 is in service, we are not picking it up", the Controller immediately recognises the 'glideslope' as a piece of the Instrument Landing System (ILS) that gives continuous descent guidance to the aircraft, and "picking it up" being used a metaphor for the onboard equipment receiving the signal. Other metaphoric expressions such as 'People on the ground' (reference to a company's operational staff) and 'Double Decker' (reference to a bi-plane rather than the conventional bus) are commonplace and highlight the fundamental need for teachers of aviation English to understand as much as possible of their students' language in order to teach it, including any cultural deviations used locally.

Despite standard recommendations and practices, regional deviations can occur frequently. One example is the place where aircraft park, officially referred to as the Apron, but often called 'ramp' in the US and 'parking' or

'tarmac' as a transposition from certain European languages. The moving walkway that passengers use to access aircraft from a terminal is similarly known as a *jetway, finger dock, air bridge* and *jetty.* Consider also a vehicle used by the emergency services being known similarly as a: *fire truck, fire tender, fire engine, fire appliance, fire vehicle.* Such variations can make communication problematic, but do highlight the critical nature of communicative skills awareness, such as paraphrasing and understanding of regional and cultural differences if communication is to be effective. Responsibility for such awareness does fall on those communicating and therefore, by default, on those teaching them communication skills, such as language.

To a novice teacher, ab-initio pilot, or ATCO, most technical language is challenging to understand, particularly if not familiar with the domain. Aviation English teachers may need to consider a specific teacher training course, and at all events a continuous period of assimilation to their student's operational domains. Site visits, documentation and other technical material can help enormously, and of course getting students to explain operational lexis and meaning not only aids speaking practice which increases motivation and confidence, but helps teachers learn from the students as Subject Matter Experts (those who will use this language in their operational communication). It is critical for teachers with little operational background to be aware of all such communication issues and to incorporate expansion of their own technical knowledge and language into a programme of continued professional development.

### 6.3. General purpose plain language

It goes without saying that plain technical lexical items and phrases cannot be used in isolation. Any plain language utterance, even in highly dynamic and technical domains such as aviation, requires some use of the sort of language that speakers use in everyday situation both in their professional and private domains. Such language can be seen generally as that learned in more traditional language courses and that could be learned from the beginning of any language. Typical plain language utterances are functional such as the request "Could you tell me…", the informational "We may need to ….", or the offering "Would you like us to …". It could also be foregrounded as prepositional phrases "Just after the …" or supported by adverbial expressions "… quicker than we thought".

Further key competencies also reliant on more general-purpose language include strategic skills such as paraphrasing or re-formulating into more simple and clearer language, such as: "It's a black liquid quite thick and it's running down the outside of the engine cover on the right-hand side", or where there is a need for clarification where requests for repetition and explanations may be necessary, such as "Sorry could you re-phrase/repeat", or, "What do you mean by ….". Such communicative strategies may be needed at any time, even between two relatively proficient speakers, particularly

during overly stressful unexpected situations, busy traffic periods, or where perhaps radio transmission quality is particularly poor. Where they may be needed, even in routine and quieter situations, would be where one speaker has a level of language proficiency notably different to the other. Here, the strategy of accommodation from the more proficient speaker is particularly important, especially where the more proficient speaker is using his/her first language. Such communication problems may be exacerbated further where the proficient speaker is monolingual and may lack developed communicative skills, as would be achieved during the learning and use of another language.

Since identifying the specific components is an important initial stage, it is equally beneficial to look at the elements of language in a short example radio transmission. The next section will include this.

## 7. LANGUAGE IN CONTEXT

Notwithstanding all the factors that can affect aeronautical communication, this is an appropriate opportunity to examine one example transmission to help focus language teachers on how the three areas of language discussed above are collectively used in one given context of an unexpected situation. In the example below two aircraft **Kingair 718JP** and **Aystar3554** are communicating with ATC (Megton Tower)[4]. Both are involved in non-routine situations and, as defined in the previous sections, there is a clear requirement for inclusion of both plain specific purpose and general-purpose languages, together with phraseologies. The three categories of language are shown as follows:

- Standard phraseology (**bold**)
- Plain specific technical language (underlined)
- Plain general-purpose language (*in italics*)

**Table 2:** Example of radiotelephony communication during unexpected situations

| | | |
|---|---|---|
| **1** | P1 | **Megton Tower Kingair 718JP 6-mile final established ILS RWY18** |
| **2** | C | **Kingair 718JP Megton Tower wind 120 degrees 13 knots runway 18 cleared to land.** |
| **3** | P1 | **Runway 18 cleared to land Kingair 718JP** |
| **4** | P2 | **Megton Tower Aystar3554 Stand 107** *we need a few more minutes* to remove the final traces of frost from the wings *are we still OK for our* CTOT. |

[4] This is a fictitious communication, but based on the content of a real-life exchange.

| | | |
|---|---|---|
| **5** | C | **Aystar3554 affirm, advise** when the frost has been removed *and* de-icing complete *ready for* pushback |
| **6** | P2 | **Wilco and** we are talking to the ground crew at the moment **Aystar3554** |
| **8** | P1 | **Kingair 718JP going around** |
| **9** | C | **Kingair 718JP roger report intentions** |
| **10** | P1 | Kingair 718JP we have a slight technical issue with the landing gear, **request** a wide visual circuit, we are visual with the field, *it's not a problem we can keep* the airfield in sight. |

Author (2022)

What is noticeable in the technical plain language is the frequent use of collocations (*remove final traces of frost from the wings*), noun-compounds (ground crew, landing gear), as was well as abbreviations, acronyms and initialisms (ILS, CTOT). This can be said of communication in many specific purpose and occupational domains, such as maritime, medical, legal, engineering, etc. Such language gives much more referential information and specificity to the communication in order to be fully understood by all listeners. What is also noticeable here are the many examples of functional language (informational = *we need, we are talking*; requesting = *report intentions*; confirmation = *are we still OK for our CTOT?*).

### 7.1. Discourse Analysis

In just a short extract, a simple analysis of discourse can show how the language used can be clearly identified and categorized. This helps to assist teachers in, not just preparing curricula, material and activities with their students, but also with building up their own understanding and expertise on this field of specific communication. Such a system of deconstructing communication also highlights the need for teachers to go beyond a lexical and structural item level and value language in a wider more referential context. Helping learners to see this not only aids a broader and more adaptable comprehension of the language, but enables them to see contextual communication much more easily in terms of how they will use it in the real world. Additionally, and it can't be stressed enough, that teachers at an early stage of their aviation English teaching career should work with operational experts, and indeed their students, when carrying out this kind of discourse analysis to more fully understand the situation, its technicalities and the communication that is involved. It can be seen, not only as helping those with a need to use the language in real life to learn, but also in forming part of a teacher's personal development and learning process.

## 8. THEORY INTO CLASSROOM PRACTICE

Once the teacher has clear objectives of their students and has started to feel much more comfortable with analysing technical language and use in communication, then consideration can be given to activities and lessons plans which will better match their learners' objectives. Learning language in contextual communication also follows 3 key principles of those twelve research-based principles that Brown (2002) identified for classroom practice. The three key principles that are particularly relevant to aviation English are:

- Principle 2: Meaningful learning
- Principle 4: ntrinsic motivation
- Principle 12: Communicative competence

Meaningful learning involves content based on contextual meaning, which can be clearly seen in the discourse examples given above. Such a match between the real-world and the classroom also helps develop intrinsic motivation, that which is derived from the learner. The more a learner can see the relevance of course activities and material to their operational communication the higher intrinsic motivation is likely to be. Finally, as such activities and material rely on authentic communication then building up competencies that are based on this becomes, in principle, easier and more appropriate to the actual learning needs. Analysing such discourse and developing activities into practical communicative activities can also develop greater strategic competencies as was mentioned earlier (HARMER, 2007).

In addition to Brown's principles, Hedge (2000) offers a similar theoretical angle which matches 3 key principles to the importance of contextual learning for students of aviation English in terms of skills being 'linguistic', 'pragmatic', and 'strategic'. *Linguistic* competence requires the learner to develop language knowledge and use. *Pragmatic* competence relates to how one uses the language in a given context. These two in fact mirror quite closely the descriptors for the vocabulary in the ICAO rating scale where they refer to 'range' and 'accuracy' of lexis (ICAO, 2010, p. 4-11). *Strategic* competence, which has already been referred to in this paper, likewise follows elements of the rating scale for assessment of language proficiency in paraphrasing (*vocabulary*) and the requirement to check and clarify (*comprehension* and *interactions*) (ICAO, 2010).

## 9. ACTIVITIES AND MATERIAL

If we follow the basic theory that such contextual material and content is key, then it is beneficial to also show how these may work in a classroom situation. As a starting point, teachers should ensure that such selected material and activities are developed to ensure operational accuracy and

relevance to the learners' objectives. They should also ensure that they are fully conversant with the technical language and situations that are being used as the basis for a lesson or an activity. Such material and activities need to be at an appropriate level for the students and must be developed to match their experience and knowledge, whether they are ab-initio or experienced pilots and/or controllers. A one-size-fits-all is unlikely to be appropriate in such specific purpose language learning.

In order to better understand how such theory and principles guide learning from a teachers' point of view, a draft lesson framework to suit the objectives and the students is given below (See Table 3). This framework gives some fairly typical activities for an aviation English class which is standardized enough to offer a basic framework for teachers new to the domain but with the flexibility to adapt ideas and content for those already with a certain level of experience of working with pilots and controllers. The table gives an activity with the supporting rationale and the focus for the learners. This can also be supported by reference to a typical learning taxonomy rationale, to state that "At the end of the lessons the students will have …". This provides for a valid learning curriculum in real-life contextual learning which can be matched to the objectives in the overall curriculum.

**Table 3:** A lesson framework for contextual learning in aeronautical communication.

| ACTIVITY | RATIONALE | LEARNING OBJECTIVE |
|---|---|---|
| 1) Warmer - discuss type of situation with relevance to non-routine situations (weather/technical/ human) | • Introduction to a subject related to a non-routine situation (See ICAO Doc9835 Appendix B) and activate schemata. | • Discursive interaction to stimulate interest and contextualise lesson. |
| 2) Play recording > discuss | • Listening to engage students in subject – who is speaking? What is happening? | • Practice gist listening skills in non-routine pilot/ATC Communication |
| 3) Play recording > answer specific questions | • Listening to engage students in subject and identify specific information events, items and issues – what, when, how, which, etc. | • Practice syntactic parsing and simple meaning construction<br>• (At higher levels this would extend to discourse construction & nuanced meanings) |

| | | |
|---|---|---|
| 4) Look at script and identify types of language | • Engage students with language and highlight how spoken language is used and differs from written. | • Linking listening to visual references and extending understanding by introduction of hidden discourse. |
| 5) Identify pronunciation (sounds clusters - real life v class) | • Introduction of students to sound clusters and syllable stress patterns not otherwise evident for specific language relevant to the situation | • Extension of meaning construction in understanding real-life spoken discourse |
| 6) Identify strings of language in the text above word level, such as: phraseology, collocations, noun compounds | • Engaging learners with extended contextual language and use, as well as pronunciation. | • Practicing lexical strings relative to context for content and sound. |
| 7) Discuss how the speakers (and then the learners would) deal with situation and what could have been done to improve (if at all) | • Demonstrating use of spoken language as well as identifying broader use of communicative skills in such contextual real-life situations. | • Recognising the interdependency of real-life contextual language as used in an operational situation and the need for a given level of proficiency through learning and maintaining communication studies. |
| 8) Discuss contextual factors and effects from a broader operational point of view | • Allowing learners to use and develop understanding of language and communication in context. | |
| 9) Role play to practice communication and language use in the above situation | | |
| 10) Group discussion and feedback | • Reflection on skills and language used and learned. | |

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## 10. AUTHENTICITY

One of the key elements of such learning is providing learners with authentic learning material and it is therefore reasonable to counsel that care

is taken when preparing materials and activities for such a specific purpose language lessons. For this purpose, the 8 key principles in Table 4 are provided as a specification that can be used in such cases. Whilst it forms a structured framework, it remains flexible enough to allow teachers to adapt material and activities for their students and ensures that content and context appropriately match a course's objectives.

**Table 4:** Principles for sourcing and providing material for teaching English in aeronautical communication

| Principle | | Rationale |
|---|---|---|
| 1. | Use pilots and controllers in any scripted and self-made recordings | Pilots and controllers are used to speaking in this type of communication and their natural rhythm, intonation and stress patterns ensure that learners are practicing what they will hear in real-life. The principle is similar to cognitive validity in testing. |
| 2. | Use real life scripts | Reflecting what has happened in previous incidents helps students engage with real-life communicative skills and helps prepare for real-life. It can improve intrinsic motivation and a greater self-confidence from new knowledge discovery. |
| 3. | Use types of situations referred to in ICAO Doc9835 Appendix B | Referring to communication in unexpected or non-routine situations linked to the ICAO LPRs helps learners reflect on what is relevant to them and also to be prepared for real-life situations as and when they occur. |
| 4. | Correct/adapt phraseology | Ensure if any scripts are re-written for learning activities, that phraseology is correct. This helps learners prepare for the real world not just in content but in the realisation that such phraseologies are there for a purpose and the correct versions should be used. It also assists teachers with little operational experience to become accustomed to the practice of phraseologies. |

| | | |
|---|---|---|
| 5. | Work with an SME (pilot/ ATCO) for authentic content. | If in doubt as to the technicalities of an event or the language and communication involved, teachers should seek help from an operational expert – either a pilot or controller. Even when feeling comfortable preparing material, it is key to have someone give it a second check for correctness and authenticity, and to ensure that it refers to locally agreed procedures. |
| 6. | Evaluate both the recording and the script with students | Ensure that learners are exposed both to a listening audio file and the script of the language from the communication. Having a visual reference of the language used in such situations can make it easier for learners to process, particularly where they may not have been exposed to specific sounds or content. |
| 7. | Speaking and listening | All material and activities should at least focus on improvement and maintenance of the two key skills required for communication between pilot and controller. Any learning of reading and writing should not be at the expense of the two key skills. |
| 8. | Communicative competence | Language forms an integral part of a wider communicative process between a pilot and a controller, and therefore should not be taught in isolation or in decontexualised situations. Acknowledgement of other communicative factors during pilot/ATC communication is important in helping learners to comprehend the important role that language plays and that it is interdependent with other skills during communication. |
| 9. | Role-plays and practice | The best way to increase learner confidence and develop a wide range of communicative competencies learned, including language, is to practice in simulated real-world situations. As with any other material, SMEs should be consulted if in any doubt as to the accuracy of any operational procedure or item. |

| | |
|---|---|
| 10. Human Factors | Focussing on language and communication as a part of human factors helps cement the interdependency of the communicative skills required, and allows a greater understanding of communication in the human situational processes for both pilots and controllers in unexpected situations. |

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## 11. CONCLUSION

Designing and teaching a language course in the specific purpose domain of aviation requires a raised level of awareness of the communication of the learners. For any teacher in this highly technical domain, whether experienced in operational matters or not, analysis of real-life communication and discourse is a vital component of identifying the language and communication skills required. Not only should a course reflect the language proficiency descriptors embedded in the ICAO rating scale, but it should reflect the social and occasional interplay between phraseologies & plain language as well as a broader range of communication skills. When materials and activities are authentic then learning takes on a real significance and students will be more easily disposed to learn what they are required to use in the real world.

Any material and activity should look beyond simple lexical and structural items in isolation and should aim to develop referential and functional language as well as strategic and pragmatic skills, including accommodation of less proficient speakers. Learning should also take account of both speaking and listening in the same communicative interactions that learners will be expected to be involved in in real life and should take account of local cultural effects on English when being used as lingua franca. Ultimately, learning should match real-life communication, rather than a set of tasks that may be derived from a potentially inappropriate and invalid exam.

If language is contextualised in real-life communication, then learners will develop the skills required not simply to have a test certificate that say they have a level of proficiency, but they will have learned the skills they require either in the cockpit or the control tower. Contextualised learning means relevance to real-world tasks and, by default, an increase in motivation, that ultimately validates language training for aeronautical communication.

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# CHAPTER 7

# GAMES, CORPUS AND MEDALS – CHALLENGING AND INNOVATING EXPERIENCES IN AERONAUTICAL ENGLISH HYBRID LEARNING

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**ABSTRACT –** This chapter presents an innovative training program conceived in the hybrid mode (synchronous virtual interactions and asynchronous e-learning) - for the Aeronautical English Learning. We discuss the conception, elaboration and implementation processes of trainings designed for Brazilian air traffic controllers, based on the linguistic categories of the ICAO rating scale (Pronunciation, Structure, Vocabulary, Comprehension, Fluency and Interaction). The face-to-face or synchronous virtual part of the training was developed to offer a better understanding of the rating scale descriptors by clarifying the differences between operational and nonoperational proficiency levels. The elaboration of the game-like activities for the second part of the training was data-driven. The data were composed of frequent mistakes compiled in a *corpus* with oral productions of students who have attended other courses; as well as difficulties presented by candidates who have obtained proficiency levels 2 or 3 in the Aeronautical English Proficiency Exam (EPLIS); and linguistic problems collected by experienced teachers. The combined work of English Language Experts (ELE) along with Aeronautical Subject Matter Experts (SME) has played an important role in the development of both parts of this hybrid learning tool. The gamification of Aeronautical English for Specific Purposes (ESP) has shown to be an engaging and more appealing environment for proficiency level elevation.

**KEYWORDS:** Aeronautical English; Hybrid Learning; New Training Tools; Gamification; Data-driven learning.

## 1. INTRODUCTION

This chapter aims at

describing innovative and challenging trainings[1] conceived to be part of the Aeronautical English Learning Program at the Aispace Control Institute (ICEA). They were designed in the hybrid mode, combining face-to-face or synchronous virtual interactions and e-learning. We discuss the creation, elaboration and planning processes of this technology-mediated learning tool, which was based on the descriptions of the six linguistic categories (Comprehension, Vocabulary, Structure, Pronunciation, Fluency and Interaction) of the International Civil Aviation Organization (ICAO) rating scale.

These trainings were specially developed for the Brazilian Air Traffic Controllers (ATCOs) who need to take the Aeronautical English Proficiency Exam (EPLIS) to prove they have reached, at least, the minimum operational proficiency level (PL) 4. The concept and initial planning of the trainings required some working group meetings, with the participation of English Language Specialists (ELE) and Subject Matter Experts (SME) from different regions and facilities, in order to plan, cooperatively, how the trainings would work and design their activities. According to Doc 9835 (2004, xi),

> The SME can ensure accurate and appropriate training content, and the language teacher can ensure that delivery focusses on language learning. The task of teaching language classes or developing appropriate language learning materials should be guided by language teaching experts and material developers.

In other words, developing accurate and effective programmes that comply with ICAO Language Proficiency Requirements demands a collaborative and constant work conducted by SME and ELE. ICAO Doc 9835 (2004, Chapter 4, 4-5) states that “the role of the trained language specialist is to arrange for language learning to occur in the context of the aviation content provided by or monitored by the SME. Such partnerships have been found to be among the most effective technical English language teaching approaches”. That’s why the working group meetings that gather different background knowledge and experiences are so important, especially when conceiving and developing new learning tools.

To understand the concepts that support the creation of these aeronautical English trainings, it seems relevant to emphasize some characteristics that differ a training from a course. A training is meant to be more practical, independent, shorter, and more flexible, due to the fact that there is little teacher participation, only tutor support, and no assignments or

[1] Even though the word *training* is considered uncountable in some dictionaries, recently some linguists have accepted the plural form *trainings* to indicate multiple episodes or sessions of training. We opted for using it as a countable word to indicate the five individual 'trainings' in the lack of a better word to express exactly what we need to emphasize the difference between our regular courses and the new trainings that make part of ICEA's Aeronautical English Learning Program.

tests. Students can choose which of the training categories they want to take and in which order, based on their language strengths and weaknesses.

Each training is composed of two parts. There is a face-to-face or virtual synchronous part (first part) with presentations that offer a better understanding of the rating scale descriptors and clarify the differences between the operational and non-operational proficiency levels. The asynchronous part (second part) is composed of self-study and game-like activities divided into different phases, according to their level of difficulty.

Next, we present an overview of the concepts that provided a theoretical support for the development of this innovative learning resource, which was based on data-driven learning and gamification, and then the hybrid learning practices.

## 2. DATA-DRIVEN LEARNING

Data-Driven Learning (DDL) is an efficient way of using the tools and techniques of corpus linguistics for pedagogical purposes. Because corpora can expose learners to a large number of authentic instances of a particular linguistic item, they can be useful in preparing all kinds of pedagogical materials and resources, from syllabus design to testing, from wordlists to course books (GILQUING & GRANGER, 2010; BOULTON, 2017). With DDL, ESP students develop the ability to find answers to their questions by accessing large collections of authentic texts relevant to their needs, as opposed to asking teachers or consulting ready-made reference materials (BOULTON, 2016). DDL exploits a number of key concepts present in other learner-centered approaches, such as authenticity, autonomy, cognitive depth, consciousness-raising, critical thinking, discovery learning, noticing, transferability, among others (BOULTON, 2016).

Taking into account aeronautical purposes for the sake of pilot-ATCO clear and effective communication, the data used to create the activities of the trainings were composed of:

a. Samples of authentic pilot-ATCO communications in AE corpora (PRADO; TOSQUI-LUCKS, 2019).

b. Errors and misuses of language compiled in a learner corpus, consisting of oral productions of Brazilian ATCO students who have attended other courses (for APP, ACC and TWR) offered in the distance learning mode (TOSQUI-LUCKS; PRADO, 2021).

c. Errors and misuses produced by candidates who took the EPLIS in previous years and obtained PL2 or PL3, but also good samples of language instances of Proficiency Level 4+.

d. Errors and misuses of language collected by our experienced teachers during various courses and teaching opportunities.

Learner corpora can be extremely useful for form-focused instruction, as they present students with typical interlanguage features, especially when the data were produced by learners from the same mother tongue background as the students. Local learner corpora go even one step further, as they contain data produced by the very same students who will be using the corpus (GILQUIN; GRANGER, 2010).

Some examples of data collected from the sources described above include language issues from different categories, such as:

- Structure: *Has a plane x There is a plane / The pilot have conditions x The pilot can or is able to perform / I prefer land now x I prefer landing now or I would rather land now/ Happened an accident x An accident happened or There was an accident / Started take fire x The fire started / He didn't went x He didn't go or He went/ The pilot changed your route x his route);* misuse of prepositions, verb tenses, articles, etc.

- Vocabulary: countable x uncountable nouns *(equipments / traffics / aircrafts / informations);* word choice (*runaway/ deviate to the alternative/ there is a medical on board*); word formation (*It descent* / *I want to trip to other countries*), words in Portuguese or Portuguese-like words (*TROV, tripulation),* etc.

- Pronunciation: words ending in -able (*capable*), -ate (*intermediate*), -tion (*formation*), - age (*shortage*), -y (*emergency, frequency*); ephentesis; word stress; sentence stress and intonation, etc.

- Fluency and Interaction: lack of discourse markers, fillers, elements of cohesion.

The pedagogical core to DDL is the aim of fostering the independent aquisition of language knowledge (lexis, grammatical constructions, collocation, and so on). Through an inductive process, learners are encouraged to discover patterns of language. It is widely claimed that such an endeavour aims to foster more complex cognitive process such as making inferences and forming hypotheses (O'KEEFFE, 2021). Taking that into consideration, we decided to present the data in a game-like format, in which all the alternatives were based on authentic language produced by Brazilian ATCOs. The student is supposed to analyse the alternatives and decide which of them are correct and which are wrong. After two attempts, the correct answer is automatically presented, followed by a brief explanation, as we discuss in the next sections of this paper.

## 3. GAMIFICATION

Gamification means using game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems (KAPP, 2012). Games can be used as learning experiences, in which the player needs a specific repertoire of skills and methods for overcoming the challenges presented. What makes a good game appealing

is the fact that it continuously challenges and makes new demands on the player's repertoire. Gamification in language learning is not just about "points, badges, learderboard". It needs to be meaningful to students, once it reaches cognitive, emotional and social aspects. The activities must be well designed and set a clear purpose so that students can actually learn while feeling motivated, challenged and engaged (QUAST, 2020).

Throughout the training categories and their phases, there are plenty of game-like elements: colors, letter types, sound and visual effects, page design, terms, etc. Learning trails and different phases with an increasing level of difficulty keep within a playful challenging proposal that makes this learning resource more motivating and appealing.

## 4. INNOVATIVE HYBRID TRAINING PRACTICES

In this part of the chapter, we describe and illustrate what these hybrid trainings look like. E-learning practices have become more and more common and have shown to be a feasible way of teaching and learning different and specific contents, especially during the pandemic context. However, we have noticed that being in touch with a real teacher or tutor - at least through synchronous virtual interactions - can make a difference when engaging students in a learning process. That's why the first part of each training is composed of some presentations that can be carried out either virtually or in person.

### 4.1. Face-to-Face or Virtual Presentations

Before starting the self-study part of the trainings, some presentations are made in order to connect the target students to their tutors, by offering them an overview of the trainings, their purposes, and some difficulties they might face during the asynchronous process.

Besides a general presentation that aims at listening to students' needs and experiences towards distance learning practices, as well as explaining them some of the aeronautical English specificities, there is also a virtual presentation for each Linguistic Category they need to master: Comprehension, Vocabulary, Structure, Pronunciation, Fluency and Interaction. The latter presentations provide clarifications on the ICAO proficiency rating scale and its categories, descriptions on proficiency levels 2 and 3, and emphasizes what is necessary to reach the intended operational level (Proficiency Level 4). All presentations were created in Portuguese, so that students from different proficiency levels and backgrounds can expose their needs and expectations, share experiences and understand the rating scale and the nature of this new training.

Authentic audio excerpts, good models of effective communication, illustrative videos, lists of websites for study references, and study tips can be found throughout the face-to-face presentations or virtual interactions. In this

part of the training, the tutor is the one who provides information, but students' participation is always encouraged through the discussions about the material presented and the interactive activities proposed. A teachers' guide with photocopyable supporting material is also provided before hand, so that the tutors can prepare themselves for these introductory presentations. Ready to be used slides meant to be shown during the first part of the training were also created to encourage the discussions and enable the learning process.

### 4.2. Distance Learning Practice

The second part of the training (self-study and asynchronous part) is carried out on a virtual platform (Moodle Platform custumized for *ICEA Virtual*). During this e-learning practice, there is no immediate or synchronous feedback from the tutor. The main aim is to offer a self-study tool that enables individual practices of the six linguistic categories previously described. A tutor is only assigned to address, virtually, the questions that students may have while doing the activities. For this purpose, there is a *forum* where the students can post their questions and see their peers' questions and answers.

Considering that this kind of learning tool is based on three principles: autonomy, flexibility, and individual learning – the engagement, organization and personal effort of each student is essential to promote English proficiency elevation. The possibility of doing and redoing the game-like activities as many times as the student wants or needs plays an important role for content consolidation. To keep the students more motivated and active during the entire e-learning process, a variety of gamified question types were created, such as: multiple-choice activities, true or false, drag and drop, ordering a sequence of events, matching etc.

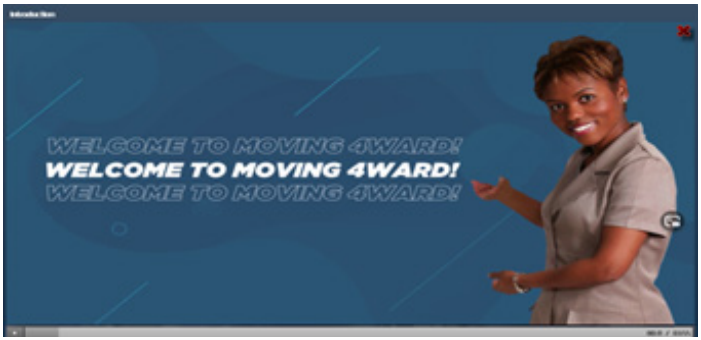
Some extra-practices with plenty of audio recordings also enrich the training tools, mainly in the Comprehension and Pronunciation categories. The radiotelephony-like audios were recorded in a studio located at ICEA, with the participation of ELE and SME.

It is important to emphasize that the trainings are targeted at all ATCOs who would like to practice and enhance their knowledge about aeronautical English and get a better performance at the exam EPLIS. As we have mentioned before, trainings are more flexible than courses, so the only pre-requisite to be enrolled is to a be an active Brazilian ATCO, regardeless of the last EPLIS scores. It means that students can range from PL1 to 6, or simply not have a valid PL, like is the case of those who will take the exam for the first time or those who have never passed to the second phase of the exam. Because of this wide target group range, we recommend a minimum of 20 and a maximum of 40 hours per training, depending on the student PL and availability to do all the extra activitities and study the explanations provided.

### 4.3. The self-study part of the training

In this part of the chapter, we show what this independent learning tool looks like, by describing and illustrating some parts and phases of it. Whenever a student starts the asynchronous part of a new training, there is an opening video with guidelines for the self-study format. Some brief explanations concerning the concept and sources of the trainings are provided. During these descriptive and illustrative videos that take no longer than three minutes, the students are given some important information that will help them succeed while doing the activities by themselves. Basically, these introductory videos (Figure 1) describe what each training is offering and what the students' responsibilities are so as to make the most of this learning experience.

**Figure 1:** Opening Video Screen




Source: https://virtual.icea.decea.mil.br/mod/scorm/player.php?a=6454&currentorg=Introduction

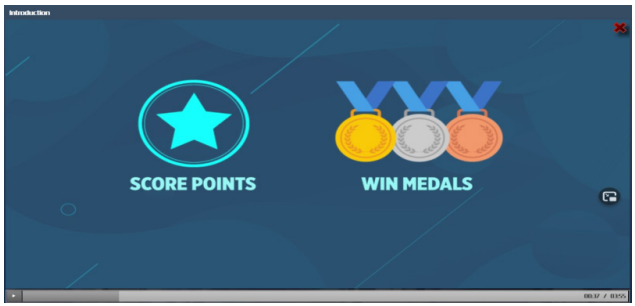
Besides describing the self-study format, the opening videos offer further explanation concerning the six linguistic categories established and described in the ICAO rating scale. The following explanation, for instance, was taken from the Comprehension Training opening video:

> The International Civil Aviation Organization regards the components of Aviation English competence as a pyramid with six language categories. The bottom categories - structure, vocabulary and pronunciation are the foundations that, combined with comprehension and fluency, support interaction. Altogether, they result in effective communication. Let's start hiking to the top of this pyramid! This is the Comprehension training. You will develop your Comprehension skill within the context of radiotelephony communications in both: routine and non-routine situations (…) Here you will practice Comprehension by means of listening to a wide range

> of pilot-controller dialogues using both: phraseology and plain English, pilot's transmissions, instructions from a controller and monologues. (Comprehension Training, ICEA, 2021)

For each correct answer, the students score points and, by the end of each phase of the corresponding training, they can also win a bronze, silver or gold medal, depending on their final score (Figure 2). Medals are closely related to the military context, what makes the game-like activities more meaningful for our target students.

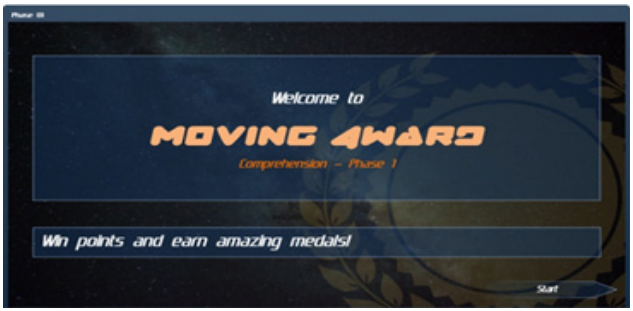
**Figure 2:** Points and Medals




Source: https://virtual.icea.decea.mil.br/mod/scorm/player.php?a=6454&currentorg=Introduction

All opening videos end up with a motivational question that resembles the name and the gamified purpose of this new learning tool: *"Are you ready? Let's move 4ward, then!"* The asynchronous learning part of all the training is composed of nine phases with an increasing level of difficulty. Each phase has around ten gamified multiple-choice activities that offer a variety of practices in different language skills and categories.

**Figure 3:** Opening Screen Phase 1 - Comprehension

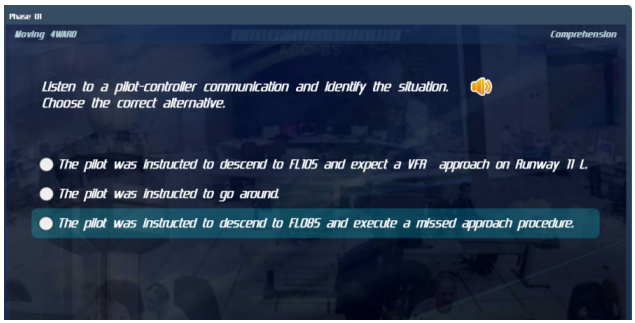



Source: https://virtual.icea.decea.mil.br/mod/scorm/player

The activities were planned to promote an inductive learning process in which students are supposed to make inferences, come up with language patterns and form hypotheses, while doing the activities. In the Pronunciation training, for instance, there is an extra practice through which students are led to infer, from the previous examples given and voice recordings, that the consonants [ch] in words as rea**ch** and approa**ch** sound like **/tʃ/**.

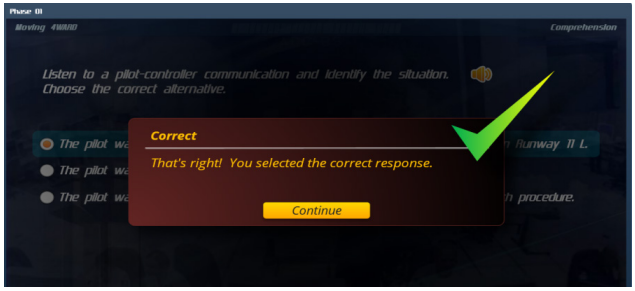
Figures 4 and 5 below depicts that throughout the phases there are authentic audio recordings of pilot-controller communications to which students have to listen, in order to choose a final answer within multiple-choice activities. The students have three chances to select the correct answer, before getting instant feedback (Figure 5).

**Figure 4:** Audio recordings and multiple-choice activity




Source: https://virtual.icea.decea.mil.br/mod/scorm/player

**Figure 5:** Correct response screen

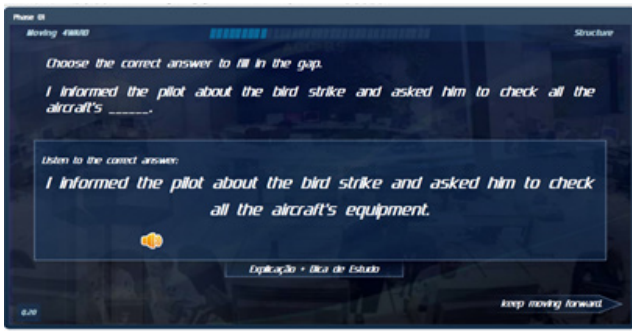



Source: https://virtual.icea.decea.mil.br/mod/scorm/player

To function as a self-study tool, it's important that the right answers be provided immediately after the students mark their final answers. The audio recording of the correct answer pops up right after choosing the final answer (Figure 6), so that besides double checking the correct answer, the students can also listen to the right way to pronounce the technical words used in the

activity they have just done.

**Figure 6:** Checking the correct answer




Source: https://virtual.icea.decea.mil.br/mod/scorm/player

After checking their answers, some activities offer an “explanation and study hint” box (Figure 7) that can be opened for getting further information. Additional explanations referring to the activity they have just done, such as specific or technical vocabulary, verb tenses, the correct use of prepositions, and etc. are usually provided in Portuguese, so that different proficiency level students can benefit from the information provided. The study hints usually guide the students to some lessons and videos carefully selected from free Internet resources and courses available on *YouTube* to fulfill students’ learning gaps, in case they need further help and clarification.

**Figure 7:** Explanation and study hint box


Source: https://virtual.icea.decea.mil.br/mod/scorm/player

## 5. CHALLENGES FACED IN IMPLEMENTING THE TRAININGS

Throughout the processes of creation, elaboration and implementation

of the trainings, we were faced with significant challenges that triggered reflections on the different roles played by e-learning designers, which involved taking effective decisions. We now describe some of these challenges based on our experiences:

a) The adequacy of the English language used on each training to teach ATCOs of different backgrounds and PL: during the creation stage special attention was paid not only to facilitate students' learning - by offering them simpler, easier and fun activities – but also to engage the multi-level group with PL ranging from 1 to 6. One way to solve this disparity was to elaborate the explanations and answers of the activities in Portuguese, seeking for more direct and concise instructions. A standardization of statements, models, instructions and guidelines was also adopted to enable the work of the content writers and the understanding of the students. In addition, we treid to make use of a clearer and objective language in all parts of the training (introduction, motivational quotes, medal winning messages and final messages); and we selected audio recordings, images, graphics, sound effects to enhance students' learning and understanding. We also provided immediate automatic correction to their response and extra website links to help students expand their knowledge. Feedback in Portuguese with a short explanation of the correct or incorrect answers has shown to be useful.

b) The selection and choice of various types of activities which can be used in game-based e-learning activitites: several meetings with the E-learning Course Development team were necessary to select and adapt the activities. They pointed out the limitations of the educational resources available on our platform (ICEA Virtual) and possible ways of adding our own content to it, by implementing the elements of game-based e-learning. We diversified the activities as much as possible, in order to help students improve the language skills needed to perform their jobs, while keeping themselves engaged in their learning process.

c) The selection of the team to develop the content for the training tools: apart from choosing the best methodology for teaching and learning Aviation English, it was also important to count on the ATCO's background knowledge and to access the technical language used by them to create materials that actually address the real linguistic needs of our target audience. In order to perform this task, it was necessary to select and adjust the schedules of ELEs and SMEs available for the defined period. Careful planning was also necessary to make better use of the time allocated to the creation of teaching materials, which involved: defining the number of questions per author, delimiting the *corpora* to be used by the authors, selecting the kinds of activities of each training, defining statements and, finally, choosing the best secure cloud storage for continuous development of our project, which lasted several months.

d) Establishing guidelines for the material developers' team: we started from the premise that raising material developers' awareness of the correct use of Phraseology and Plain Aviation English was a must-do. Authenticity in materials and accuracy in the use of Phraseology and Plain Aviation English were of paramount importance to reach the desirable quality of the trainings, because of its imapact on aviation safety. So, ELEs and SMEs were encouraged to get into the habit of always looking words and phrases up in the current Air Traffic Phraseology Manual (MCA 100-16, 2020) and the ICAO document – DOC. 4444, which provides the procedures for the air navigation service.

e) Offering permanent support for tutors: it was necessary to create and organize a Tutor Support Room on the ICEA Virtual Platform, in which a range of resources were made available to help tutors deliver the first part of the trainings (ppt slides, videos, tutorials, and photocopyable materials), and also the training supporting documents (Tutor's Checklist and Methodological Recommendations).

Thus, the role of the e-learning designers concerning the careful planning and the knowledge of the virtual platform, added to the competent performance of the teaching material developers were key aspects to the implementation of these new trainings.

## 6. DELIVERY AND FINAL CONSIDERATIONS

Every new course or training developed at ICEA has to go through a validation process before it is considered to be completed. This validation consists of offering the training to a group of students and asking both students and tutors to fill out a very detailed form in which they give opinions about many different aspects of the training/course (content, delivery, instructions, audiovisual aspects, length, resources, etc.). After receveing this feedback, corrections and improvements are still made. The Comprehension, Vocabulary, Structure, Interaction and Fluency trainings were offered for a validation group of around 600 students in the second semester of 2021. After accomplishing them, the students' and tutors' suggestions for corrections and improvements were collected, analysed by the course coordinators and planned to be implemented in the following months. The Pronunciation training was scheduled to be offered in the second semester of 2022. After the entire validation process is over, all the trainings will be reviewed once again. Finally, they will officialy become part of ICEA's Aeronautical English Learning Program for ATCOs.

In this chapter we shared some aspects and challanges of the conception and designing process of new trainings based on the ICAO Rating Scale (ICAO, 2010) targeted to Brazilian ATCOs as a supplementary tool for

their aeronautical English learning program. We consider it to be innovative as it combines *corpus* linguistics resources in the selection of data and elements of gamification in the delivery. Another innovative characteristic is that it was desgined to be offered in the hybrid format, combining the positive aspects of on-site learning, especially when it comes to motivation and engagement; and the positive aspects of e-learning: flexibility, economy and autonomy. We believe that sharing our experience can help other teachers and course developers make consistent decisions about content and delivery formats.

## ACKNOWLEGEMENTS

We would like to thank all the people involved in the making of and validating process of the trainings: the ELE and SME who took part in the working groups for developing the material; the E-learning Course Development team for giving life to our crazy ideas; the tutors for embracing this new project and helping us revise the operational content; and the air traffic controllers of the validation group, our dear students, for giving us enhancing feedback on what they liked and on what could be improved.

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# CHAPTER 8

# MICROLEARNING ON THE FLY: AERONAUTICAL ENGLISH VIA *INSTAGRAM*

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**ABSTRACT –** In most of the world, the COVID-19 pandemic helped further the transition into online education modes. It was no different with CRCEA-SE, the Brazilian Air Force organization responsible for approach and tower controls roughly in the states of São Paulo and Rio de Janeiro. Not only were we unable to proceed with face-to-face training, but we also had the unprecedented condition of more free time among our air traffic controllers in what is usually the busiest airspace in South America. Along with commander support, those favorable winds propelled our team to increase Aeronautical English microlearning opportunities online, especially on our Instagram profile @an.eye.on.you. In this article, we briefly go over the history of this initiative and, more importantly, the lessons learned from the experience of making Instagram posts and managing continuous online learning of Aeronautical English.

**KEYWORDS:** Microlearning; Aeronautical English; English for Specific Purposes; Online learning.

## 1. INTRODUCTION

The challenge of meeting the language proficiency requirements (LPRs) set forth by the International Civil Aviation Organization (ICAO) in Annex 1 (ICAO, 2020) – whereby pilots, air traffic controllers and aeronautical station operators must demonstrate a minimum level of the language(s) spoken in aeronautical communications – is quite an undertaking in a big developing country such as Brazil.

Brazil's 22-million-square-kilometer airspace is overseen by more than 4,000 controllers and aeronautical station operators, who had varying degrees of contact with oral English before applying for a position in the Brazilian Airspace Control System.

Once a year, these professionals are tested on their operational knowledge (COMAER, 2020a), including Portuguese and English phraseology. Standard phraseology, a collection of words and sentences to be used in set situations, is expected to account for most of pilots' and controllers' communication needs over the radio. For situations that have not been predicted, these professionals have to draw upon their "plain language" proficiency, as dubbed by ICAO (ICAO 2007, 2010, 2020). The proficiency of Brazil's air traffic controllers and aeronautical station operators in "plain English" is assessed through EPLIS, developed by the Airspace Control Institute (ICEA) to address the ICAO LPRs (COMAER, 2021, 2018).

"Plain English" does not exist on its own: it complements standard phraseology in air-ground communications (for a deeper discussion of those concepts, please refer to Tosqui-Lucks and Silva, 2020, and Drayton and Coxhead, 2022). For safety reasons, it also needs to emulate the conciseness and preciseness of phraseology (ICAO 2007, item 3.2). The combination of the so-called "plain English" and standard phraseology – that is, all that is spoken by pilots and controllers via the radio – is referred to in this article as "Aeronautical English", as proposed by Tosqui-Lucks and Silva (2020). A particularly specific case of English for Specific Purposes (ALIZIERI, 2010; ICAO, 2010; COMAER, 2018), Aeronautical English is nobody's mother tongue, but rather a case of English as a lingua franca (ICAO, 2010; KIM; ELDER, 2009; TOSQUI-LUCKS; SILVA, 2020). It takes time, effort and operational experience to learn how to communicate in this environment, and this should be true for all the parties involved, including the so-called 'native speakers' (BIESWANGER, 2013; DOUGLAS, 2014; GARCIA, 2015; BOROWSKA, 2016; TOSQUI-LUCKS; SILVA, 2020).

### 1.1. CRCEA's response to the challenge

Over the skies of São Paulo and Rio de Janeiro, Brazil's two largest cities with an added population of nearly 20 million, lies the country's busiest airspace (DECEA, 2019), overseen by the Regional Center of Airspace Control Southeast (CRCEA-SE) with over 600 air traffic controllers (DECEA, 2022). About 11-12% of the air traffic departing from, landing in, or crossing this region speaks English to communicate with air traffic services (ATS) (DECEA, 2019). The busy professionals in these ATS facilities, like their counterparts in the rest of the country, struggle to find time and reliable resources to study Aeronautical English in between the courses that are provided by their employer. As a result, only about half of them have ICAO Levels 4, 5, or 6 (ICEA, 2022).

Realizing that their air traffic controller colleagues were heavy users of Instagram, a photo-based social medium that has been adopted by 110 million Brazilians (VOLPATO, 2021), two CRCEA-SE air traffic controllers and Aeronautical English instructors unpretentiously created an Instagram profile @an.eye.on.you in March 2019 with a view to helping their students and co-workers revise Aeronautical English vocabulary items. In its first-year anniversary, however, An Eye on You took on a whole new proportion as the COVID-19 pandemic hit Brazil and prevented face-to-face teaching. What started as a complementary activity became CRCEA-SE's main teaching initiative, and the Aeronautical English team, much like our counterparts all over the world, had to plunge into online language training, learning as we went.

In this article, therefore, we will go over the lessons learned and the best practices that we could glean in the 3 years of An Eye on You (AEOY), in which we have gathered nearly 3,000 'followers', as Instagram labels those who subscribe to our content, produced more than 300 posts, and conducted 10 interviews with aviation professionals. We hope our experience, with both hits and misses, can help other teachers to design more effective online microlearning materials.

## 2. MILESTONES AND STONE WALLS

When Stephanie Faria was about to graduate as an air traffic controller, the invisibility of her new career in the eyes of the general public led her to illustrate this one-way glass concept alongside a motto (Figure 1): "You may not see us, but you can be sure that we keep an eye on you." A few years later, that drawing helped her and Thalita Diniz think of a name for their project, an Instagram account to teach or review aviation vocabulary that is not used daily by air traffic controllers in Brazil.

When the project grew, the need for a logo and a symbol arose, and they had the idea of using binoculars, such as those used by tower controllers, to sum up the quote (Figure 1 on the right).

**Figure 1:** AEOY then and now


Source: AEOY Instagram, 2020

Little by little, the project expanded beyond vocabulary posts, taking onboard new Instagram resources. For instance, in August 2019, the first poster with audio was published, which made it possible to demonstrate the pronunciation of vocabulary or grammar items and also publish listening tasks.

Another tool that we have put to use since October 2019 is the stories quiz and question stickers. Social media, as marketing gurus dictate, is all about the 'social', making interaction mandatory. As teachers, we realized the affordance of that resource: through quizzes we could check learners' previous knowledge of the language items being taught and invite them to check out our latest post. Through open questions, we could carry out a brief needs analysis (e.g., 'Have you ever been in an ATC situation in which you weren't able to express an idea in English?') or have learners produce sentences in response to prompts. In addition, learners could interact with us through comments, stories stickers, or asking us for the content they wanted.

In May 2020, we reached our 50th post and 800 followers. Along with that milestone came the realization that this was not a side job any more, but rather one of our main tasks. Due to the COVID-19 pandemic and the subsequent dwindling air traffic, our commander encouraged us to explore online training options and to take advantage of controllers' extra time to study. We decided to invest more time in our Instagram account, expanding its use to cater for different ICAO rating scale categories, and developed an accompanying website for those who did not use social media. Learners could now ***pull*** the content they wanted whenever they wanted with the help of the website, or they could have some content ***pushed*** onto them when scrolling their Instagram feeds (KAPP; DEFELICE, 2019).

What was missing, however, was trackability. Although Instagram and Google Sites offer much data on website traffic, we could not tell how much any individual had learned. We could analyze, in a way, how attractive our content was, but not how effective. Commanders also requested indicators of engagement and learning. As a result, we created a monthly content verification, a Google Forms questionnaire that is published on our website (bit.ly/aneyeonyou) and automatically scored in order to assess learning of the material posted in the previous month.

Still, there was much to master in terms of social media management to make sure we reached our target audience. For example, we learned that, at that time, Instagram would only show our posts to a small sample of our followers. Only if those chosen few engaged with the content by commenting or sharing did Instagram deliver the post more widely. After studying more about Instagram marketing, and with the guidance of a fellow controller and Instagrammer, we developed our visual identity, as we will discuss in more detail in the following section. We also started posting motivational quotes on Monday to encourage resilience in language learning and we added a final poster to each publication to encourage people to comment, share or like the content – what Instagrammers refer to as a "call to action" or CTA.

The fact that the key word in 'social media' is 'social' meant that we also needed to show our faces and humanize the profile, making the AEOY brand more authentic (KOTLER; KARTAJAYA; SETIAWAN, 2017). Although we were an Instagram account by CRCEA-SE, we needed to reveal the air traffic controllers and teachers behind the profile so followers could feel they were connecting with human beings, not just with the institution. One of the first ways we did that was to start the series of live interviews we called "An Eye on Aviation", which would bring in aviation professionals from all over the country and the world with the potential of attracting Brazilian ATCOs' interest and getting them to practice listening and interactions through the chatbox. We debuted with Thiago Silva, a Brazilian tower controller who went from ICAO Level 3 to 6, and in the following month, we had Michael McCormick, who was the New York Air Route Traffic Control Center manager on 9/11.

Aware of the importance of teaching relevant content for the day to day of air traffic controllers and following our commander's suggestion, in October 2020 we started a new post category: the Phraseology Refresher. With that and the increasing use of short videos called Reels, a new tool which the Instagram algorithm gives priority to, we achieved 2,000 followers in April 2021.

One year later, in its third anniversary, AEOY neared the mark of 3,000 followers and is now a consolidated resource for Brazilian air traffic controllers, especially those in the CRCEA-SE region. Increasing engagement with and score on the monthly assessment forms substantiate the claim that participants and ATC facility commanders have turned to AEOY as a source of continuous English language training. Although the return of face-to-face alternatives will likely reduce the AEOY team's availability for poster design, reaching out to controllers in their downtime still seems paramount. That is why we persevere, albeit with fewer posts per week. Having come this far, it seems it is just a matter of when we learn to overcome these stone walls on the way to more milestones.

## 3. ELEMENTS OF DESIGN

Undoubtedly the watershed moment for AEOY was the creation of its visual identity in September 2020, following Livia Leal's (@livialeal.ingles) suggestion, along with its tagline "Aviation English on the fly". A visual identity makes a brand more readily identifiable ('brand recognition') and conveys credibility (STRUNCK, 2001).

By then we already had the logo designed by Stephanie Faria, which had a blue background that alluded to the Brazilian Air Force color but had a lighter, less stern hue, in line with the message of approachability and friendliness we wanted to convey (Figure 1). The typography in the logo was also chosen with those qualities in mind: Quicksand is a sans serif font with round corners. It was now time to develop post templates, which would save

us time when designing posts as we would not need to develop the art from scratch for each and every post. In addition, these post templates would help followers identify AEOY posts amid their Instagram feed. Those interested in learning from us would, we hoped, stop and read more carefully, spending more time with the post, thus signaling to Instagram that our content was worth distributing to other users.

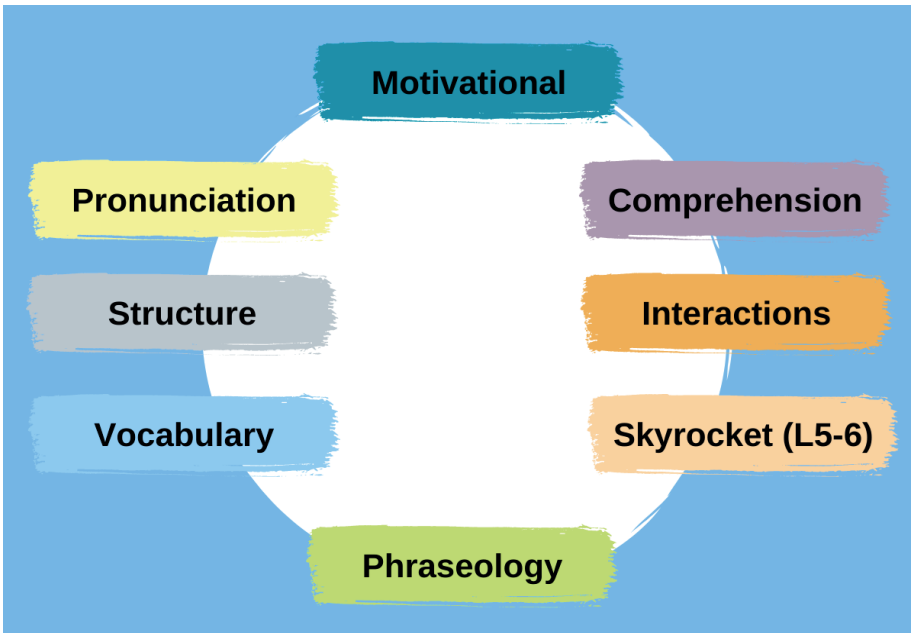
### 3.1. The sky concept

**Figure 2:** "noise abatement" and **Figure 3:** listening comprehension


Source: AEOY Instagram, 2022

Our post template had to be related to our focus on Aeronautical English, of course. Therefore, we decided to use the many colors of the sky and its elements as a reference. The white circles in the corners represent clouds (Figures 2 and 3), while the colors represent sky colors from sunrise to sunset, on grey or sunny days. However, they are not just the colors of the sky/ there are, of course, meanings behind them. Let us now turn to the colors of our post templates:

**Figure 4:** Our post categories and corresponding background colors




Source: Authors, 2022

- **Yellow, #fdfd96 (Pronunciation)** - As we noticed that our students tended to feel embarrassed about their accents in English, we wanted to make pronunciation feel lighter and more joyful. We then chose yellow for pronunciation posts, a color associated with sunshine that evokes feelings of happiness and positivity (VAN BRAAM, 2021, p. 35). Yellow can also serve as a warning, which makes sense since we work on those features of Brazilian pronunciation of English that tend to affect intelligibility the most.
- **Grey, #c5cdd4 (Structure)** - Associated with safety and reliability, grey conveys a more conservative idea (VAN BRAAM, 2021, p.44). Grammar, the pillars of the language, seemed to go well with that concept. Besides, grey goes better with the red crosses and green ticks that we use to draw attention to common mistakes and correct sentences, respectively.
- **Blue, #7dc0ff (Vocabulary)** (Figure 2) - With a calming effect, blue also represents communication and clarity (VAN BRAAM, 2021, p.28), both characteristics we wanted for our learners' vocabulary knowledge and use. This lighter blue is also present in our logo, so it made sense that it should appear in our most frequent type of post.
- **Purple, #b39eb5 (Comprehension)** (Figure 3) - We wanted to empower our learners to deal with the challenges of listening to a foreign language with a variety of accents, delivery styles and speeds, as suggested

in ICAO Doc 9835. Therefore, we chose a color that conveys power (VAN BRAAM, 2021, p.23) in order to encourage learners to practice comprehension.

- **Orange, #f1b351 (Fluency and Interactions)** - Akin to yellow, orange is considered the color of communication, freedom, and joy (VAN BRAAM, 2021, p.40). Being a vibrant color, it was chosen to call people to action (CTA), that is, to encourage them to interact with the posts. Later, we started using it also for posts that are built as task repetition exercises to build fluency.
- **Salmon, #fad6a5 (Skyrocket)** - Usually representing the strength in femininity, pink goes along with a striking and bold attitude (VAN BRAAM, 2021, p.21). We chose a more salmon hue, reminiscent of the sunset, as the basis for our Skyrocket series, which are posts for the air traffic controllers who are already level 4 or 5 but dare to go further.
- **Teal, #038dab (Motivational Mondays)** - Our motivational mondays are written on top of the color that stands for intuition and an elevated spirit (VAN BRAAM, 2021, p.32). Drawing us into ourselves, it fitted the bill for posts that try to encourage intrinsic motivation, resilience in learning, and self-efficacy.
- **Green, #c9e265 (Phraseology)** - Green is the only color in our palette that is not associated with the sky concept. Created much later, our 'phraseology refresher' needed a background color that would ground us, much like phraseology does in ATC communications, and refer to a constant need to 'recycle' our knowledge of the basics. In comes 'green', a color often associated with growth and health, for it is the color of nature. According to Segal (2010, p.84), green fuels the brain, helps people to make decisions, and improves actions and concentration, all wishes we have for our controllers' daily routine.

In short, we used colors to represent the sky and got the added bonus of the meanings behind the colors. On top of that, many studies describe colors as a memory aid, which means that our brain can retain more information when colors help increase our attentional level (DZULKIFLI; MUSTAFAR, 2013). In other words, there are more chances of the stimuli being transferred to our permanent memory if we use colors.

### 3.2. Representation matters

Unfortunately, and perhaps unsurprisingly, our colorful backgrounds did not match the many monochromatic stock image banks. If you google "air traffic controller", for example, you will see that most photos depict Caucasian men working at towers in civilian clothes. That is a sharp contrast to Brazilian reality. Most air traffic controllers in Brazil are Air Force sergeants, many of whom work in Approach Control (APP) and Center (ACC) rooms. About half of ATC trainees are female, and in an ethnic melting pot such as Brazil, many would not identify as white.

As a self-taught artist, Stéphanie Faria learned many things by observation and research. She noticed that her friends were not able to see themselves in characters in the media and understood that the lack of representation made them feel invisible. Consequently, when she began AEOY, she brought the richness of Brazilian diversity to her drawings, and inclusive representation became a core value of the project.

Take, for instance, the 2021 campaign for the International Day of the Air traffic Controller (Figure 5). With the slogan "ATCOs shouldn't be invisible", it offered a variety of frames for people to add their photos to, representing civil and military controllers of different ethnicities and ATC facilities. By asking the followers to appropriate and personalize the drawings, we hoped to show that AEOY sees them for who they are, contributing to a sense of belonging and pride among the Brazilian ATC community.

**Figure 5:** Celebration of the International Day of the ATCO, 2021


Source: AEOY Instagram, 2021

## 4. ONLINE MICROLEARNING

### 4.1. Describing the target audience

To better represent our learners and cater for their needs, we first needed to identify who they were. According to Instagram "insights", most of our followers are based in the cities of the largest ATC facilities in CRCEA-SE: São Paulo and Rio de Janeiro, with 12% and 11% respectively. Most of them (47%) are between 25 and 34 years old, followed by 24% in the 35-44

bracket and 17% in the 18-24 range. In other words, a substantial part of our learners can be considered millennials, with Gen Z increasing in number as novices arrive. As to gender, the numbers are quite balanced: 51.5% male and 46.4% female, with other genders being ignored by Instagram statistics. The statistics provided by Google Analytics for the website are quite similar, except that the percentage of São Paulo (52%) and Rio de Janeiro (33%) states is even larger. That predominance is probably due to the fact that the monthly assessment form is only available via the website and has been made mandatory for most ATC facilities under CRCEA-SE jurisdiction, which encompasses those two states.

In other words, our 'learners' are actually professionals who work in some of Brazil's busiest ATS facilities with tight schedules. Rio and Sao Paulo controllers also tend to live in different parts of the cities, which puts them constantly on the go. As a result, any form of training has to take into account this perceived lack of time and geographical distance, attested in a 2020 CRCEA-SE survey in which 74% of the respondents (n=69) reported preferring online modes of training delivery.

An interesting datum is that our target audience largely prefers to use their cell phones to access the website: 71% of our website visitors used a cell phone to open it, followed by 27% on a desktop computer and only 2% on a tablet. Although our Google site is mobile responsive and Instagram is mainly a cell phone app, future or parallel initiatives need to consider this "mobile first" trend when choosing a platform.

### 4.2. Why (not) microlearning

While the use of cell phones increases the potential for learning anytime anywhere, it also limits the amount of time dedicated to each learning session. People's attention span on a smartphone is estimated to last no longer than 15 minutes as distractions and other responsibilities compete for attention (SUN; SHEN; LIN, 2020). That fragmented learning experience requires mini lessons that can provide the feel of a complete learning cycle within that time frame.

More importantly, long and continuous training sessions would be incompatible with ATCO's work and training schedules, which are precisely calculated to prevent fatigue (COMAER, 2020b). We would not wish to unbalance that equation, as elevating controllers' aeronautical English proficiency is supposed to improve, not hinder, operational safety.

In that regard, microlearning seems to be a perfect fit. As Bruck (2006, p.16) puts it:

> Microlearning does not require the creation of a larger 'time-space'. It is enough to use the inter-spaces between different activities to take the small learning step. The

power of microlearning results from the repeated use of inter-spaces over time.

To tap into that power, however, we first needed to understand microlearning better and face our fear that we would be dumbing down content (TIPTON, 2017), preventing complex learning processes (NEUHOLD; LINDNER, 2006), or providing an atomized, discrete-point, or structuralist view of language, such as the small unauthentic bites of "Grammar McNuggets" which Thornbury (2010) advised against.

To counter that McDonaldization of language learning, we chose to see microlearning in another light, such as Kapp and Defelice's definition of microlearning: "Microlearning is an instructional unit that provides a short engagement in an activity intentionally designed to elicit a specific outcome from the participant" (KAPP; DEFELICE, 2019, p.11).

This tightly packed definition lists Kapp and Defelice's (2019) criteria for quality microlearning. By "instructional unit", they mean microlessons should be self-contained, in that they do not depend on other lessons, and feel like a "start-to-finish" experience. From "short engagement" we extract the idea of a brief learning experience which is both short in time and highly focused on its outcome. The word "engagement" also highlights the need to draw and sustain learners' attention. The intentionality of the design means microlearning cannot be the equivalent of slicing a longer course into mini lessons, much like distance learning is not meant to be the digital transplantation of a face-to-face course. Finally, the idea of eliciting specific outcomes in activities made us think of task-based approaches to English for Specific Purposes needs analysis and language teaching, which require clear can-do objectives we could state and be accountable for.

In addition, Kapp and Defelice reminds us that microlearning is but a "part of a larger learning ecosystem" (KAPP; DEFELICE, 2019, p. 14). That ecosystem view broadened the perception of what we were doing as part of the whole national project to increase Brazilian ATCOs' Aeronautical English language proficiency. AEOY would not be, nor could it ever be, a replacement for other training initiatives. Rather, it would complement, scaffold, and reinforce the learning provided by them.

### 4.3. Engaging instructional units

After trying out other formats – such as Google form exercises, Wordwall games, and Quizlet flashcards –, we settled on the Instagram carousel post as our main instructional unit. The carousel post is a series of up to 10 posters, which we design on Canva.com on top of our template.

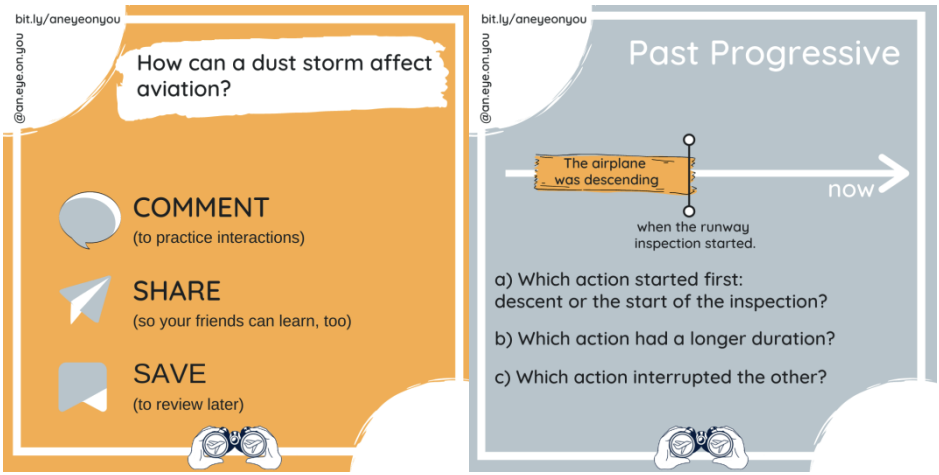
**Figure 6:** clickbait title and **Figure 7:** simple task


Source: ANOY Instagram 2021

In time, we saw a pattern develop in which the opening poster of the carousel is provocative, trying to draw followers' attention with clickbait titles (Figure 6 - "7 pronunciation mistakes you might be making on EPLIS") or, more commonly, with straight-forward questions (KAPP; DEFELICE, 2019) or tasks, combined with pictures. The idea behind the question or task is usually to test-teach-test, helping learners notice the gap between their knowledge and the target forms (e.g., Figure 7 elicits "traffics" or "aircrafts", which are common mistakes among Brazilian ATCOs, and Figure 8 starts with an expression many forget). Indirectly, it also states the outcome we expect from that minilesson. Last but not least, the pictures and questions aid in activating schemata, such as in the "noise abatement" post (Figure 2) and in listening comprehension posts (Figure 3).

The final poster in the carousel is our orange call to action (CTA, Figure 8), most often with a provocative question to have learners use the language taught in the post more freely (the final 'test' in test-teach-test) or to generate a discussion on the topic. Unfortunately, not many people respond to that, perhaps due to the usual military restraint online.

**Figure 8:** final post and **Figure 9:** CCQs




Source: ANOY Instagram, 2022

In between the first and the last slide lies the meat of our minilesson, and, as you can imagine, we try to keep it slim.

### 4.4. Keeping it short and simple

When designing the meat of our carousel posts, less is more, as Kapp and Defelice (2019) sum up in the acronym KISS (Keep it short and simple). As we are competing for attention with everything else going on in learners' lives, we cannot risk overloading their working memories (DALEY, 2019). As a result, we often choose to bring new information in installments, but still contextualized in examples of usage. Before giving out the explanation or definition, we also try to engage learners with the language in guided discovery, such as by asking concept questions (Figure 9; THORNBURY, 2006), presenting matching exercises, or teaching new language through text, in which case we highlight the language we are going to work on.

Highlighting language chunks is one of the visual codes we use, as are icons (e.g., a green check for a correct sentence and a red cross for an incorrect use), timelines (Figure 9), emojis and color coding (e.g., using red for the negative form). Not only is Instagram a visual medium, but getting rid of any extraneous "fluff", as Kapp and Defelice (2019) call it, also means making the most of visual – rather than verbal – information. Vocabulary that can be presented visually is often accompanied by a picture. We also offer simple definitions, examples of the word in use, highlights of collocations, and practice exercises, building on the previous knowledge within that minilesson little by little.

In fact, when it comes to our language in the posts, following Kapp and

Defelice (2019), we trim words and simplify our language, avoiding grammar or vocabulary that would be too sophisticated for an ICAO Level 3 to process. What face-to-face L2 teachers call “grading language”, pitching it to the right proficiency level, becomes even more essential in a self-study scenario in which a teacher cannot promptly accommodate language or scaffold content at the point of need. As a result, we try to offer simple, yet authentic and correct language – if not, the translation into Portuguese or use of Latin cognates does the trick.

Verbal information is organized in the clearest possible way: we do not usually centralize information, preferring left or justified alignment, and we avoid using all capitals. Long blocks of texts are also broken down whenever possible, except for showing the original documents when it comes to phraseology. Anything that is not informing something needs to go, in line with the coherence principle for avoiding cognitive overload (DALEY, 2019).

## 5. WHY TEACH STANDARD PHRASEOLOGY

Up until now, we have exemplified with our posts of so-called “plain English” – or “plain Aviation English” (BIESWANGER, 2016) –, which shall be used “only when standardized phraseology cannot serve an intended transmission” (ICAO, 2016). And while many training and assessment initiatives focus on this “spontaneous, creative and non-coded use of a given natural language” (ICAO, 2010), we seem to take for granted standardized phraseology, “a set of operational procedures” (ICAO, 2010) which should provide the tools for communication in most of the situations encountered in the daily practice of ATC and flight.

Although standardized phraseology is available in local and ICAO documentation, it does not necessarily follow that it is going to be remembered or used accurately. On the contrary, a pilots/air traffic controllers phraseology study conducted by the International Air Transport Association (IATA, 2011) showed that the use of non-standard and/or ambiguous phraseology is something in the region of a quarter of all communications. Similarly, Drayton and Coxhead (2022) and Lopez, Condamines and Josselin-Leray (2011) found out in their studies – with native and non-native speakers of English, respectively – that plain language was being used for situations in which phraseology was prescribed.

Those studies certainly resonated with our experience as Aeronautical English instructors, in which questions such as “How do I say ‘xyz’ in phraseology?” are not uncommon. This suggests that not only is there something missing vis-à-vis the teaching and recurrent training of standardized phraseology, but also that we seem to need a better way of reinforcing its correct use.

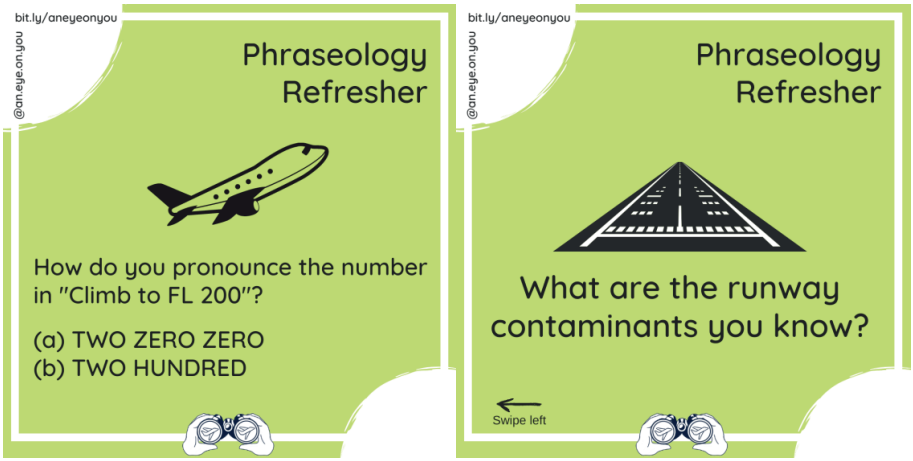
This is exactly where the idea of a phraseology refresher comes in handy: the repeated use of and easy access to standardized phraseology

through microlearning.

### 5.1. How to tackle the issue

At the end of 2020, our commander, Col. Ciccacio, suggested we started providing our air traffic controllers with practical phraseology tips. Helped by São Paulo Approach controllers and instructors, the team started a weekly series of phraseology posts (Figure 10). Around the same time, we also received a safety recommendation from SIPACEA-SE – the section of incidents/accidents investigation and prevention – to create a post about runway contaminants and surface conditions (Figure 11).

**Figures 10 and 11:** covers of the 1st Refresher and the SIPACEA suggestion




Source: AEOY Instagram, 2020

This new initiative certainly did not go unnoticed. A few followers questioned our lessons and even our credibility to publish about what they understood as operational issues. As a response to our FL 200 post (Figure 10), we received the comment *"I learned FL2-0-0, could you share the extract?".*

That taught us a lesson: although the post had been carefully researched in national and international documents, we had only alluded to the documentation. Since then, when it comes to phraseology, we show screenshots of the documents, to bring more authenticity and authority to the lesson.

Like our other posts, each and every Phraseology Refresher undergoes close scrutiny within our team, which is made up of three seasoned air traffic controllers, who are also aeronautical English instructors, and a

language expert. Besides, we research what we post thoroughly and often crosscheck our ideas with other aviation professionals in Brazil and abroad. This practice has resulted in more than 30 Phraseology Refreshers, which provide our followers with a reliable source of standardized phraseology.

We provide, but we do not spoon-feed. Instead, we aim at fostering independence and a sense of responsibility in ATCOs, so they stop assuming they know phraseology by heart and get used to checking the official sources we display.

## 6. IN A NUTSHELL

We will concede this article was not a particularly brief instructional unit on Aeronautical English microlearning. However, while we can try to be concise and precise on radiotelephony or in our minilessons, a lot goes on in trying to make online lessons shorter, yet still effective. If, as we say in Brazil, "the best perfumes come in small bottles", there is a whole alchemy in making that fragrance – or learning – stick. We hope to have shed light on the main elements, from design to microcontent, that have made AEOY a trusted source for zooming in on aeronautical language with the help of our binoculars.

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# Aviation English Testing

PART III

# CHAPTER 9

# TEST PREPARATION ISSUES IN THE AERONAUTICAL CONTEXT IN BRAZIL

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**ABSTRACT –** For safety reasons, language training for pilots and air traffic controllers (ATCOs) should go beyond test preparation and provide the practice that is necessary in aeronautical communications. In other words, the aim of aeronautical English training should rather be safety than merely passing a test. However, considering the high stakes involved, test preparation is constantly sought by test takers. Scholars have argued that test preparation has the potential to be positive if it leads to meaningful test scores and is learning-oriented (PLAKANS; GEBRIL, 2015). Based on this premise, this presentation aims at discussing the potential positive and negative aspects of aeronautical English test preparation for ATCOs and civil pilots, both on teachers and students, in the Brazilian scenario.

**KEYWORDS:** Test preparation; Aviation; Language training; Language assessment.

## 1. INTRODUCTION

In the last few years, an increasing number of professionals have had to undergo language testing, sometimes more than once, to show proof of proficiency in working areas where breakdowns or miscommunication can lead to serious consequences. That is certainly the case of pilots and air traffic controllers (ATCOs). Meanwhile, and almost in the same proportion, a flourishing language teaching market has aroused in order to prepare these professionals to be approved in high-stake exams, used as a gate-keeping mechanism, which has the power to grant them the necessary results to achieve professional goals, such as job promotions, benefits or, to say the least, to renew their professional certifications which allow them to continue working. The greater the relevance of the decisions made upon test results, the bigger will be test-takers' interest in preparing for it".

In the field of language assessment, ample evidence exists to suggest a connection between

language teaching and test preparation. In the aviation context, in particular, as in some other areas of English for Specific Purposes (ESP), this is quite debatable. Despite the relevance of the topic, little research has been found on the impact of teaching and test preparation on exams results in the aviation context. To fill this gap, this study sought to shed light on the potential positive and negative aspects of aeronautical English test preparation for pilots and ATCOs, both on teachers and students in the Brazilian scenario. Hence, our research question is: what are the positive and negative aspects of test preparation in the aeronautical context in Brazil?

Let us now turn to a proposition we encounter here and there, and sometimes replicate, without giving the appropriate attention it deserves: Teachers should not be involved in preparing students for tests. Would that be a myth? In fact, we agree that "the nature of myths is that they are not entirely false" (PLAKANS, GEBRIL, 2015, p. 3). Thus, if we consider test preparation as either a good or bad practice, we may not be wrong. What seems to be at stake, however, is how this preparation should be considered and for what purpose.

## 2. LITERATURE REVIEW

In the literature on language assessment and testing, there seems to be general agreement that tests may impact the teaching practice – or training, as it is frequently called in the aviation scenario – in different ways and measures. For instance, in a recent study in Italy, Mazzolini (2020) examined the attitudes towards International Civil Aviation (ICAO) language proficiency requirements on testing and training with regard to job security of pilots and ATCOs. The general perception among participants in her study – all pilots and ATCOs – is that language proficiency tests should be seen as a starting point to make them aware of the importance of speaking English in their job. However, the author also points out that the mastery of English should go beyond test preparation. She concludes that further research is needed in order to investigate, for instance, the adequacy of ICAO level 4 as the operational level, and other issues related to aviation language testing.

Messick, a famous scholar in the field of Educational Measurement, in 1996, argued that "there should be little, if any, difference between activities involved in learning the language and activities involved in preparing for the test (MESSSICK, 1996, p. 241-242). In 1982, the same scholar had pointed out that there is a progression on the types of test preparation, ranging from short-term test items manipulation to long term instructions to help develop the student's knowledge and ability in the domains being tested. We believe these considerations go beyond the field of language testing and assessment and touch education at large.

Crocker (2006), for instance, listed over twenty practical suggestions for test preparation, understanding that good teaching and test preparation, in

general, can go hand in hand. Popham (2001, p. 16), for his turn, differentiates negative and positive approaches to test preparation by naming the first item teaching and the second curriculum teaching. In a previous paper, Popham (1991) argued that the increase in inadequate test preparation practices is somehow connected to the pressure that test-takers and other stakeholders suffer in having to show good results in high-stake exams. Xie (2013) agrees that there could be negative or positive aspects in test preparation, depending on the type of activities being trained.

Accordingly, Plakans and Gebril (2015, p. 123) remind us that "test preparation has the potential to be good if it leads to meaningful test scores and is genuinely learning-oriented". The same authors explain that "teaching to the test" is associated with negative outcomes because it only focuses on content or skills related to the test, while "teaching for the test" is an approach that "perceives assessment as an important aspect of the learning process and, consequently, is not in a state of conflict with it" (PLAKANS; GEBRIL, 2015, p. 126).

Teaching to the test might include negative test preparation practices, such as "test-deviousness strategies[1]" i.e., that is a set of skills that help test-takers answer specific questions without having much real knowledge. Class activities are reduced to a point where teachers focus only on preparing students to answer test questions, or perform tasks, expected to appear on standardized exams. Such practice could enormously inflate conclusions about test taker's abilities and cause test score pollution, which happens when scores include inaccuracies that are not related to the knowledge or construct that this assessment tool is intended to measure.

Some possible outcomes of negative practices, according to Smith (1991) are: i) reducing instructional time by focusing on test preparation exercises; ii) narrowing the scope of the curriculum; iii) limiting teachers' creativity. Meanwhile, as measures to mitigate the negative impact of test preparation, both on students and teachers, Plakans and Gebril (2015) suggest teaching test-taking strategies, so that test-takers are able to perform at their best, rather than being confused by unexpected formats or feeling overwhelmed by time pressures or anxiety. The same scholars also recommend provide all test-takers with access to test-preparation materials or classes. As an example, manuals or guides with explanations about the test should include information about test construct, the skills to be tested, the number of items included, the time allotted for each section and sample items, preferably, with suggested answers. By avoiding negative practices, it is possible to prepare students to do well on tests but also to be successful in the use of language in real life.

Teaching for the test, on the other hand, can facilitate access to test

[1] In this paper we prefer the term "test-deviousness strategies" (COHEN, 2022) to "test wiseness", since we agree that the latter is a misnomer, as it might have a positive connotation, whereas the first one seems to refer to negative strategies to respond to test tasks.

materials and can help reduce variations in test performance among test-takers (MESSICK, 1982). Consequently, if there is an alignment between test preparation and the results of a comprehensive needs analysis, the test purpose, the test construct, the test instrument, the assessment criteria, the interpretation and uses of test results, then test preparation should not be seen as a bad practice. It would, in fact, be creating fairer and more meaningful learning situations indicating that what is being taught and learned closely corresponds to test-takers' needs in the target language use (TLU) domain.

In the aeronautical English field, in Brazil, two studies have explored the interface between test preparation and assessment. Souza (2018) investigated the washback effect of EPLIS (Aviation English Language Proficiency Exam for the Brazilian Airspace Control System) on teachers' and students' perceptions, attitudes, and actions in an air traffic control initial training program. This author understands that using test items that are similar or even identical to the ones used on the test may not necessarily be considered bad practice, provided that it is clear to teachers and students the reasons and the extent to which such practices are being used. Activities that focus exclusively on the test format (reducing the curriculum and the methods of instructions) should indeed be avoided. On the other hand, in small amounts, the same items could be used simply to familiarize the students to the test format. Prado (2020), in turn, used a list offered by the National Civil Aviation Agency (ANAC) website with 23 aviation English institutions and investigated the aviation English market in Brazil through internet-based materials addressed to civil pilots. The result of her study indicates that an excessive focus on the Santos Dumont English Assessment (SDEA), developed an applied by ANAC, is given by aviation language institutions to the expense of the proficiency rating scale recommended by ICAO.

### 2.1. Needs analysis and test preparation

Now let us turn to Doc 9835 (ICAO, 2010), which establishes the aeronautical English language policy for international radiotelephony communications, and consider a few questions for a comprehensive needs analysis to guide test preparation: i) Who are the test-takers? ii) What exactly should be assessed? What is the test purpose, or why does the test exist? How is language going to be assessed? Which criterion (scale, rubrics) should be used for correction? What do test results mean and what could they be used for?

In terms of who is Doc 9835 aiming at, the answer is clear-cut: pilots and ATCOs from International Civil Aviation for ICAO members states. As for what should be assessed, the same document states that it is the language for aeronautical radiotelephony communications between pilots and ATCOs in normal and abnormal situations. According to ICAO, in Doc 9835, phraseology should be considered operational knowledge and consequently, not directly assessed on a language test. Despite being the norm, we agree

that such statement should be reviewed. Considering test construct, or what should be assessed, listening, and speaking for aeronautical communications are the most relevant skills. Regarding test purpose, ICAO intends to ensure a minimum language proficiency level for aeronautical communications between pilots and ATCOs worldwide. In relation to test instruments, ICAO does not prescribe just one exam, as each member state may choose the instrument to be used accordingly. Concerning the assessment criteria to be used for test scoring, Level 4 on ICAO six-level rating scale is considered the minimum operational level. In regard to interpretation and uses of test results stakeholders should make decisions well-informed about pilots and ATCOs' abilities to communicate over the radio in normal and emergency situations with interlocutors from different regions of the world and sociocultural backgrounds. Test results should, therefore, be meaningful enough to be used for career purposes, such as admissions, job promotions, and professional certifications renewal. In short, test results should be representative of pilots and ATCO's language abilities required for international aviation safety.

Therefore, training should focus on safety, rather than only preparing aviation personnel for taking a test. Our aim in this study is to examine some of the material available online and check their linchpin.

## 3. METHODOLOGY

The main purpose of this study is to discuss the test preparation in the aeronautical context in Brazil encompassing the training available online for both pilots and ATCOs and check their positive and negative aspects.

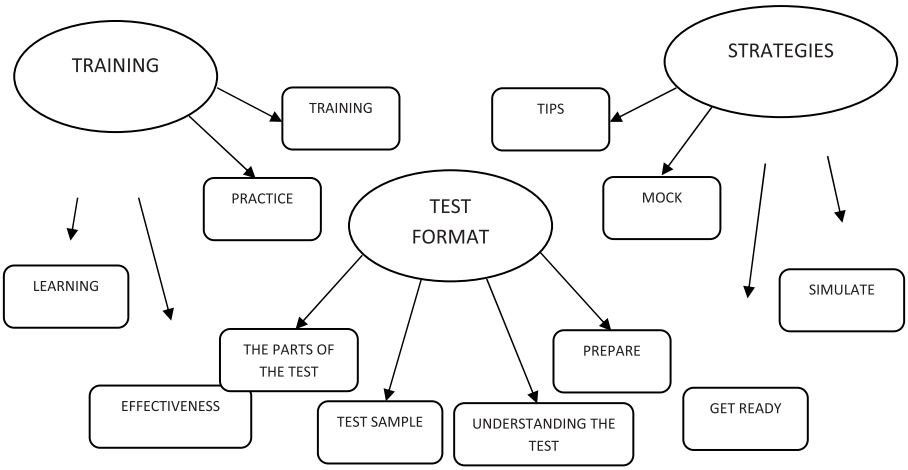
We conducted a multimodal analysis and gathered data both from EPLIS and SDEA websites and from English schools' websites, YouTube channels, and Instagram pages. Altogether, we analyzed texts and class videos from sixteen websites, twelve YouTube channels and six Instagram pages dedicated to teaching aeronautical English for both pilots and ATCOs. It is important to point out that the sources we analyzed will not be informed as references, since we do not intend to disclose study resources.

As a methodological tool, we used the concept of thematic analysis, which is a method for identifying, analyzing, and reporting patterns, also called themes, within data. A theme captures something important about the data in relation to the research question and represents some level of patterned meaning within the data set (BRAUN; CLARKE, 2006, p.79). The themes the researcher identifies, codes, and analyzes should be an accurate reflection of the content of the entire data set.

The first step was to familiarize ourselves with the data, by reading the texts and watching the videos. Then, we transcribed the most important sets of data and generated initial codes, i.e. the topics that appear the most. After that, we reduced the codes to themes and interpreted data based on these themes. Figure 1 bellow describes the codes and themes generated

from the data set.

**Figure 1:** Codes and Themes




Source: Authors, 2022

## 4. TEST PREPARATION IN THE AERONAUTICAL CONTEXT

The three themes generated from the data, Training, Test format and Strategies, presented in the previous section, guided our analysis. In this section, we are going to present some extracts which were representative of each theme and discuss them based on our view of test preparation (Cf. section 2).

### 4.1 Theme 1: Training

In this theme, we could identify data from websites, channels and pages which aimed at training aviation professionals to perform in real life situations and, consequently, at improving aviation safety. Table 1 bellows shows some examples of how some training providers indicated their concern with students' performance, regardless of their need to take a proficiency test to assess that.

**Table 1:** Training for real life

| |
|---|
| (1) "This is a portal for professionals who wish to improve their English, especially aviation English" |
| (2) "The student will be exposed to situations which they will face when flying." |

| |
|---|
| (3) "Learning English improves aviation safety. So we make an effort to deliver the most effective courses." |
| (4) "Activities to improve their aviation English skills for them to feel ready to work in a safe and effective way." |

Source: Authors, 2022

Phrases such as "improve their English", "learning English", "improve aviation safety", "improve their aviation English" are examples of the importance given to training for real life situations. In other words, we could find learning-oriented perspectives in some of the data resources.

On the other hand, we could also find examples that may be characterized as "teaching to the test", as some training providers promise easy and fast solutions to pass the so-called ICAO test, as well as effective methodology to be ready for the day of the test.

**Table 2:** Teaching to the test

| |
|---|
| (5) "We provide easy learning methodology to acquire the desired ICAO English level in less than 6 months" |
| (6) "The student improves constantly and gets ready for the day of the test" |
| (7) "Our teaching methodology is a 100% effective." |
| (8) "We make an effort to deliver the most effective courses." |

Source: Authors, 2022

Doing well on the test and achieving level 4 or higher can be said to be the focus on these samples, since these training providers do not mention the connection between learning and aviation safety. Instead, they seem to base their content in marketing strategies to sell to a more range of people. Examples 6, 7 and 8, for instance, could be used in any website, video, or page whose objective is to sell English courses.

### 4.2 Theme 2: Test format

Regarding the theme test format, we found complete lessons, videos and posts discussing and analyzing test samples. Both the official websites of EPLIS and SDEA provide test takers with test-preparation materials, which can be a measure to mitigate the negative outcomes of test preparation, according to Plakans and Gebril, 2015 (p.138). In addition to the samples provided on the official websites of the test providers, we could find similar versions, which seemed to have been developed by training providers, based on the official samples. The extracts shown in Table 3 bellow exemplify how some training providers are concerned with students' familiarization with test format.

**Table 3:** Familiarizing with test format

| |
|---|
| (9) "You can find an analysis of a complete test sample." |
| (10) "In this class, we'll go through all you have to know about the ICAO test parts." |
| (11) "Understanding ICAO English tests." |
| (12) "Analyzing part 2." |

Source: Authors, 2022

Nonetheless, some data were related to promises on how to do well in the test by using some techniques and tricks on specific parts of the exam, and by acknowledging what to do and not to do and what to say to impress the examiner on specific parts of the test. Several training providers focus their content on negative test preparation practices, or test-deviousness strategies, and present a set of techniques to help test-takers perform well on test tasks and answer some test items correctly.

**Table 4:** Test-deviousness strategies

| |
|---|
| (13) "Understand the parts of the test and what the examiner expects from you." |
| (14) "How to get a Level 4 without understanding the situations in Part 2." |
| (15) "How to get correct answers in Part 1." |
| (16) "Understand what the examiner expects from you in each part of the test." |
| (17) "Describing the picture technique." |

Source: Authors, 2022

Table 4 shows the focus given on providing test takers with samples of the different parts of the test, as well as specific practices and simulations. We found samples, as extract 14 illustrates, in which training providers indicate they can train test-takers to be assessed as Level 4 without even understanding the questions asked by the examiner. We agree with Souza (2018) that, in small amounts, the use of exercises of the parts of the test could be a positive practice to familiarize students with the test format.

Nevertheless, there are some training providers whose content is based on test format exercises and explanations. We reassure that training in the aeronautical context cannot be focused exclusively on that.

### 4.3 Theme 3 – Strategies

Data have indicated that most training providers use strategies that may be considered positive, such as practicing the responses of different

parts of the test. Simulation appears in most of the resources as a technique to enhance test-taker's performance. Training providers justify their use by saying that it may help test-takers not to feel shy when taking the test and not to use an amount of filler that might affect communication.

**Table 5:** Enhancing performance

| |
|---|
| (18) "English for ICAO test: simulate your answers on the test." |
| (19) "Learn techniques which will enhance your performance." |
| (20) "Free mock test samples: a self-study guide." |
| (21) "Simulate your answers and practice the most common mistakes." |
| (22) "Avoid common mistakes." |

Source: Authors, 2022

Data analysis has also indicated that test preparation seems to rely on specific strategies for each part of the test and on practices that seem to depend on memorizing chunks and preformulated sentences. Most training providers offer tips and tricks to achieve Level 4 or higher, which may even include pretending and deceiving the examiner.

**Table 6:** Deceiving practices

| |
|---|
| (23) "How to disguise the rater: learn how to say exactly what the rater wants to hear." |
| (24) "What to say when you haven't understood what the examiner's asked." |
| (25) "10 valuable tips to get your Level 4." |
| (26) "5 techniques to go from Level 3 to Level 5." |

Source: Authors, 2022

Extracts from Table 6 exemplify techniques and deceiving practices which aim at passing the test rather than learning aeronautical English for real life situations. Some training providers offer lists of preformulated answers that would fit a lot of scenarios and, unfortunately, they gather a lot of followers and viewers.

## 5. FINAL REMARKS

We share the understanding that test preparation can only be effectively deterred if "a hefty dose of assessment literacy" Popham (2001, p. 19) is provided to stakeholders, mainly teachers and policymakers. For safety reasons, language training for pilots and ATCOs should go beyond test preparation and provide the practice that is necessary in real aeronautical

communications. Some practices, such as providing test-takers with samples of the exam for them to know the test format, are positive. However, memorizing answers and trying to deceive the rater can be harmful to aviation safety. In other words, the aim of aeronautical English training should rather be safety than merely passing a test.

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# CHAPTER 10

# CREATING A RUBRIC FOR PLACEMENT TESTS FOR AVIATION ENGLISH PROGRAMS

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**ABSTRACT –** Ever since the United Nations International Civil Aviation Organization's (ICAO) decision to require English proficiency for pilots to fly internationally, a key question that researchers have been investigating is how to assess Aviation English proficiency (MODER & HALLECK, 2012). Although there is a growing body of Aviation English assessment literature, there is a need for assessment tools that are designed specifically to be placement tests for programs training English learners who are not yet at operational level 4 (FRIGINAL et al., 2020). To work towards addressing this need, a speaking placement test rubric was developed using qualitative case study data. Recordings of 4 aviation students learning English as a second language were analyzed. In the recordings, the students were answering questions and completing a task to demonstrate their ability to carry out pilot-ATC dialogues. Their mistakes and miscommunication repairs were observed and analyzed in light of communicative ability, aviation safety, and the ICAO proficiency descriptors. Based on these observations, a rubric was created as a tool for placing aviation students into different levels of ESL classes that are all below operational level 4. Exploratory findings, implications for pedagogy and assessment, and future directions will be discussed.

**KEYWORDS:** Aviation English; Assessment; L2 Pedagogy.

## 1. INTRODUCTION

English for aviation has been an increasingly prominent focus for ESP researchers. In contexts like aviation, clear communication is very important because of the potential safety repercussions of misunderstandings. Pilots and air-traffic controllers from many different L1 backgrounds have to communicate, and miscommunications can be very dangerous. Communication issues have been identified as contributing factors in a number of accidents (COOKSON, 2009; CUSHING, 1994). Given the importance of clear

communication among speakers of many different languages, the International Civil Aviation Organization (ICAO), a specialized agency of the UN, made a decision in 1998 to require pilots to demonstrate proficiency in English before making international flights by 2011 so that they would be able to communicate with air traffic controllers who did not share their first language in English effectively (ICAO, 1998).

ICAO published a manual on how to implement the English proficiency guidelines in 2004, and it was updated in 2007 and 2010. The manual includes phraseologies that can be memorized that pilots are supposed to use for predictable situations that are likely to occur in flight, and for any unexpected circumstances that cannot be described using the proscribed phraseologies, pilots are supposed to be able to use "plain language" to explain the situation clearly. Descriptions of what constitutes as *plain language* are also provided in ICAO's manual. Because of the potential need to explain circumstances in English outside of the memorized phrases, pilots who wish to fly internationally must demonstrate English proficiency if they do not fit ICAO's definition of native English speakers. The guidelines for implementing ICAO's English proficiency requirements include descriptions of six different levels of proficiency, with "operational level 4" being the minimum level required for international flight. ICAO did not design a standardized Aviation English test, but the descriptions of proficiency requirements can be used in test design.

Researching communication between pilots and air-traffic controllers, with the goal of drawing pedagogical implications for English for Aviation programs, has been an important goal for applied linguists (FRIGINAL et al., 2020). Among the research in applied linguistics centered on Aviation English, assessment has been a key issue drawing the attention of many researchers (ALDERSON, 2010; DOUGLAS, 2000, 2001; DUSENBURY & BJERKE, 2013; FOWLER et al., 2021; GARCIA & FOX, 2020; KNOCH, 2014; MODER & HALLECK, 2012).

However, there is still a need for placement exam options for Aviation English programs admitting students who are at lower proficiency levels. The present case study addresses this issue by providing a speaking task rubric that was developed by analyzing task performances of English language learners studying aviation. The paper begins with a brief overview of previous literature on Aviation English and Aviation English assessment. A description of the present case study's data and the procedures are provided, followed by a discussion of the findings and the Aviation English placement exam rubric that was developed using the data. Future directions are also addressed.

## 2. LITERATURE REVIEW

### 2.1. Aviation English Research Informing Pedagogy

Following ICAO's decision to mandate English proficiency for pilots

flying internationally, Aviation English research has aimed at informing English pedagogy for aviation personnel who need to reach ICAO's minimum proficiency requirements. Research on English as a lingua franca (e.g. JENKINS, 2000) can serve as a foundation for more specific Aviation English research (KIM & ELDER, 2009). There have been many notable studies describing Aviation English that can inform pedagogy and assessment, many of them focusing on pilot/ATC communication (FRIGINAL et al., 2020). For example, many descriptions of Aviation English that can inform needs analyses have been provided (ESTIVAL, 2016; ESTIVAL et al., 2016), and corpora of pilot-ATC communications have been compiled to aid in Aviation English research (PRADO & TOSQUI-LUCKS, 2019).

Prinzo (1996) analyzed errors in pilot-ATC communication, which can be helpful for Aviation English teachers thinking about how to help students avoid common errors. Since errors and miscommunications occur in aviation regardless of pilots' L1 backgrounds (ESTIVAL & MOLESWORTH, 2009), it is very important for pilots to try to resolve them efficiently when they happen (ISHIHARA & PRADO, 2021). Ishihara & Prado (2021) provide a description of negotiation of meaning in aviation contexts, and Henrich (2008) examined questions in pilot/ATC communication. Although much of the communication in Aviation contexts has to be very concise, pragmatics is another focus of aviation English researchers, such as Ishihara and Lee (2021).

In addition to research describing English in aviation contexts, there is also literature focused on effective ways to teach aviation English, such as the work of Roberts and Orr (2020) and Emery (2015). An example of a curriculum developed for an aviation context based on a comprehensive needs analysis comes from Paramasivam (2013), who created a task-based and genre-based language curriculum for air traffic control trainees in Malaysia. Relying on interviews and extensive discussions with content instructors at the Malaysian Aviation Academy and with professional ATCs employed by Malaysia's Department of Civil Aviation, Paramasivam identified spoken fluency in RT communications as being the most critical area of student need.

### 2.2. Aviation English Assessment

In addition to describing Aviation English and how to help English as an additional language users aspiring to be pilots reach ICAO's proficiency requirement, Aviation English assessment has also been an important research focus, as ICAO did not create a standardized Aviation English test. It is the responsibility of each member state to develop tests and procedures to comply with the ICAO LPRs, and given the high-stakes nature of aviation language testing, selecting the appropriate tests and the difficulty in confirming the quality of the available aviation tests have always been a challenging endeavor for stakeholders (ESTIVAL et al., 2016).

Quality proficiency assessment tools are key in successful

implementation of the language requirement. The available tests of aviation English come in different sizes and forms. For example, some tests are designed specifically for either pilots or controllers, while others use the same test for both groups. Some tests evaluate candidates' performance in all six levels of ICAO scales, while others focus only on levels 3-5 (ESTIVAL et al., 2016). Moreover, many university-based flight programs rely on tests that were designed to be general university entrance tests such as IELTS and TOEFL to evaluate the English proficiency of candidates rather than using aviation-specific tests (ALDERSON, 2010; CAMPBELL-LAIRD, 2006).

Moder & Halleck (2012) argue that in contexts like aviation, careful needs analyses and research are crucial in test design and curriculum development because of the potential safety-related consequences of improper testing. If someone who is not really proficient enough in English to be able to explain an emergency situation to ATC and understand their instructions flies internationally, it could be dangerous. On the other hand, if a test is unreasonably difficult, then pilots who should be able to fly internationally might be prevented from making this advancement in their careers. For these reasons, Aviation English gatekeeping tools have been an important research focus (ALDERSON, 2010; DOUGLAS, 2014), as well as more specific areas such as rating scales (KNOCH, 2014) and listening assessment (GARCIA & FOX, 2020).

Although there has been growing research in Aviation English assessment, there is still a need for assessments for students who are not yet ready to become pilots whose English proficiency is below the Operational Level 4 (FRIGINAL et al., 2020; BIESWANGER et al., 2020). Many international students come to the US for flight training, and English proficiency also has a role in their success learning in aviation programs that use English as a medium of instruction (DUSENBURY & BJERKE, 2013). Students aspiring to become pilots sometimes work on improving their English proficiency before or during flight training, and international students attending universities in the US are often required to take ESL courses before starting their program of study if they are not at a high enough English proficiency level. According to Lynch and Porcellato (2020), the nuanced skills likely needed for flight training and the composite scores of popular tests like TOEFL and IELTS are significantly different, indicating that aviation-specific placement tests would be important for ESL programs geared towards aviation students.

Although many Aviation English assessments have been created based on the research that has been done, there are still not enough options for placement exams for Aviation English programs assigning students to the appropriate level course for learners who are not yet at the minimum proficiency level required by ICAO. Considering the lack of placement test options for Aviation English programs, a placement rubric was created based on the analysis of recordings of ESL students studying aviation performing aviation tasks.

## 3. METHODS

First, recordings of aviation students performing paper-based tasks were analyzed and the errors were noted. After analyzing the observation data, an aviation task rubric was created using the notes from students' task performance and information from the *Manual on the Implementation of ICAO Language Proficiency Requirements* (ICAO, 2010). The recordings analyzed included four different students who spoke English as an additional language and came to a flight school in the US as international students.

The students had some aviation background, but they had not yet completed their flight training. At the time of recording, they were in an ESL program at the university where they were studying. In the recordings, each student responded to interview questions about their experience learning English and then attempted a paper-based ACT communication task. The students were instructed to act as pilots, and a teacher interviewing them role-played as an air-traffic controller. For the task, students were given information about what they needed to communicate to ATC.

Three different tasks were used. One task instructed the student to call for taxi clearance, and then the student was informed that an engine died, and they had to decide how to best handle that situation. Another task instructed the student to call for taxi clearance, and then informed them that a wheel fell off the plane before takeoff, and they had to communicate the situation to ATC. Another task involved taking off, and then being informed that there was low pressure and high temperature, and the student had to ask to land. In cases when the students did not know how they should respond to the task, the teacher role-playing as ATC would momentarily pause the role-playing to explain what they needed to do. The audio recordings of these task performances were graciously shared by a partner university

The errors in each recording were analyzed. Errors that related to ICAO's proficiency guidelines, errors that interfered with students' ability to perform the task they were given, and errors that led to miscommunications that would have been dangerous in a real flight situation were noted and categorized based on ICAO's (2010) divisions of skill areas: pronunciation, structure, vocabulary, fluency, comprehension, and interactions. Task performance issues, especially as they related to language, were also noted.

Based on the observations and consulting *Manual on the Implementation of ICAO Language Proficiency Requirements* (ICAO, 2010) to include important skills that did not surface in the case study data, a rubric was created. In the rubric, the language skills were categorized based on ICAO's proficiency descriptors, with an added task performance category.

## 4. RESULTS & DISCUSSION

### 4.1. Observations

In terms of pronunciation, the errors that could be important for communication were noted. In cases when the instructor asked for repetition or showed other indications that he did not understand the student, the context was analyzed to try to identify the most likely reasons, but the reasons were not always clearly identifiable. There were some cases when the students' utterances seemed to be comprehensible, but the instructor expressed that he did not understand them.

In terms of segmental features, which Deterding and Lewis (2018) consider important in ELF contexts, there were cases of elision of final consonants, which could potentially make many words less clear. There were also cases of the /dʒ/ sound pronounced as [j], leading to a miscommunication in one instance, replacing /m/ with [n] in word final position, and elision of the voiceless glottal fricative in word initial position. Although the students' intonation and stress were not always what a listener might expect to hear, suprasegmental errors did not appear to lead to any miscommunication in the data set. There were some cases of words that are part of the standard Aviation English phraseology being mispronounced, and these words would be an important priority for pronunciation improvement since they would be expected to be frequently needed in flight and potentially relevant to safety.

There are many types of structural errors that could lead to miscommunications in aviation, but in the data observed, the problematic errors were missing tense and aspect markers, missing linking verbs, issues related to syntax that interfered with communication, and word form errors. Other types of errors did not appear to impede communication in the data, but some of them, such as article usage, are specifically listed in proficiency descriptors in the *Manual on the Implementation of ICAO Language Proficiency Requirements* (ICAO, 2010).

In terms of vocabulary, lack of knowledge of aviation-specific terms such as *cabin pressure* and *shallow turns*) made task completion difficult in some cases. There were also instances of students using words from their L1 like the words meaning *but*, *forty*, and *storm*. In some cases, students were able to express what they needed to communicate, even if they did not use the ideal vocabulary for the aviation register or they were not using the proscribed phraseologies, but in other instances lack of vocabulary was a severe impediment to their ability to communicate what was needed for the task. For students entering an ESL program with an aviation focus who have not gotten far enough in their aviation studies to know the appropriate phrases for each in-flight situation, it would be important to evaluate their "plain language" abilities and try to determine the suitable level of ESL classes to meet their vocabulary needs.

There were notable fluency issues in the data. Some of the students spoke very slowly, even when the task involved a description of an emergency, and there were many pauses, some of which were quite lengthy. Although the reasons for pauses cannot be certain, based on the context and what was heard, it seemed that many of the pauses may have been related to lack of aviation content knowledge, inadequate vocabulary, thinking for a long time to remember numbers, and possibly looking at the task diagram trying to figure out the meaning of ATC's question (overlapping with content knowledge and listening comprehension issues). The data only comprised of audio recordings, not videos, but from the conversation about the diagrams it seemed like students may be taking time examining them. Regardless of the reasons for the disfluencies, they would be an important area for an aviation ESL program to focus on, and thus important to include on a placement exam rubric.

In terms of comprehension, there were observable issues related to both aviation-specific phrases and more general English phrases. Since comprehension is an internal process, observers cannot know for sure what students understood and what they didn't unless they state that they did not understand, but their responses or lack of responses to questions and prompts can provide strong enough clues, at least for the purpose of this project. It is possible that there may have been other comprehension issues that did not become apparent in the conversation.

Among the misunderstandings of aviation specific terms and phrases, there were cases of students not being able to understand ATC asking whether a fire emergency team should be called, numbers in the context of discussing altitude, taxiing instructions, request to take off from a different runway, and the phrase "state your intentions." Some of these examples of phrases may not actually be necessary for students to know when they are entering an aviation English program, as students would eventually learn them as they progress in their studies, but they were noted because they affected the students' task performance. In terms of more general English, aside from the numbers, there was a case when a student did not understand the phrase "came off" in the context of a wheel falling off the plane.

In the real world, misunderstandings do occur in pilot-ATC communication (HENRICH, 2008), and the pilot's response to the misunderstanding is something that ICAO (2010) identifies as important for safety in the "interaction" category of language proficiency. In particular, it is important to try to seek clarification quickly when misunderstandings happen (ISHIHARA & PRADO, 2021). Generally, the students observed did ask for clarification when needed, in some cases with the correct phraseology, and sometimes resolution to the misunderstandings was reached after clarification requests. There were some instances though when the instructor reminded students that they needed to ask for clarification when misunderstandings occurred. It was evident that the students had not yet learned all of the

proscribed rules for interaction, such as the local rule that pilots should read back ATC's instructions to hold short, but these types of interaction features would be learned in their content courses rather than their language courses.

Another language-related interaction issue observed was the way that students reported emergencies. Since their fluency was limited, the students reported emergencies quite slowly, and without intonation changes, they did not sound like they were describing an urgent situation. However, if they memorize the appropriate phraseologies for expressing emergencies that might occur, the urgency of their situation could be clear regardless of their speed and tone.

In terms of task performance, the students had difficulty with the tasks, but the difficulty was due to both language issues and lack of content knowledge. Since content knowledge and language knowledge are so intertwined in ESP tasks, it would be better in language assessments to ensure that tasks are not beyond students' level of content familiarity to avoid the difficulty of figuring out which task performance issues happened only because of language.

In terms of language, the students lacked some of the phrases needed to express the flight problems they were assigned. The comprehension, vocabulary, pronunciation, and fluency issues mentioned above also made it difficult for students to perform the task. In terms of content knowledge, some of the students had not yet learned what to do in the situations they were assigned, indicating that the tasks were not appropriate for their level. Not all the students were even aware that the situation described in the task was a dangerous situation.

### 4.2. Rubric

Using the information from the observations made and consulting the ICAO descriptors to prioritize factors that ICAO considers important, a rubric was developed. The rubric is displayed below in Table 1. There are four proficiency levels on the rubric so that students can be divided into classes at 4 difficulty levels, but programs using the rubric would need to adapt it to suit their existing structure, perhaps merging or splitting levels. It is important to note that "level 4" on the rubric does not correspond with ICAO's operational level 4--students who are already at ICAO's operational level 4 would not necessarily need to enroll in an ESL program. Level 4 on the rubric should describe students who need some ESL instruction. In all the skill areas, students with the highest possible scores would be expected to still make mistakes.

**Table 1:** Rubric for Aviation Task.

| **Pronunciation** |
|---|
| **Level 4:** The student's pronunciation is always clear and understandable. Occasionally puts some strain on the listener, but does not really impede understanding. |
| **Level 3:** Demonstrate a marked accent or a localized regional variety of English. Interviewer should pay close attention to understand or may have to clarify something from time to time. There may be some specific things that the student can improve on such as segmental errors, pronunciation of word final consonants, consonant clusters, question intonation, or other areas that need practice. |
| **Level 2:** Frequent mispronunciation hinders intelligibility or comprehensibility. |
| **Level 1:** It is evident that the student's pronunciation would be difficult to understand over the radio and may cause them danger if they need to fly internationally. |
| **Structure** |
| **Level 4:** Consistently controls basic structures needed to complete the task, with errors possibly occurring when complex structures and language are used. |
| **Level 3:** Has just enough grammar to get their intended meaning across. More complex structures are not attempted. |
| **Level 2:** Use of basic structures which are frequently inaccurate. Occasionally impedes communication or the ability to complete the task. |
| **Level 1:** The student had difficulty forming sentences or the structure impeded communication multiple times. |
| **Vocabulary** |
| **Level 4:** The student uses an adequate range of vocabulary to manage most everyday and aviation specific topics. The student had enough vocabulary to adequately complete the task and respond to interview questions. |
| **Level 3:** Choice of words is occasionally inaccurate in everyday and aviation-specific topics. Limited vocabulary may prevent discussion at some stages of the interaction, but does not really impede communication. |
| **Level 2:** The student uses words incorrectly, uses nonexistent words, or has to use another language to fill in vocabulary gaps. The vocabulary range is not adequate to deal with everyday or aviation-specific topics that were discussed. Lack of vocabulary occasionally impedes communication. |
| **Level 1:** The student had a lot of difficulty performing the task because s/he could not think of the right words. |

| Fluency |
| --- |
| **Level 4:** Nearly natural speed in most everyday contexts. There may be some natural hesitation while searching for language. The student is able to communicate what is necessary for the task at a reasonable speed. |
| **Level 3:** Speech is slow and hesitant. It occasionally demands unreasonable patience of the listener, but does not really impede communication. The pace may be a hindrance to rapid communication in an urgent in-flight emergency. |
| **Level 2:** Slowness of speech flow is such that communication lacks concision and efficiency. long silent pauses frequently interrupt the speech flow. It is likely that the pace may be a hindrance to rapid communication in an urgent in-flight emergency. |
| **Level 1:** Because of the pauses and hesitations, it is clear that the student would be in danger if they had to describe an urgent situation in English while flying. |
| **Comprehension** |
| **Level 4:** The student demonstrates the ability to understand all or most of the interviewer's questions by responding appropriately or asks for clarification when needed. Understanding is not hindered by the interviewer's non-standard dialects or regional accent. Able to understand aeronautical radiotelephony communications. |
| **Level 3:** Textual relations are occasionally misunderstood or missed. With some help, ultimately comprehend the unexpected or unusual communication. |
| **Level 2:** Comprehension is limited to routine communications. May not be proficient enough to understand unexpected events and radio reception. Unmarked or complex textual relations are misunderstood or missed. The student does not always resolve misunderstandings with clarification requests. |
| **Level 1:** Comprehension is very limited. The student was not able to understand many of the questions. |
| **Interactions** |
| **Level 4:** The student communicates by participating in turn-taking. Responds, comments, asks questions, negotiates meanings verbally and non-verbally. The student demonstrates some of the pragmatic competence needed for aviation communication. The student follows aviation interaction protocols (such as identifying the flight they are on) during the task performance. |

| |
|---|
| **Level 3:** The student communicates adequately in most everyday and aviation contexts, but could be rather passive with responding and commenting. They do not check, seek confirmation, or clarify a situation or communication adequately. The student demonstrates some of the pragmatic competence needed for aviation communication, but it is clear that there are some gaps in their understanding of aviation pragmatic norms. The student mostly follows aviation interaction protocols (such as identifying the flight they are on) during the task performance. |
| **Level 2:** Interactions lack concision and efficiency. breakdowns in communication. Not confident in speaking. Gives simple responses only when required, but is unable to maintain or develop the interaction.The student demonstrates a lack of pragmatic competence needed for aviation communication. The student does not follow aviation interaction protocols (such as identifying the flight they are on) during the task performance. |
| **Level 1:** The student had severe difficulties with interactions because of language proficiency related challenges. |
| **Task Performance** |
| **Level 4:** The student was able to use language to complete the task. |
| **Level 3:** The student was able to use language to complete the task, but there were mistakes in the task because of language-related issues. |
| **Level 2:** The student could do some components of the task, but did not complete it. |
| **Level 1:** The student could not perform the task. |

Source: Authors, 2022

In terms of pronunciation, intelligibility and comprehensibility should be prioritized (DERWING & MUNRO, 2014). Although the ICAO (2010) proficiency descriptors of pronunciation focus on suprasegmental features, Jenkins (2000) suggests that segmental features are more important in ELF communication, and as they were more influential on intelligibility in the case study data, they are included in the rubric. A student with mostly clear pronunciation would place into an advanced course using the rubric, and a student who needed substantial pronunciation improvement to be understood would be placed into a beginning level.

In terms of structure, ICAO (2010) differentiates between “basic structures” (articles, adverbs of frequency, comparison with adjectives, discourse markers, modal verbs, cardinal numbers, ordinal numbers, passive voice, direct and indirect objects, question words, relative clauses, present simple, present continuous, past simple, past continuous, present perfect, present perfect continuous, future simple, *going to*, existential *there*) that pilots need to be able to use and more advanced structures that are not necessarily essential for international flight. The “basic structures” are prioritized in the

rubric, since these are what students would eventually need to know, with the assumption that their mastery of basic structures may not be complete even in the most advanced ESL class.

In the vocabulary section, evaluators would need to see whether students had enough vocabulary to explain what they needed to describe for the task they were assigned. Since the target student population would be students who may have not yet finished their aviation studies, it cannot be expected that examinees would use the appropriate phraseologies perfectly. Raters could focus more on the students' "plain language" skills.

Fluency could be a very important skill in the aviation domain, as pilots can be expected to possibly need to describe urgent emergency situations quickly without sacrificing clarity. Accordingly, speed and pauses, which were notable issues in the case study data that was analyzed, are represented in the fluency section of the rubric. There should be an expectation that students placing into the highest level on the rubric would still have room for fluency improvement.

In terms of comprehension, students placing into a high level would be able to understand most of what the examiner said and students placing into a low level would need a lot more language instruction to improve their comprehension abilities. ICAO (2010) specifies that pilots should be able to understand many different accents and varieties of English, and while this type of skill may not be able to surface in a single task, raters can at least try to determine whether students understood their interviewer. Misunderstandings that are resolved appropriately could count as comprehension, because even ICAO's operational level 4 allows for some misunderstanding and clarification requests. How students respond to miscommunication or misunderstanding should be noted by raters, as this is an important interaction skill in aviation. Other interaction issues that can be rated are pragmatics and turn-taking.

Raters should determine whether the students' language skills are sufficient to communicate what is needed for the task they are given. Students placing into the highest level should not be expected to complete the task perfectly, but they should be able to communicate at least the minimum amount needed for the situation they are assigned. At lower levels, students would demonstrate a need for a lot more language instruction to be able to reach the level of proficiency needed for aviation tasks.

### 4.3. Overlapping Skill Areas

One of the challenges in creating a rubric divided into different language skills is that there is a lot of overlap between different components of speech. For example, clarification requests relate most to interaction, but they are also connected to comprehension because they can provide evidence about what was or was not understood. Fluency can be affected by vocabulary and structure knowledge, because thinking about how to say something may

require pausing or slowing down. Taking time to recall content knowledge could also lead to speech that seems less fluent. In addition, receptive vocabulary knowledge affects comprehension, as does knowledge of structures.

In the data analyzed, there was an overlap of vocabulary and structure. A student did not know the word for "forty," and although it is a word, so it could be thought of as a vocabulary issue, ICAO (2010) explicitly lists numbers as "basic structures" that pilots need to know. Task performance is intertwined with all other areas, especially vocabulary, because students have to know the phrases needed to complete the task.

### 4.4. The Importance of Task Design

Task design is a really important factor in effective assessment that needs to be considered. The rubric was created to be general enough to fit a variety of tasks, but if the task is poorly designed, fair assessment is likely to be difficult. Using a task that is beyond students' level of content knowledge, for example, may make language assessment challenging.

One way to address this issue could be giving students who have limited aviation experience at the time they enroll in an ESL program instruction on how to complete an aviation task before being assessed so that the role of content knowledge is de-emphasized. When designing tasks for Aviation English assessment, communication tasks and lists of communicative functions that pilots need to be able to perform in the appendices of the *ICAO Manual on the Implementation of Language Proficiency Requirements* (ICAO, 2010) may be helpful.

### 4.5. Raters

When using the proposed rubric, it is important to select raters who have a linguistics or English teaching background. Determining whether a student is intelligible can be quite subjective and raters' biases could influence their perceptions of intelligibility (Lindemann 2011). While it would be ideal to have raters who have experience with Aviation English as a lingua franca, it may not be feasible for ESL programs to find enough raters with these qualifications. They should at least be experienced in ESL or EFL pedagogy and be familiar with the curriculum in the program that students are entering to be able to make an informed decision about what level classes would meet students' language needs.

## 5. CONCLUSION

This case study project involved an analysis of English learners' task performance to aid in the creation of a placement exam rubric for Aviation English programs targeting students below ICAO's operational level 4 English proficiency. As a case study, it was possible to carefully analyze students'

performance in detail, but the small sample size can also be considered a limitation. Observing more students performing aviation tasks could be an important future direction for expanding the project, especially if students who have more first language backgrounds and levels of proficiency are included.

Triangulation with other types of data, such as observations in Aviation English classes and aviation content classes, as well as interviews with flight instructors, could also shed light on other areas of Aviation English communication that should be included on the rubric. Before implementing the rubric in a program, it would also be important to pilot it with a sample group of students and make adjustments as needed.

Future research could also focus on conducting needs analyses to develop high quality assessment tasks, especially for students with different levels of aviation content knowledge and for students who are aspiring to have careers in aviation besides pilots, like air-traffic controllers or airplane maintenance technicians. Expanding research on Aviation English assessment can provide Aviation English programs with important information.

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# CHAPTER 11

# THE LISTENING CONSTRUCT: THEORIES AND IMPLICATIONS TO THE ASSESSMENT OF PILOTS AND ATCOS

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**ABSTRACT –** Listening is complex. Assessing an invisible cognitive operation such as listening is challenging, especially in a high-stake testing context. The purpose of this chapter is to discuss the main theories that have informed the definition of the listening construct in language testing (e.g., BUCK, 2001; FIELD, 2019) as well as to discuss some implications for the testing of pilots' listening comprehension, as required by the International Civil Aviation Organisation (ICAO) policy. The main characteristics of the listening construct on a theoretical level are presented, followed by a discussion on issues related to its operationalization. It gives insights into what listening tests should be testing. Some features of the language used by pilots and ATCOs that may help their communication to be more effective are discussed, as well as those that may contribute to communication challenges. This discussion might be useful for listening test developers, especially those who are involved with the development of aeronautical English listening tests.

**KEYWORDS:** Assessment of listening; Construct definition; ICAO language proficiency requirements; Aeronautical English.

## 1. INTRODUCTION

When a language test needs to be developed, a basic question to be asked is: what is the test construct? In other words, test developers need to determine what they want to assess (BACHMAN, 2007). Understanding the construct is fundamental to test development. The term construct can be understood as a theoretical description of the relevant skills and abilities of a specific assessment context (FULCHER; DAVIDSON, 2007). CRONBACH & MEEHL (1955)'s definition of construct was "some postulated attribute of people, assumed to be reflected in test performance" (p. 283). Other definitions include: "a meaningful interpretation of observed behaviour" (CHAPELLE, 1998, p. 33), "the thing we are trying to measure" (BUCK, 2001, p. 1), "the theoretical entity that the test developers and test users intend the test to measure, the quality or qualities of the test takers we wish

to make inferences about" (DOUGLAS, 2010, p. 33), and "the trait (traits) or underlying ability that we intend to measure through assessment" (CHENG; FOX, 2017, p. 224). As Bachman (1990) explained, a clear definition of language abilities must be the basis of all language tests. However, defining a test construct may be a challenge (FOX, 2007), or even "a persistent problem" (BACHMAN, 2007, p. 41). No matter how difficult it may be, understanding the test construct is crucial to the process of language test development. As Chalhoub-Deville (2003, p. 369) argued, "the L2 construct is far reaching in terms of its impact on varied aspects of test design, validation, research, and theory formulation". Thus, having a clear definition of the test construct is extremely important, especially in high-stakes testing contexts, such as the case of pilots/air traffic controllers (ATCOs) language proficiency testing.

The language proficiency requirements (LPRs) for pilots and ATCOs were introduced by the International Civil Aviation Organization (ICAO) in 2003 (ICAO, 2010). From March 2008 (later postponed to 2011), pilots and ATCOs should demonstrate their ability to speak and understand English (or the language normally used by the station on the ground) in order to be allowed to fly internationally (in the case of pilots) or control international flights (in the case of ATCOs). The ICAO LPRs include a set of holistic descriptors and a rating scale, which range from levels 1 to 6 in six different categories: pronunciation, structure, vocabulary, fluency, comprehension, and interactions. Pilots and ATCOs need to be awarded at least a level 4 in all six categories in order to receive a final level 4, the minimum required level for safe radiotelephony communication. Since the publication of the ICAO LPRs, some researchers have questioned the validity of the construct which underpins the ICAO policy and its rating scale (e.g., DOUGLAS, 2004, 2014; EMERY, 2014; KIM; ELDER, 2015; KIM; BILLINGTON, 2016; KNOCH, 2014; READ; KNOCH, 2009). They all expressed the importance of conducting more research to investigate the nature of the language used in pilots/ATCOs communications in order to inform construct definition. Douglas (2004, p. 250), for example, argued that "the combination of elements that must be incorporated into a construct definition of what is to be measured by the new tests is very complex, and it must be said, somewhat ambiguous in places". Emery (2014) also considered the ICAO policy and rating scale to be problematic. He argued that "the ICAO guidance material ... is of little practical use in the definition of the construct and the development of test specifications" (p. 206). Moreover, although ICAO (2010, p. 4-13) acknowledged that comprehension "represents half of the linguistic workload in spoken communications", the fact that comprehension is, as mentioned, only one out of six skills in a rating scale which was developed to assess speaking may diminish the importance of the assessment of listening (GARCIA, 2015). Therefore, better understanding the listening construct in the context of pilots/ATCOs communications is crucial. It is important to note that comprehension is important for both pilots and ATCOs; however, it seems to be even more prominent for pilots, as ATCOs' turns tend to be longer than pilots' (CLARK et al., 1990).

As Hart (1998) argued, it is important to understand the history of the subject we are studying and learn how it has developed. Thus, the primary purpose of this chapter is to discuss the main theories that have informed the definition of the listening construct in language testing. I start by presenting the main characteristics of the listening construct on a theoretical level, followed by a discussion on issues related to its operationalization. Next, I discuss some implications for the testing of pilots' listening comprehension. Throughout the chapter, I include some comments on construct validity (i.e., the validity of the inferences made from test scores) and on test validation, which can be understood as "the ongoing process of justifying particular interpretations and uses of test results" (CHAPELLE, 1998, p. 33). The chapter ends with a short conclusion.

It is important to emphasize that the comments on the assessment of pilots' listening comprehension are related to the listening they perform in their communication with the ATCOs. In the workplace, pilots interact with a range of different professionals. Apart from ATCOs, they interact, for example, with flight attendants, flight dispatchers and aircraft maintenance personnel. Pilots also need to interact with each other, and, because of the increase in the number of flights with pilots that do not share the same first language, English has been increasingly used in the cockpit by pilots who are speakers of English as a second or foreign language. In this chapter, I refer to the language used by pilots and ATCOs in their communication as *aeronautical English* because, as Tosqui-Lucks and Prado (2020) explained, the term that has been traditionally used, *aviation English*, refers to a broader and more general context. According to them, "aviation English consists of the language used by all professionals in the aviation industry, such as mechanics, meteorologists, pilots and controllers" (p. 3).

It is also important to note that, although according to ICAO's policy, pilots and ATCOs who are native speakers of English do not need to be formally evaluated, research has shown that being proficient in conversational English is not the same as being a proficient user of aeronautical English (TRIPPE, 2018, 2019). Estival et al. (2016, p. 199) claimed that "pilots who are native English speakers commit, in some cases, as many communication errors as English as a second language pilots". As Read and Knoch (2009) argued, the ICAO LPRs have given "native-speaking aviation personnel no incentive to develop their communicative competence in ELF [English as a lingua franca] terms" (p. 21.7). For Douglas (2014), pilots and ATCOs who are native speakers of English should be assessed for their communication ability, and this assessment should include linguistic awareness and the "abilities to accommodate their use of English in the context of intercultural communication" (p. 2).

## 2. THE CONSTRUCT OF LISTENING

According to Buck (2001), defining the construct is a two-stage

process:

> Firstly, we define it on a theoretical or conceptual level, and then secondly, we operationalise that through the texts we select, and the tasks we ask our listeners to perform. The conceptualisation of our listening construct will be based on both our theoretical understanding of listening comprehension, and from our knowledge of the target-language use situation. The operationalisation of the construct will be based on our knowledge and experience as test developers. (BUCK, 2001, p. 94)

Then, the first step we should follow if we want to define a listening construct is to try to understand how the complex process of listening works. As Green (2017) pointed out, "it is essential that test developers spend quality time thinking about what the complete listening process involves before they embark on any task development work" (p. 1). Thus, in this section I start by presenting some characteristics of the listening skill on the conceptual level. Then, I explore issues related to the definition of the listening construct on the operational level. While discussing these topics, I include some considerations related to the assessment of pilots' listening comprehension.

It is important to point out that, unfortunately, "very little is written in the language assessment literature on the specific constructs, or abilities, that underlie listening, on how to go about designing listening assessment procedures, on how to validate and evaluate listening tests" (ALDERSON; BACHMAN, 2001, p. x). Harding (2015) also highlighted that listening is "still a very under-represented skill" (p. 123).

### 2.1. What does listening consist of?

Language proficiency is traditionally understood as composed of four main language skills: writing, reading, speaking, and listening. Listening seems to be the skill that people spend most time using, about 45% of the total time of communication (FEYTEN, 1991, as cited by BUCK, 2001). Both reading and listening cannot be assessed directly, as they happen inside the mind of the listener (FIELD, 2019). However, "listening," as Lynch and Mendelsohn (2010) pointed out, "is not merely an auditory version of reading" (p.180). We can no longer view listening as a passive or receptive skill because the successful listener plays an active role in understanding what was said. Anderson and Lynch (1988) argued that "understanding is not something that happens because of what a speaker says: the listener has a crucial part to play in the process, by activating various types of knowledge, and by applying what he knows to what he hears and trying to understand what the speaker means" (p. 6).

Listeners are not empty containers in which the information is

poured. They interpret the information they are receiving according to their individual characteristics, their background knowledge (knowledge about the topic and about the world), the context, and other non-linguistic variables (BUCK, 2001). Buck (2001, p. 8) explained that "when we listen, we use our background knowledge of the world to set up expectations, and then use those expectations to help us comprehend what we hear". Those expectations might be different among listeners, as well as their motives for listening. Thus, listening is an individual process: different people have different interests and different needs. They "make different inferences, and they have different interpretations of the texts they hear" (BUCK, 2001, p. 29).

Understanding the characteristics of the spoken text which are different from written texts help us have a clearer idea of the listening construct. One characteristic of spoken text is that "speech is encoded in the form of sound" (BUCK, 2001, p. 4). There is no blank space or gaps between words in spoken language as there is in written texts. As Field (2019, p.11) explained, "the listener is presented with a string of syllables and has to work out where, within that string, one word ends and the next begins". This process is called lexical segmentation. Also, the acoustic signal that listeners listen to may vary considerably due to, for instance, phonological modification, accent, stress and intonation.

Another characteristic of speech that differentiates it from written language is that "it is linear and takes place in real time, with no chance of review" (BUCK, 2001, p. 4). However, it is not always true that listeners have no chance of review. Nowadays, TV programs, for example, can be easily recorded or watched online, where listeners have the chance to listen again whenever they misunderstand something. Pilots are also encouraged to ask ATCOs to say again whenever they need clarification. Additionally, research has shown that learners can be taught to apply some strategic resources which can help them to become more effective listeners (O'MALLEY et al., 1989). Buck also argued that the speaker determines the speed of the text (which is usually fast, about three words per second), and that speakers often need to rely a lot on their memory. For this reason, he argued that processing needs to be automatic (a fast, effortless and unconscious process) rather than controlled (a conscious process which requires attention).

However, it is important to note that, nowadays, there are situations in which the listener determines the speed of the text (on YouTube, for instance, the speed of the video can be adjusted - it can be played at one quarter of the normal rate up to twice the normal rate). Another characteristic that differentiates spoken from written texts is that speech "is linguistically different from written language" (BUCK, 2001, p. 4). Spoken texts are usually unplanned; sentences are not clearly articulated. Speech usually consists of less complex idea units; vocabulary and grammar in spoken texts are usually simpler (although the use of idioms might make it more difficult for listeners) and less formal (grammatical structures might even be incorrect). Hesitations,

false starts and restatements are frequent. For all these reasons, Buck argued that testing listening is much more challenging than testing reading.

It is important to point out the difference between listening and hearing. While the verb *to hear* can be understood as "to receive or become conscious of a sound using your ears" (CAMBRIDGE DICTIONARY, n.d., Definition 1), the verb *to listen* is defined as "to give attention to someone or something in order to hear him, her, or it" (CAMBRIDGE DICTIONARY, n.d., Definition 2). A person could easily hear without listening, but never listen without hearing. Hearing is a precursor for listening and provides a basis for it (ROST, 2016). Although both hearing and listening involve physiological and neurological processes, listening is more intentional and involves a desire to understand what is being heard. This process involves both linguistic and non-linguistic knowledge (BUCK, 2001).

Linguistic knowledge includes phonology, lexis, syntax, semantics, and discourse structure. Buck explained that, although people tend to think that processing different kinds of knowledge occurs in a sequence that goes from the smallest sound segments (phonemes) to consecutive higher stages (lexis, syntax, and so on), it does not. "Listening comprehension", as he states, "is a top-down process in the sense that the various types of knowledge involved in understanding language are not applied in any fixed order – they can be used in any order, or even simultaneously, and they are capable of interacting and influencing each other" (p. 3).

Non-linguistic knowledge refers to "knowledge about the topic, about the context, and general knowledge about the world and how it works" (BUCK, 2001, p. 2). When the listener knows the topic of the spoken text, they can use this knowledge to interpret what has been said; they can use their world knowledge in order to make inferences. Buck drew attention to the fact that the listening process is inferential and that background knowledge is important to listening comprehension:

> If the listener shares the same knowledge as the speaker, much of what is being said can be understood by means of inferences based on shared background knowledge. However, if the listener has no knowledge relevant to the particular events being described in the text, then it will be more difficult to make inferences, and comprehension will be more dependent on interpreting the linguistic information. (BUCK, 2001, p. 20)

The context in which the communication takes place is also very important. There are different types of contexts. The context that is set by the text is referred to by psycholinguists as *the co-text* (BUCK, 2001). Sociolinguists consider *the context of the situation* in which the communication occurs to be very important. Another type of context that needs to be taken

into consideration is the *cognitive environment*. As listening comprehension happens in the mind of the listener, it is a cognitive process. According to Buck, "the context of interpretation is the cognitive environment of the listener" (p. 29), and it includes all the other contexts. For him, "it is the one that has the strongest influence on comprehension" (p. 21).

Furthermore, in order to better understand the listening construct, it is important to comprehend the difference between declarative knowledge and procedural knowledge (BUCK, 2001). Declarative knowledge is knowing something (e.g., knowing a grammatical rule), whereas procedural knowledge is knowing how to do something (e.g., knowing how to apply that grammatical rule). What seems to be important for listening is procedural knowledge, and that is what language testers should focus on (BUCK, 2001).

For listeners to understand a word, they have to access their mental lexicon to recognize the word and understand its meaning (BUCK, 2001). The acoustic information and the knowledge of the context are two kinds of information that are used in order to understand the word and its meaning. However, words are not usually understood in isolation, but as part of an idea unit, which may be understood as "short phrases or clauses … strung together in a rather loose way, often connected more by the coherence of the ideas than by any formal grammatical relationship" (p. 9). Parsing is an important concept in this context. It involves establishing the relationship between the words and the utterances, with the help of syntactic and semantic clues. For this reason, as Buck (2001, p. 17) pointed out, "idea units are hardest to process when both the semantics and the syntax are challenging". Nevertheless, listeners need not only to process idea units, but also, and very importantly, they need to process much larger linguistic units: they need to process connected discourse. At the discourse level, cohesion is an important variable that needs to be addressed by test developers. Understanding ideas connected by connectors, and determining what other cohesive devices (e.g., definite articles and pronouns) refer to is crucial (BUCK, 2001; FIELD, 2020).

The listening situation in which the listening takes place may also impact the listening process (BUCK, 2001). A communication between pilots and ATCOs, for example, is likely about traffic instructions, clearances, information about weather, airport, and so on. The listener's role may be collaborative or non-collaborative. Non-collaborative listening requires only understanding what has been said, whereas collaborative listening requires "making appropriate requests for clarification, back-channelling, making responses to interactional language, or taking responsibility for organising turn-taking" (BUCK, 2001, p. 12). These skills are not usually considered to be listening skills. However, some listening situations surely make these kinds of demand on the listeners. Pilots most of the time need to be collaborative listeners, as they need, for example, to repeat the instructions they were given (read-back), and to ask for clarification whenever they do not understand what they heard. However, sometimes they also need to listen to recordings

(e.g., Automatic Terminal Information Service – ATIS). In cases like this, the recording keeps constantly playing, so they can hear it as many times they need.

Moreover, it is also important to consider the function of the interaction, which can be transactional, where the purpose is to communicate important information that needs to be understood by the listener (e.g., ATCO's instructions), and interactional, where the purpose is just to interact socially (e.g., small talk). As Buck (2001) pointed out, "in most listening situations, there is both transactional and interactional language use, although one will usually be more dominant in any particular situation" (p. 14). In pilot/ATCO's communication, any kind of unnecessary information is discouraged (e.g., greetings); transactional language is dominant. It is important to point out that the term interactional cannot be misinterpreted, as being able to interact effectively is very important in the context of pilot/ATCO communication. As a matter of fact, as explained earlier in this chapter, interactions is one of the six categories included in the ICAO rating scale.

An important theoretical model of the listening process was developed by Nagle and Sanders (1986). According to this adult listening model, the sensory or echoic memory captures the acoustic input and transfers it to the working memory, where it is processed by an executive processor, and then passed to the long-term memory, where it is synthesised with the implicit and the explicit linguistic knowledge, as well as with other knowledge. For Nagle and Sanders, "comprehension becomes more efficient as knowledge increases, processes become automatic, and experience confirms the reliability of the learner's decoding, inferring, and predicting" (p.22). According to Buck (2001), although this process may be considered oversimplified, it does include some important elements. However, as Buck pointed out, it does not explain how meaning is represented in the memory. Meaning, as he explains, may be built up as propositions or mental models. The latter is the most common. Buck (2001, p. 29) argued that "mental models constitute a very important part of the cognitive environment and help determine how later parts of the text will be interpreted".

Another important model of the listening process was presented by Field (2019). In his simplified cognitive model, the listening process consists of five different phases (or operations). The first phase is input decoding, when listeners "relate the sensations reaching their ears to the sounds of the target language" (p. 10). This decoding might be at the phoneme or syllable level, but it is important to emphasize that "larger units can influence the recognition of smaller ones" (p. 10). The next stage is the lexical search, when listeners put together the sounds they hear to form words. Then comes the parsing operation, when "the listener has to assemble a group of words into a syntactic pattern" (p. 11). As listening occurs in real time, we can say that it is a tentative process, as listeners need to constantly revise their understanding. These three initial phases are perceptual, whereas the last two (meaning

construction and discourse construction) are considered conceptual, as they do not involve language. Meaning construction involves interpreting the information which was obtained according to the listener's knowledge and to the context. It is in the last operation, the discourse construction, that the listener puts everything together by connecting the new information to what they have previously heard.

A number of scholars have developed taxonomies to try to describe the sub-skills that are involved in the listening process (e.g., AITKEN, 1978; CARROLL, 1972; RICHARDS, 1983; VALETTE, 1977). Most of these taxonomies were mainly based on what Buck (2001, p.57) called "theoretical speculation" , whereas others were based on empirical research. Although these taxonomies may not be a thorough list of the sub-skills required in the listening process, they can be useful because they show some of its very important components and they may help test developers think of what they should include in their tests of listening comprehension.

In short, these taxonomies tell us that the listening construct is composed of a number of sub-components (listening is multidimensional) and that both the ability to extract the basic linguistic information and the ability to understand that information in a wider communicative context should be tested. Linguistic processing (phonology, stress, intonation, lexis, syntax, semantics and discourse structure) needs to be assessed, as well as the interpretation of the co-text, the context of situation and world knowledge (e.g., summarizing, making inferences, understanding sociolinguistic implications, understanding the speaker's communicative purpose). However, these taxonomies "give no indication of the relative importance of individual skills, nor do they provide guidance on how they should be sampled for test construction" (BUCK, 2001, p. 59). In the next section, after having presented the main features of listening, I will talk about some issues regarding the assessment of this skill.

### 2.2. The assessment of listening

As Wagner (2014, p.1) pointed out, "the assessment of listening has historically been somewhat neglected and even overlooked in the language literature". The three main approaches to language testing can help us better understand how the construct of listening has developed. They are: the discrete-point approach, the integrative testing approach, and the communicative testing approach (BUCK, 2001). The discrete-point approach is influenced by the behaviourist theory. According to this approach, the units of linguistic knowledge can be identified, isolated and tested separately. Lado (1961) was the main supporter of this approach. He believed that the assessment of listening should focus on the recognition of elements of oral language, including segmental phonemes, stress, intonation, grammar and vocabulary. The theoretical view of listening that is implicit in this approach, as Buck (2001, p.66) argued, is that comprehension is "understanding language on a local, literal level, and meaning is treated as something that is contained

within the text, and the listeners' task is to get it out".

The integrative testing approach, advocated by Oller (1979), highlights the importance of knowing how to use the language. This approach "puts the emphasis on assessing the processing of language as opposed to assessing knowledge about the elements of the language" (BUCK, 2001, p. 67). Somewhat similar to the integrative testing approach, the communicative testing approach also recognizes the importance of language use. However, the focus shifted from the importance of testing how to use the language to the importance of testing the use of language for the purpose of communication. As Buck (2001, p. 83) explained, the idea was that "testers should be less concerned with how much a person knows about the language, and more about whether they can use it to communicate effectively".

An important characteristic of communicative testing is authenticity of texts and tasks (BUCK, 2001). Although some authors do not differentiate authentic texts from genuine texts, the difference between the two needs to be considered. Genuine texts are taken from the real world, and present some features of spoken language, such as assimilation, elision, hesitations, and reformulations. For some authors (e.g., FIELD, 2019), the use of genuine texts in listening tests is ideal.

However, using genuine texts also presents some disadvantages; for example, difficulty with copyright, sound quality problems, or a narrow range of texts types to choose from (ROSSI; BRUNFAUT, 2021). Genuine texts may be authentic if they reflect real life purposes. However, genuineness does not necessarily imply authenticity. Genuine texts are not authentic if they do not reflect real life purposes. Authentic texts might not be genuine; they can be created or adapted texts. What is important for test development is that the texts correspond to the target language use (TLU), no matter where they came from. TLU tasks can be defined as "a set of specific language use tasks that the test taker is likely to encounter outside of the test itself, and to which we want our inferences about language ability to generalize" (BACHMAN; PALMER, 1996, p. 44). For a test task to be authentic, the relationship test takers have with the text needs to reflect the TLU situation. As Rossi and Brunfaut (2021, p.17) pointed out, "while genuine texts certainly have their place in assessing listening, they might not always be suitable for item generation … since they might become inauthentic when taken out of their original context and might not allow for adequate language sampling to generalise test results to the TLU domain". Authenticity has been the subject of much debate in the last two decades. As Ockey and Wagner (2018) pointed out, while some scholars fully embrace it, others are very reluctant to support it.

Although authentic tests may be more complicated to develop and administer, I believe that the use of more authentic tasks and texts can help to better assess the construct that we want to measure. As Ockey and Wagner (2018, p.3) explained, "by using test tasks that have many of the same characteristics as the target language use task, test users should be able to

make more valid inferences about the test takers' ability beyond the testing context". However, test developers need to keep in mind that authenticity does not automatically imply construct validity (FULCHER; DAVIDSON, 2007).

The communicative testing approach has had a profound influence on language testing, since its beginning until today. By understanding these three approaches, we can see "the development of an expanding view of the listening construct: from the narrow view of listening as recognizing elements, through listening as language processing, to the more current idea of listening as interpreting meaning in terms of a communicative context" (BUCK, 2001, p. 93). A brief explanation about the development of the assessment of listening by Cambridge ESOL may illustrate how the assessment of listening has developed: Cambridge ESOL, one of the major English test providers in the world, has been assessing listening since 1913, when its first English examination was launched (MILANOVIC; WEIR, 2013). Back then, listening was assessed through a dictation, part of the oral paper, as well as through a conversation, which was part of the same paper.

Additionally, there was a written paper on phonetics. It was a very demanding test. Since then, the way Cambridge test developers understand the construct of listening has developed significantly. In the 1970s, listening started to be tested in a specific listening comprehension test. Listening was only assessed in isolation, not as part of an interaction. At that time, test-takers had to listen to literary passages being read in the examination room "requiring not much more than comprehension of factual detail and utterance-level processing" (MILANOVIC; WEIR, 2013, p. xi). This was, of course, problematic for many reasons (e.g., issues with test standardization). With the advent of communicative approaches to language teaching and testing in the 1970s, tasks started to reflect more the real-world tasks.

As Field (2019, p.1) argued, "testing second language listening proficiency validly and reliably has always posed a challenge". The challenges faced by test developers when writing test specifications for listening tests include deciding whether the candidates will be allowed to listen to the text more than once (TAYLOR; GERANPAYEH, 2011), issues related to task authenticity (BRINDLEY, 1998; LYNCH; MENDELSOHN, 2010; WAGNER, 2014) and to memory (WU, 1998). It is also important to consider the complexities of cognitive processes involved in listening so that "the cognitive processing activated in the test taker by a test task corresponds as closely as possible to what they would expect to do in the (…) listening context" (TAYLOR; GERANPAYEH, 2011, p. 96).

Listening test developers must try to understand very well what language they are targeting so they can develop a test which is similar and representative of that domain (BACHMAN; PALMER, 1996; WAGNER, 2014). Identifying the characteristics of the specific situation in which the language is being used is of utmost importance. They need to think carefully about the purpose of the test and the specific target language situation in order to make

informed decisions. For example, if the TLU domain involves listening and speaking together, assessing listening at the same time as speaking may be necessary. The recognition of the importance of integrative testing questions the aforementioned traditional four skills approach, which assesses reading, writing, speaking and listening independently (OCKEY; WAGNER, 2018).

Assessing listening together with speaking may be challenging, "but it is a necessary and advisable goal" (WAGNER, 2014, p. 6). Field (2020) also highlighted the importance of assessing interactive listening. He argued that the listening processes that are employed by listeners in an interactive conversation might be different from the processes that occur when listening in isolation, and that interactive listening is more cognitively demanding than listening to a recording. Moreover, as Lam (2021, p.20) argued, interactive listening is "fundamentally social" and "needs to be assessed outside the boundaries of (receptive) listening tests".

In the context of pilot/ATCO communication, most of the listening performed by pilots is in an interaction with the ATCO, not listening to recordings (e.g., ATIS). Therefore, I believe that in this context, for both pilots and ATCOs, it is extremely important to assess integrative listening. As Green (2017, p.8) argued, "air traffic controllers (ATC) need to be able to demonstrate not only good listening skills but also the ability to interact when communicating with pilots or fellow ATC colleagues … Therefore, an interactional listening task is likely to have much more validity". The ICAO LPR test design criteria (ICAEA, 2021) highlight the importance of assessing listening in isolation. They say that "it is possible for tests to also evaluate comprehension subjectively in an interactive context in addition to having a dedicated listening test section, but not to the exclusion of including dedicated listening comprehension test sections" (ICAEA, 2021). However, I believe they emphasize that listening should be tested separately from speaking, in a test that is entirely dedicated to the assessment of listening, without drawing much attention to the importance of the assessment of integrative listening. In my opinion, this should have been highlighted, not just as a possibility, but as a necessity.

## 3. FURTHER IMPLICATIONS FOR THE ASSESSMENT OF PILOTS' LISTENING IN THE CONTEXT OF RADIOTELEPHONY COMMUNICATIONS

As Green (2017, p. 29) pointed out, "the definition of what listening is will differ according to the purpose of the test and also the target test population". Radiotelephony communications between pilots and ATCOs are very different from normal daily conversations. This kind of communication "represents a very specialized and socially significant form of discourse" (READ; KNOCH, 2009, p. 21.3). These communications consist mostly of standard phraseology, which is a sub-language for routine situations, such as orders, requests, advice, permissions, approvals, etc. It was created as an attempt to standardize the language use in pilot/ATCO radiotelephony communications in an effort to avoid misunderstandings. Whenever there is

no standard phraseology to convey meaning, pilots and ATCs rely on plain English, which was defined by ICAO as "the spontaneous, creative and non-coded use of a given natural language" (ICAO, 2010, p. x).

An important characteristic that differentiates listening to pilot/ATCO communications from other types of listening is that the topics are related to aircraft operation. Although these topics are limited to situations that are relevant to the operation of the aircraft, its range can vary considerably. For a list of communicative language functions, events, domains, subdomains and tasks associated with pilots/ATCOs communications, test developers may refer to Appendix B of ICAO's DOC 9835 "Manual on the implementation of ICAO Language Proficiency Requirements" (ICAO, 2010), which was based on research at the Direction Générale de l'Aviation Civile (France) as well as on Ramos et al. (1999). However, it is important to point out that this list has been considered vague and insufficient to be used in test development (ARAGÃO; SCARAMUCCI, 2020). Aragão and Scaramucci suggest that this list needs to be informed and validated by subject matter experts so that it can truly reflect the pilot/ATCO work environment.

Some features of pilot/ATCO communications may help their communication to be more effective, while others may make it more challenging. The features that may contribute to successful communications include: absence of overlapping (as pilots and ATCOs talk via radio), the fact that messages should be grammatically simple, meaningful and brief (PRINZO; BRITTON, 1993), and the possibility to ask the speaker to repeat or rephrase the message whenever necessary. In pilot/ATCO communications, it is advisable to ask for clarification, differently from the listening situation that Buck (2001) and Lynch and Mendelsohn (2010) described, where listeners usually have just one opportunity to listen to an input. In this context, asking for repetition on clarification is a matter of safety.

Although "these extra communications increase radio frequency congestion and reduce the efficiency of information transfer" (PRINZO; BRITTON, 1993, p.1), checking information, seeking confirmation, and requesting clarification need to be encouraged in both teaching and testing. Allowing a test taker pilot to ask for clarification, or to listen to the input again, is, in my opinion, a good practice, as it corresponds to their TLU domain.

Some features of aeronautical English that may contribute to comprehension problems are:

*Absence of visual support* – Communications between pilots and ATCOs is a voice-only interaction, with no visual references. In other types of interactions, messages are usually conveyed not only by the sound, but also by the use of non-verbal signals (BUCK, 2001; TANENHAUS et al., 1995; WAGNER, 2013). As visual support may help listeners understand spoken texts, its lack may be considered a difficulty factor in the interaction between pilot and ATCOs. As they are not able to see each other, test tasks to assess pilots' listening should not include audiovisual texts of ATCOs. However, pilots

also talk to ATCO when they are at airports, looking at the taxiways, runways, airport signs, other aircraft, etc. Therefore, test developers may include images that help to contextualize the task (e.g., a controller may ask a pilot to check if he can see oil leaking from another aircraft that is close by, so the task may include a picture of the aircraft, as seen from the test taker's cockpit perspective).

*Different accents* – Accent plays an important role in understanding spoken texts. As pointed out by Buck (2001), "when listeners hear an unfamiliar accent (…) this can cause problems and may disrupt the whole comprehension process. An unfamiliar accent can make comprehension almost impossible for the listener" (p.35). Research has shown that even native speakers process information slower when listening to unfamiliar native accents under adverse listening conditions (ADANK et al., 2009). Pilots seem to spend more time listening to ATCOs who are non-native speakers of English than to native speakers (GARCIA; FOX, 2020; ICAO, 2010). They are exposed to a wide variety of familiar and unfamiliar accents. Although Level 4 pilots and ATCOs are supposed to assume a dialect and/or accent which is intelligible to the aeronautical community, their accent might sometimes interfere with ease of understanding (see descriptors for pronunciation in the ICAO rating scale). As listening to unfamiliar accents is an element that seem to contribute to listening comprehension difficulties in pilot/ATCO communications (GARCIA; FOX, 2020), the ability to understand multiple speech varieties should be part of the listening construct of pilots/ATCOs' aeronautical English tests. Harding (2018) also argued that in some assessment constructs, such as in the air traffic control (ATC) domain, "the ability to cope with an unfamiliar accent could be conceptualized as a central part of the listening construct" (p. 97).

*Emotional stress or increased mental workload* - As there is standard phraseology set for all routine situations in pilot/ATC radiotelephony communications, the need to use plain English arises usually in non-routine, abnormal or unexpected situations (e.g., very bad weather, heavy workload, time pressure and mechanical failure). When dealing with these kinds of situations, pilots and ATCOs may get emotionally stressed (ALDERSON, 2009), and this stress may compromise their linguistic performance. Research has shown that increased workload may affect pilot's accuracy when reading back ATCO's transmissions (ESTIVAL; MOLESWORTH, 2016).

*Problems related to the environment and the channel* – Other elements that may influence listening comprehension difficulty in pilot/ATC radiotelephony communications are related to the environment and the channel. Cockpits are noisy environments, especially because of the loud noise produced by the engines (MOLESWORTH, 2016). In addition, radio transmission is frequently poor. Research has shown that pilots think it is challenging to interact with the ATCOs via radio, as many times they need to use clarification strategies, not because of linguistic problems, but because of the bad quality of the transmission (ESTIVAL; MOLESWORTH,

2009). However, this seems to be less of a problem nowadays because of the improvement in the quality of the transmissions (GARCIA; FOX, 2020).

*Speech rate* - Speech rate is also a factor that might increase difficulty for pilots and ATCs to understand each other. Buck (2001) pointed out that research indicates that "the faster the speech, the more difficult it is to comprehend" (p. 38). Although ICAO recommends ATCOs to speak at a rate of 100 words per minute, research has shown that they speak at a much faster rate (GARCIA; FOX, 2020; PRINZO; BRITTON, 1993).

*Threats of intercultural factors* – The intercultural context in which communications between pilots and ATCOs take place may contribute to misunderstandings. Factors related to power distance, communication styles and non- collaborative behaviour, among others, may negatively affect the effectiveness of communications (MONTEIRO, 2019).

*Unfamiliar topics* - Aviation professionals may come across a wide variety of unexpected or unfamiliar topics and this might have a negative impact on their ability to understand what they hear. Standardized phraseology consists of a reduced vocabulary of around 400 words (ICAO, 2010). However, as previously discussed, pilots and ATCs need to use plain English to deal with abnormal and emergency situations. In this case, the range of vocabulary that may be used is extensive. Research has shown that topic familiarity impacts language listening comprehension, regardless of the listener's proficiency level (SCHMIDT-RINEHART, 1994). It is also worth noting that, according to Révész and Brunfaut (2013), lexical complexity has a significant impact on listening difficulty. They argued that a low proportion of function words, a high frequency of academic words, greater lexical density and wider lexical diversity contribute to the need of an increased processing effort to understand speech.

Understanding these features of radiotelephony communications may help test developers define the listening test construct. These features may be included in the test tasks so that they reflect the TLU. For example, test developers need to consider the speech rate of the spoken texts, the range of accents to be included, and also the possibility to add aircraft background noise to the recordings performed by pilots and ATC room background noise to recordings of ATCOs (some interference may be included too). As Douglas (2000) argued, tasks of language for specific purposes (LSP) tests need to be based on the characteristics of the TLU domain. According to him, "it is this analysis of target language use task characteristics which will allow us to make inferences about language ability in the specific purpose domain" (p. 14).

Miscommunication in ATC might occur due to problems related to the speaker, problems related to the channel, and/or problems related to the listener (ICAO, 2010). The problems related to the speaker include propositional failure (e.g., inaccurate assumptions about shared background knowledge with the listener), encoding failure (e.g., wrong choice of

vocabulary or grammar mistakes), or delivery failure (e.g., pronunciation problems or inappropriate speech rate). The problems related to the listener can be due to decoding failure (e.g., language, attention, memory problems), to interpretation failure, which can be a consequence of the speaker encoding problems, and to feedback failure.

Cushing (1994) classified pilot/ATCO communication problems into language-based problems and problems not based on language. For him, the communication problems based on language which he identified were: problems of language (e.g., ambiguity, homophony, intonation), problems of reference (e.g., uncertain reference, uncertain addressee), problems of inference (e.g., implicit inference, lexical inference, unfamiliar terminology, false assumptions), and problems involving repetition (e.g., partial readbacks). The communication problems not based on language which he lists are: problems with numbers, problems with radio, problems of compliance, and other general problems.

As forementioned, test item writers also need to take into consideration issues related to memory. Human memory plays an important role in comprehending what we hear (ORTEGA, 2009; WU, 1998). As previously discussed in this chapter, human working memory capacity is limited and "when the task demands are high, as in a test of listening comprehension, often because of both storage and processing needs, the computation will slow down and some partial results from working memory processing may be forgotten" (WU, 1998, p. 23). According to Clark et al. (1990), for example, when pilots' working memory needs to process transactions with a higher number of speech acts (phrases or clauses), there is a higher probability of misunderstanding. As Buck (2001) pointed out, the limit to the capacity of the working memory "seems to be restricted to about seven units, or chunks of information" (p. 77). Garcia and Fox (2020)'s study suggested that the average number of pieces of information in ATCO's messages is three or four, but as real-world transmissions may be longer than that, some test recordings might also include more items. If the test task demands too much of the test takers' memory, the inferences we can make about the test takers' listening ability might not reflect their real ability. Therefore, it is important that aeronautical English test developers take into consideration the limitations of human memory in order to ensure greater construct validity.

Another important issue that test developers need to consider is whether test takers should be allowed to take notes while listening to the spoken text. Pilots are used to taking notes of ATCO's instructions, so it is natural for them to want to take notes. As discussed by Hughes (2003, p. 167), "where the ability to take notes while listening to, say, a lecture is in question, this activity can be quite realistically replicated in the testing situation". From my own experience applying the *Santos Dumont English Assessment* (SDEA), the Brazilian national examination for testing pilots' English proficiency, I can say that pilots get stressed and anxious if they are not allowed to take any

notes during the test. Pilots were not allowed to take notes during SDEA from 2007 to 2010. They used to complain that the test was assessing their memory capacity rather than their listening skills. Since 2010, they have been allowed to take notes while listening to the audio texts and this change in the testing procedures was very appreciated by the test takers.

It is important to note that, although plain English should only be used by pilots and ATCOs when the standard phraseology does not suffice, it is frequently used when phraseology would be enough (KIM; ELDER, 2009; HOWARD, 2008; MORROW et al., 1994). As a matter of fact, research has indicated that 70% of the communication between pilots and ATCOs does not comply with the prescribed phraseology (MELL, 1992, as cited in ICAO, 2010). According to ICAO (2010), "users, particularly expert speakers of a language, for all sorts of respectable reasons such as pressure of work, and less respectable reasons such as carelessness and insensitivity, fail to adhere to prescribed ICAO standardized phraseology, thereby creating possibilities for misunderstanding in a busy international environment" (p. 3-5).

Hamzah and Fook Fei's study (2018) found that one of the main factors that causes miscommunication between pilots and ATCOs is incorrect utilization of phraseology. Test developers need to face the challenge whether to include in their listening tests only texts in which phraseology is used appropriately and in accordance with the ICAO standardized phraseology, as recommended by ICAO (2010), or to include texts with certain deviations from phraseology (e.g., "thirty minutes" instead of "three zero minutes" or "point" instead of "decimal" for frequencies). This online forum comment can illustrate this issue:

> Get rid of the word "decimal" in ATC frequency changes. ATC will use phrases like contact ground "point" 75 or contact tower on 118 "point" 3. Pilots don't even use the "point" for most freq changes and just say something like 24 4 for 124.4. Tower controllers will usually just say contact departure expecting you to know or they will say contact departure on 124 "point" 7. The "Point" being is that if you listen on any freqs on LiveATC you will not hear many if at all any controllers or pilots use the word "decimal". It takes up too much bandwidth. And trying to remember the freq numbers when they throw in that 3-syllable word between them is much more difficult. So Asobo wanted to make the scenery real why not make some of the ATC a little more real? In all of my flying years I have rarely if ever heard or used that word. (WHATACROCKTHIS, 2020)

I particularly believe that if the purpose of the test is to assess the ability to understand real-life communications, unstandardized phraseology may be included in the test, but care needs to be taken. The test rubrics must be clear

in relation to what is going to be tested and why, as well as what to expect from the test takers. This means that if the recordings include communications that do not comply with ICAO standardized phraseology, test takers should be made aware that they might encounter non-standardized communications in the test because unfortunately this is what they should expect to hear in real-life ATCO communications. They should also be encouraged to use standardized phraseology when responding to the test tasks. It is important to emphasize that pilots and ATCOs need to be trained to use standardized phraseology as much as possible in order to enhance safety.

## 4. CONCLUSION

As Field (2019) argued, having extensive information about the nature of the skill we want to assess "enables us to shape the material and tasks that we devise so as to ensure that they truly measure competence in the skill" (FIELD, 2019, p. 7). There is still a lot to be known about the nature of listening and about its operationalization in language tests, especially in the context of pilot/ATCO communications. Nevertheless, it is clear that for the assessment of languages for professional purposes, "the theoretical construct and its operationalization should, at least in part, be derived from or be relevant to the TLU domain" (KNOCH; MACQUEEN, 2020, p. 190).

To conclude, listening is complex, especially in a second or foreign language. The assessment of listening is a challenging endeavour. Test developers need to make the best they can to develop tests and create tasks that truly measure the construct that they seek to assess, especially in high stakes testing contexts such as the pilot/ATCO's communications.

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# CHAPTER 12

# THE ASSESSMENT OF ENGLISH IN AERONAUTICAL RADIOTELEPHONY COMMUNICATIONS: A MIXED METHODS STUDY

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**ABSTRACT –** The high-stakes context of international radiotelephony (RT) communication, in which pilots and air traffic controllers (ATCOs) use aviation English (AE) as a lingua franca, requires a robust testing policy that is clear and fair to all stakeholders. The ICAO Language Proficiency Requirements have been criticized for their lack of fit with pilots' and ATCOs' real-life communicative needs, for both native and non-native speakers of English (Douglas, 2014; Kim, 2012). This paper reports on a multiphase mixed methods study that investigated the proficiency construct (awareness, knowledge, skills, and attitudes) in pilot-ATCO intercultural RT, following Fulcher and Davidson's (2007) test development framework. Drawing on theoretical and empirical studies in the domains of Aviation English, English as a Lingua Franca, Intercultural awareness, and Interactional competence, the communicative demands of pilots and ATCOs involved in intercultural RT communications and how they can be specified within a construct framework and operationalized as test tasks were explored. Integration of findings underscored the value of a broader view of professional communicative competence for intercultural RT communication and the importance of giving voice to aviation stakeholders in all phases of the test development process.

**KEYWORDS:** Aviation English; Construct specification; English as a lingua franca, Intercultural awareness; Interactional competence.

## 1. INTRODUCTION

This chapter aims to provide an overview of my doctoral research, which was presented at the 8th GEIA Seminar, in November 2021. I conducted my research in Applied Linguistics and Discourse Studies at Carleton University, in Ottawa, Canada, under the supervision of Professor Janna Fox and got my PhD degree in 2019. The study is entitled *Reconsidering the measurement of proficiency in pilot and air traffic controller radiotelephony communication: From construct definition to task design* (MONTEIRO, 2019). My motivation to conduct research in the field of international radiotelephony (RT) communication

in aviation comes from my work experience in the language proficiency assessment of pilots, which is a high-stakes assessment for professional purposes, and my engagement in professional organizations and international research groups in this particular field.

The International Civil Aviation Organization (ICAO) established language proficiency requirements for personnel involved in international RT communication, specifically regarding the need to "demonstrate the ability to speak and understand the language used for radiotelephony communications" (ICAO, 2010, 4-4). The main actors in this multicultural workplace context are pilots and air traffic controllers (ATCOs) with distinct linguistic and cultural backgrounds who operate in busy airports and airspaces that demand expeditious communications, with no visual channel. They engage in tasks that require a great deal of coordination and cooperation within a complex, dynamic and highly context-dependent setting. On top of that, it's a high-risk environment, subject to poor acoustic conditions, but which requires knowledge, skills, and attitudes that go beyond language proficiency for safe outcomes.

But a question remains: is the ICAO language proficiency testing policy adequate to cope with the new dynamics brought by the growth of aviation worldwide, i.e., is it aligned with the communicative needs of pilots and ATCOs working within complex and multicultural contexts? First, we should note that the policy is still rooted in an "institutionalized conservatism" (HARDING; MCNAMARA, 2017, p. 575) in relation to native speakers' norms. As a result, the policy neither requires native or expert speakers of English to be formally assessed nor does it account for the use of Aviation English (AE) as a lingua franca.

Research has also shown that the testing policy lack of fit with pilots' and ATCOs' real-life communicative needs might lead to construct underrepresentation (DOUGLAS, 2014; KIM, 2012; KIM; ELDER, 2015), which may in turn: i) threaten the validity of inferences drawn from test scores; ii) have an impact on individuals, on teaching and learning activities and on testing policies and practices; and iii) bring about potentially deadly unintended consequences (MESSICK, 1989). As a result, this Language for Specific Purpose (LSP) assessment context calls for a robust testing policy that is clear and fair to all stakeholders. Added to that, a clearer definition of the aeronautical RT construct is of utmost importance, one that is aligned with current views of language use, with the multiple factors that impact RT communication, and also with stakeholders' perspectives.

Thus, the main objective of this study was not only to add to current discussions within the aviation industry on the ICAO testing policy, but also to contribute to the safety of pilot-ATCO intercultural communications through the exploration of the dimensions of awareness, knowledge, skills, and attitudes required for effective communication, relying on the perceptions of a range of international stakeholders. Additionally, this project aimed to

increase the validity of inferences drawn from the results of specific purpose aviation English tests through the design and pilot testing of new tasks that operationalize the identified RT construct.

## 2. LITERATURE REVIEW

An extensive literature review has been conducted aiming to explore what was already known about the research problem, namely the occupation-specific context of intercultural RT communications in aviation and its high-stakes testing. The review has been organized according to the three layers of the test development process, defined as "layers of architectural documentation" by Fulcher and Davidson (2009, p. 126). These layers can be represented in the form of an inverted pyramid, starting with *Models*, in the higher level, moving to *Frameworks*, and then to *Test Specifications*.

The authors' use of architecture as a metaphor for test development proved to be helpful in identifying the layers and sub-layers of architectural documentation that articulate design decisions. *Models,* as the authors define the first layer, provide "a theoretical overview of what we understand by what it means to know and use a language" (p. 126). The second layer, *Frameworks*, "lays out the constructs to be tested, selected from models, because they are shown to be relevant to the specific context in question, and useful in the decisions that need to be made" (p. 127). Finally, the third layer includes *Test Specifications*, "where we find the detail that is specific to a particular test for use in the context specified in the [construct] framework" (p. 128).

The existing relation of test purpose, test use and validity is highlighted by Fulcher and Davidson (2009, p. 140), who argue that "a critical component in any validity argument is the relationship between test purpose, test architecture, the claims that we wish to make about the meaning of test scores, and hence the use of the test for decision making". Therefore, it is important to note that the test development process is initiated by the mandate (e.g., testing policy), which "motivates the purpose of the test and provides parameters for the definition of useful constructs in the test" (CHENG; FOX, 2017, p. 110). Nonetheless, the entire process is located within a social and policy context, which may have "unanticipated social consequences" (MCNAMARA; ROEVER, 2006, p. 2), requiring the "values implicit in test constructs [to] be investigated and articulated … by considering the discourses within which language tests are located and have their meaning" (MCNAMARA, 2007, p. 137).

### 2.1. First layer

In the first layer – *Models* – a theoretical and empirical review of studies was conducted, to underpin the development of models of language use within the multicultural aviation workplace, beginning with policy documents, descriptions of the language used for RT communications and the multiple

factors that can impact the effectiveness of these exchanges over the radio. Apart from that, conceptual papers from different theoretical perspectives, such as English as a Lingua Franca (ELF), intercultural awareness/competence (ICA) and interactional competence (IC) were also reviewed, as other studies at their interface with Aviation English (AE). Figure 1 summarizes the main topics reviewed in this first layer.

**Figure 1:** Summary of the literature review: First layer – *Models*

- ✓ ICAO policies and manuals // Language used for radiotelephony communications
- ✓ Factors that can lead to misunderstandings
- ✓ Intercultural communications // National cultural dimensions
- ✓ Face-work, politeness, and impoliteness theories // Theories of cross-cultural communications
- ✓ **Intercultural awareness/competence (ICA)** (BAKER, 2011; BYRAM, 1997)
- ✓ **AE and ICA** (HELMREICH; MERRITT, 1998; HAZRATI, 2015; MONTEIRO, 2012, 2016)
- ✓ **English as a lingua franca (ELF)** (BAKER, 2017; JENKINS; COGO; DEWEY, 2011)
- ✓ **AE and ELF** (ESTIVAL; FARRIS, 2016; ICAO, 2010; KIM, 2012; KIM; ELDER, 2009)
- ✓ **Interactional competence (IC)** (KRAMSCH, 1986; HALL, 1999; YOUNG, 2011)
- ✓ **AE and IC** (DOUGLAS, 2014; ICAO, 2010; KIM, 2018; KIM; ELDER, 2009; READ; KNOCH, 2009)
- ✓ Models of communicative competence

Author, 2022

## 2.2. Second layer

The second layer – *Frameworks* – included a review of studies that inform the specification of a framework that maps the constructs to be measured, considered to be relevant to the target language use (TLU) domain and useful in the decisions that need to be made. In addition, in order to address the sub-layers of *Evidence models* and *Task models* (FULCHER; DAVIDSON, 2009), studies that refer to the operationalization of the construct and the design of test tasks based on tasks characteristics were also included in the review (see Figure 2).

**Figure 2:** Summary of the literature review: Second layer - *Frameworks*

- ✓ **Test mandate, test purpose and construct definition // Test architecture – layers and sub-layers**
- ✓ **Evidence Centred Design // Social dimensions of language tests**
- ✓ **Approaches to construct definition // Arguments for and implications of the assessment of ELF**
- ✓ **Indigenous assessment criteria** (e.g., ELDER et al., 2017; FOX; ARTEMEVA, 2017; JACOBY; MCNAMARA, 1999; KNOCH, 2014; O'HAGAN; PILL; ZHANG, 2016; PILL, 2016)
- ✓ **Operationalization of ELF construct** (HARDING & MCNAMARA, 2017)
- ✓ **Characteristics of test tasks and task design** (BACHMAN & PALMER, 1996; DOUGLAS, 2000)

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## 2.3.Third layer

In the third layer – *Test specifications* – a review of studies that provide the foundation to the design of test task specifications was carried out, including the ones that set the qualities of test usefulness and qualities

of good testing practice. Figure 3 summarizes the main topics and authors reviewed in this layer.

**Figure 3:** Summary of the literature review: third layer – *Test specifications*

| |
|---|
| ✓ **Task specifications** (e.g., DAVIDSON; FULCHER, 2012; DOUGLAS, 2000; FULCHER; DAVIDSON, 2007) |
| ✓ **Qualities of test usefulness** (BACHMAN; PALMER, 1996) |
| ✓ **Qualities of good testing practice** (DOUGLAS, 2000) |

Author, 2022

## 3. METHODOLOGY

The literature review sought to provide a firm foundation for the research design and a rationale for the research questions. As a result, responding to industry needs, this study extends previous research by addressing the following overarching research question: *What are the communicative demands of pilots and ATCOs involved in intercultural RT communications that go beyond language proficiency; how can they be specified within a construct framework and operationalized as test tasks?*

The need to explore the construct of pilots and ATCOs' international RT communications and its specification and operationalization in test design called for multiple phases under a unique methodological framework, which multiphase Mixed Methods (MM) designs provide. Therefore, considering the complex nature of the research problems identified, their intersection with various fields of inquiry, and the diverse context in which they are embedded, a multiphase MM investigation (Creswell & Plano Clark, 2011) was conducted, comprising three interrelated studies. It began with an exploration of the intercultural RT communication context (Phase 1 – MM study) in order to identify intercultural factors that may affect the way pilots and ATCOs interact in the English language and to verify the extent to which those factors impact on safety, based on pilots' and ATCOs' perceptions. Then, based on a review of theory and research (Phase 2 – QUAL study), the aim was to propose models of language use relevant to the occupational domain of pilots and ATCOs, followed by the specification of the construct from the models to a framework, and giving voice to aviation stakeholders to identify the key construct components.

In order to verify the operationalization of what was considered relevant for inclusion in an aviation English test in terms of language and communication, draft tasks were designed which might be used in the assessment of pilots' English proficiency in this occupational context. Later, two tasks were pilot tested (Phase 3 – MM study) with Aviation English Testing Experts (AETEs), including interlocutors and raters with both language and operational backgrounds. This multiphase MM study was exploratory in nature; however, the QUAL and quan strands were conducted sequentially but also concurrently across phases and within phases, characterizing the "range of

possibilities for the application of mixed methods [which is] well suited to meet the complexities of test development" (ZIEGLER & KANG, 2016, p. 77).

The integration of the three studies is further detailed in the procedural diagram shown in the Appendix. It illustrates: i) the stages of data collection and analysis (yellow boxes for qualitative strands and blue boxes for the quantitative ones); ii) the mixing, merging or integration of results that occurred within each phase and between phases, leading to a final integration and interpretation of data at the end (green ovals); iii) three more specific research questions that guided each phase of the study; and iv) the time frames in which each phase did occur.

## 4. PHASE 1

### 4.1. Overview

Phase 1 began with a qualitative exploration of intercultural factors that arise from scenarios of international RT communications. These factors were thematically coded and categorized into a taxonomy, which informed the subsequent quantitative phase, the development of an online survey sent to pilots and ATCOs. The objective was to identify the least and the most frequent situations associated with those categories and their potential threat to the safety of RT communications. Table 1 provides an overview of Phase 1, including participants, instruments, procedures, and analysis.

**Table 1:** Overview of Phase 1

| Strand | Participants | Instruments | Procedures | Analysis |
|---|---|---|---|---|
| **QUAL** | | 6 scenarios of pilot-ATCO interactions | Selection of scenarios: purposive sampling | First Cycle Coding: Initial/Process coding Values/Simultaneous Coding |
| | | | Familiarization with dataset: listening and reading to transcripts | Second Cycle Coding: Pattern Coding Inter-coder reliability |
| **Quan** | 23 pilots and 15 ATCOs | Questionnaire Section II: 8 questions Section III: 17 questions | Recruitment by email: snowballing | Descriptive statistics Frequency distribution |
| | 7 NSs and 31 NNSs of English | + open-ended responses | Online survey: informed consent | Magnitude Coding (evaluative content) Initial Coding Provisional Coding |

*Note.* NSs=Native speakers; NNSs=Non-native speakers
Source: Monteiro (2019)

### 4.2. Results and discussion

In Phase 1, the outcome of the QUAL strand, i.e., the analysis of six scenarios of authentic international RT communications, was a taxonomy of intercultural factors that may impact the way pilots and ATCOs interact in the context of international RT communications using the English language. These factors were organized into six categories (*power distance, face-work strategies, conflict management, communication styles, non-collaborative behaviour* and *collaborative behaviour*), comprising 14 sub-categories in total. Table 2 shows the integration of the QUAL and quan strands, through the alignment of the sub-categories with the online survey questions.

**Table 2:** Alignment of the sub-categories with the online survey questions

| Theme | Categories | Sub-Categories | Operational Definitions in the Questionnaire |
|---|---|---|---|
| **Intercultural factors in international pilot-ATCO communications** | Power Distance | Power relations | Q18, Q19 |
| | | Deferential role | Q20, Q21 |
| | Face-work strategies | Self-face concern | Q22 |
| | | Mutual-face concern | Q12 |
| | Conflict management | Conflictual direction | Q23, Q24 |
| | | Neutral direction | Q10, Q11 |
| | | Expectancy violations | Q25 |
| | Communication styles | Directness | Q13 |
| | | Indirectness | Q26, Q27 |
| | Non-collaborative behavior | Unprofessional tone | Q28, Q29 |
| | | Unprofessional attitude | Q30, Q31, Q32 |
| | | Non-compliance with rules | Q33,Q34 |
| | Collaborative behavior | Professional attitude | Q14, Q15, Q16 |
| | | Supportiveness | Q17 |

Source: Monteiro (2019)

Quantitative findings indicated the situations that were perceived as the least and most frequent in participants' opinion, although they confirmed that all situations included in the survey do happen in international RT, according to the participants. Similarities but also some differences in perception across groups of participants (i.e., pilots vs. ATCOs, native vs. non-native speakers of English, male vs. females) were observed, as well as complex connections and relationships that exist among the recognized sub-categories.

Figure 4 compares mean values for frequency and importance and indicates that the frequency of occurrence was generally lower than their perceived importance as a potential threat to safety. Evidence from the survey open-ended responses also supported the validation of the taxonomy sub-

categories. Figure 5 presents the number of valid comments for each sub-category organized according to their magnitude coding: if the participant's comment contradicted the sub-category, if it was neutral or if it validated the sub-category. As it is possible to see in orange, most of the categories received comments that validated the situations presented in the questions.

**Figure 4:** Comparison of means for frequency

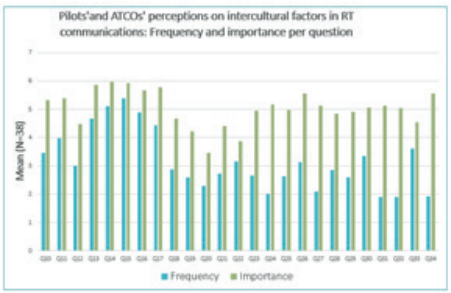
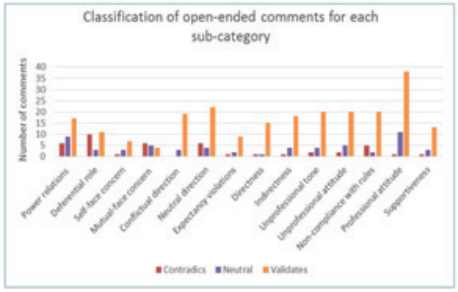



**Figure 5:** Summary of Magnitude Coding and importance per question (Contradicts, Neutral, Validates) of survey open-ended responses




Source: Monteiro (2019)

## 5. PHASE 2

### 5.1. Overview

In Phase 2, informed by the review of theoretical and empirical studies, models of language use that account for the communicative demands of intercultural RT communication were proposed. From these models, a framework that maps the constructs considered to be relevant to this occupational context was specified based on a synthetic organization of recurring themes. Then, the matrix was validated by 128 aviation stakeholders. Not only were domain experts involved – pilots and ATCOs – but also AE teachers, AE examiners/test developers, AE researchers, AE curriculum developers and regulators shared their expertise and collaborated in the reconceptualization of the construct during focus group discussions. Table 3 provides an overview of Steps 1 to 3, within Phase 2.

**Table 3 -** Overview of Phase 2

| Strand | Participants | Instruments | Procedures | Analysis |
|---|---|---|---|---|
| **QUAL Step 1** | | Theoretical/ empirical studies included in the Lit. Review | Identification of key areas (AE, ELF, ICA, IC) to build different representations of the context | 3 models: Comprehensiveness, interpretability, and usefulness |
| **QUAL Step 2** | | Theoretical/ empirical studies included in the Lit. Review | Synthetic organization of recurring themes (AW, K, S, AT) | Matrix (4 domains x 4 dimensions) populated with construct components |
| **QUAL Step 3** | 128 aviation stakeholders: 20 NSs + 108 NNSs of English | Focus groups: | Focus groups: | Nvivo 1st cycle: Provisional Coding (AW, K, S, AT) Inter-coder reliability |
| | 52 male + 76 female | A scenario of RT communication for each group (Phase 1) + 6 questions to discuss | Intra- and inter-group discussions (audio-recorded) | 2nd cycle: Provisional Coding (construct components) |

*Note.* NSs=Native speakers; NNSs=Non-native speakers; AW=awareness; K=knowledge; S=skills; A=attitudes

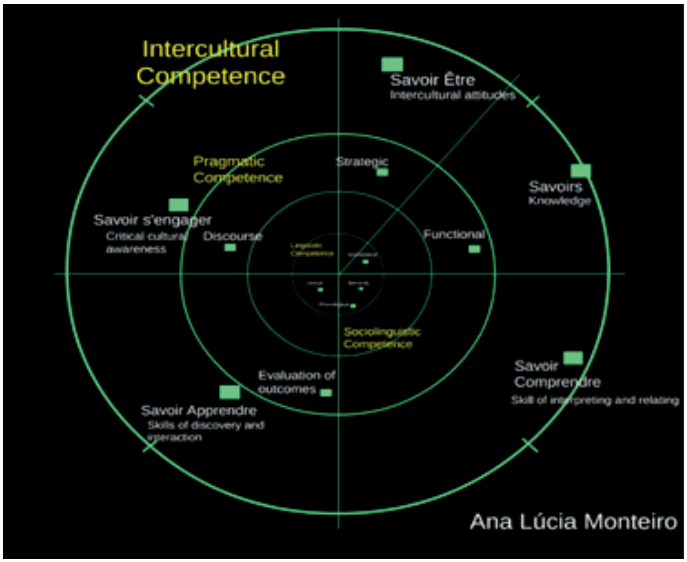
Source: Monteiro (2019)

## 5.2. Results and discussion

### 5.2.1. Phase 2, Step 1

The outcomes of Phase 2 – Step 1, related to *Models* of language use, included three different representations of the communicative demands of pilots and controllers. First, I began with the largest model, as shown in Figure 6, which simply maps the territory or the discursive space where RT communications take place (represented by a radar screen), expanding from Linguistic, Sociolinguistic, and Pragmatic Competencies (which are part of the existing notion of communicative competence) to include Intercultural Competence, adding Byram's (1997) five *savoirs*: intercultural attitudes, knowledge, skills of interpreting and relating, skills of discovery and interaction, and critical cultural awareness.

**Figure 6:** First model of the discursive space of RT communications




Source: Monteiro (2019)

The second model (see Figure 7) shows the interaction of several layers of culture (HOFSTEDE, 1991), represented by an individual's cultural frames of reference and his/her own expectations, values and interpretations, with the dialogic and co-constructed nature of the utterances (BAKHTIN, 1986), in an interaction between two individuals using AE as a lingua franca and governed by the rules of the air traffic control system. As Kesckes (2014) highlights, culture has a priori elements, i.e., ethnic or cultural marking in communicative behavior (see blue rectangles in the model, portrayed in Figure 7) and emergent features, co-constructed in the moment of interaction (see utterances A1, A2, A3 and their responsive reactions in B1, B2 and B3), which should be combined to approach culture in a dialectical and dynamic way.

In addition, this second model, which presupposes the use of AE as a lingua franca, takes into consideration Baker's (2011) notion of intercultural awareness (ICA) as an expanded and dynamic framework for intercultural competence. His definition of ICA as "a conscious understanding of the role culturally based forms, practices and frames of reference can have in intercultural communication, and an ability to put these conceptions into practice in a flexible and context specific manner in real time communications" (p. 202), includes the two main ideas the model purports to convey. Finally, the third model (see Figure 8) illustrates each one of the critical constructs that interact in this workplace context, how and where they overlap, showing us where the test should be situated, that is, the core features that must operate smoothly and simultaneously for effective communication in this aviation workplace.

**Figure 7:** Second model of radiotelephony communications in intercultural contexts and

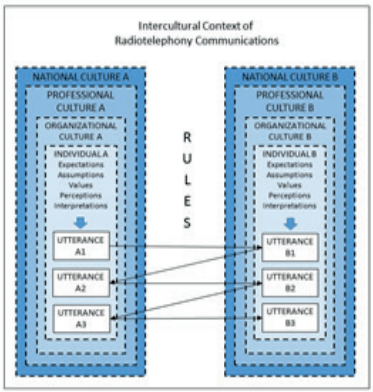



**Figure 8:** Third model of ESP in RT communications = AE, ELF, ICA IC overlap


Source: Monteiro (2019)

### 5.2.2. Phase 2, Step 2

In regard to the layer of *Frameworks*, in Step 2 the matrix of construct specification was built, drawing its structure from the proposed models in Step 1, in terms of four theoretical perspectives or domains – Aviation English (AE), English as a Lingua Franca (ELF), Intercultural Awareness/competence (ICA and IC), and Interactional Competence (IC) – across the dimensions of interest – awareness (AW), knowledge (K), skills (S) and attitudes (AT). The matrix was populated by organizing components of the construct selected from the literature review according to their best fit to each cell, i.e., each domain and dimension intersection.

### 5.2.3. Phase 2, Step 3

The matrix was later validated, in Step 3, by groups of aviation stakeholders, who shared their perspectives of what is essential for effective aeronautical RT communications while discussing real scenarios of pilot-ATCO exchanges. The coding process of participants' comments revealed that: i) most components of the construct included in the preliminary matrix (built in Step 2) were confirmed; ii) a few components were not explicitly cited by the study participants, and therefore, not included in the final matrix; iii) some components not included previously did emerge during participants' discussions. The final matrix of construct specification, as shown in Table 4, was defined by selecting the four components of the construct with the highest number of coding references for each cell.

Another perspective on the importance of a certain construct component was made possible by considering the number of focus groups

in which it was mentioned. The three most cited construct components were *background knowledge*, *professional tone and attitude*, and *compliance with rules and procedures*, which are all related to the specific purpose language ability of this professional domain and also corroborate findings from other studies (e.g., DOUGLAS, 2014; ESTIVAL, 2018; KIM, 2012; KIM, 2018; KNOCH, 2014).

## 6. PHASE 3

### 6.1. Overview

Phase 3 of the study addressed the sub-layer of *Evidence models,* still at the *Framework* level of Fulcher and Davidson's (2009) test architecture, through the development of a checklist of behaviors that provide evidence about the construct and

**Table 4:** Final matrix of construct specification

| Construct definition within the aviation radiotelephony domain | | | | |
|---|---|---|---|---|
| | **Awareness** | **Knowledge** | **Skills** | **Attitudes** |
| **Aviation English (AE)** | **- situational awareness** (67)<br>**- group identities and authority gradients in aviation** (50)<br>- rules of use that characterize the domain (27)<br>- threats presented by cross-cultural communications (19) | - background knowledge (rules and procedures) (78)<br>- standard phraseology (36)<br>- plain English for the specific purpose of aeronautical RT communications (26)<br>**- communication as a Human Factor** (6) | **- Crew Resource Management (CRM)** (55)<br>**- language proficiency (ability to use the language)** (45)<br>- communicate effectively in routine and in highly unpredictable situations (39)<br>**- conflict management** (12) | - professional tone and attitude (195)<br>- compliance with prescribed rules and procedures (e.g., use of phraseology, read back/hear back) (193)<br>**- assertiveness** (87)<br>- clarity, conciseness, and correctness (37) |
| **English as a lingua franca (ELF)** | - challenges faced by speakers of EFL and interlocutors' possible linguistic difficulties (34)<br>- difficulty presented by the use of jargon, idioms, slang and colloquialisms (17)<br>- the need to speak English as a lingua franca (17)<br>- different varieties of English and speech communities (9) | **- nuances of the language** (5)<br>- language as a social practice (4)<br>- one's own communicative style and the problems it could pose to ELF interactions (3)<br>- characteristics of one's L1 phonology that may influence English pronunciation (2) | - adjust and align to different communicative systems (new patters of phonology, syntax, discourse styles) (23)<br>- eliminate ambiguous expressions and sentence patterns (21)<br>- adapt linguistic forms to the communicative needs at hand (20)<br>- self-repair, rephrase, paraphrase, and clarify (13) | - patience (68)<br>- collaborative behavior (45)<br>- avoidance of any kind of superiority of one variety over another (39)<br>- tolerance (12)<br>- openness and humility to negotiate differences (12) |
| **Intercultural Awareness/ Competence (ICA)** | - how the cultural background of participants can impact the complex and dialogic nature of their communications (58)<br>**- power distance** (27)<br>**- gender expectations** (17)<br>**- face concern** (12) | - what is involved in intercultural interaction (11)<br>- potential threats posed by intercultural communications (11)<br>- different cultural frames of reference (communication style, conflict management, face-work strategies, etc.) (10)<br>- how social groups and identities function (3) | - move beyond cultural stereotypes and generalizations (11)<br>- engage with and negotiate sociocultural differences (5)<br>- engage with politeness conventions (5)<br>- accommodate to difference and to multilingual aspects of intercultural communication (4) | **- politeness** (90)<br>- willingness to cooperate (25)<br>- respect (20)<br>- readiness to suspend disbelief about other cultures and belief about one's own (9)<br>- willingness to relativize one's own values, beliefs, behaviors (9) |
| **Interactional Competence (IC)** | - shared responsibility for successful communication (5)<br>- discourse as co-constructed among participants (3)<br>- communication as 'a two-way negotiative effort' (1) | - register specific to the practice (10)<br>- an appropriate participation framework (3)<br>- the processes we go through to solve communication issues (1) | - deal adequately with apparent misunderstandings, by checking, confirming, and clarifying (44)<br>**- use of communicative/ interactional skills** (36)<br>- accommodate to the constraints of the context and perceived ability of the hearer (20)<br>**- declare non-understanding** (9) | **- avoidance of intimidation and threatening behavior** (10)<br>- cooperation (9)<br>- tolerance (6)<br>- flexibility (4) |

*Note*: In **bold**, additional components of the construct suggested by aviation stakeholders during focus group discussions. In (parentheses), the number of coding references for each component of the construct.

Source: Reconsidering Context in Language Assessment: Transdisciplinary Perspectives, Social Theories, and Validity (Table 5.2), 1st Edition by Janna Fox and Natasha Artemeva, © 2022 by Routledge. Reproduced by permission of Taylor & Francis Group.

Also through the use of the ICAO checklist of language functions associated with aeronautical RT communication (ICAO, 2010). In addition, the sub-layer of *Task models* included the design of two draft tasks – interactive tasks between a pilot (test-taker) and an air traffic controller (interlocutor) in the form of a role-play that elicits the language used for international RT communications in sequential phases of a flight. Unexpected situations and linguistic complications were intentionally included in the tasks, requiring the use of plain language and communicative strategies to manage the interaction, negotiate meaning, and accommodate his/her interlocutor.

Finally, related to the last layer in the architectural framework, task specifications were developed for the two draft test tasks. These tasks were pilot tested with a group of Aviation English Testing Experts (AETEs) in Brazil. In this MM convergent parallel study, qualitative data from interviews, focus group discussions, and transcripts of task performances from the pilot testing were analysed and compared to quantitative results from the checklists. Table 5 provides a summary of Phase 3, including participants, instruments, procedures, and analysis.

**Table 5:** Overview of Phase 3

| Strand | Participants | Instruments | Procedures | Analysis |
|---|---|---|---|---|
| **qual** | | Preliminary matrix of construct specification | Design of "Indicator Checklist of skills/ behaviors" | Design of 2 draft tasks<br>Definition of tasks characteristics<br>Design of task specifications |
| | | List of language functions for aeronautical communication | Design of "Observation Checklist of language functions" | |
| **QUAL** | 35 AETEs: (test-takers, interlocutors + observers) | Role-play cards Semi-structured interviews | Pilot testing of tasks 1 and 2 Interviews + responses to feedback forms | Interviews and focus groups: Descriptive/ Magnitude Coding<br>Feedback forms: frequency/percentage analysis |
| | 3NSs + 32 NNSs of English ELEs: 19<br>SMEs: 16 | Feedback forms<br>Discourse data from task performances | Focus group discussions with 3 groups of AETEs<br>Transcription of task performances | Transcripts: coding for language functions/ behaviors |
| **quan** | 35 AETEs: (test-takers, interlocutors + observers) | Indicator Checklist of skills/behaviors | Rating of importance of language functions | Descriptive statistics<br>Frequency distribution |
| | 3NSs + 32 NNSs of English ELEs: 19<br>SMEs: 16 | Observation Checklist of language functions | Observation of task performances<br>Filling in Observation Checklist + Indicator Checklist | Degree of agreement among observers<br>Relevance of language functions and behaviors |

*Note.* AETEs=Aviation English Testing Experts; NSs=Native speakers; NNSs=Non-native speakers; ELEs=English Language Experts; SMEs= Subject Matter Experts

Source: Monteiro (2019)

## 6.2. Results and discussion

Findings from the pilot testing of the two draft tasks in Phase 3, and their discussion based on the qualities of good testing practice, indicated that situational authenticity, interactional authenticity, practicality and impact of the tasks were generally perceived as positive by the research participants, i.e., those who acted as test-takers, interlocutors and observers. However, issues of reliability, in relation to the need for clearer instructions to guide test-takers throughout the tasks, and to the effect of interlocutors' behavior on test-takers' performance, were pointed out, as well as issues of validity, in terms of the controversial topic of what aspects of the construct should be measured in the specific purposes testing of pilots and ATCOs.

In this phase of the study, joint displays were built to display the convergence/divergence of QUAL and quan results. Table 6 presents evidence gathered from transcripts of task performances (represented by a T, when the behaviour was identified in the transcript of the role-play task) and AETEs' perceptions of skills/behaviors of effective communication collected using indicator checklists (represented in the quan columns by their degree of agreement – Very Good (VG), Good (G), Some (S), or Little agreement (L).

**Table 6:** Behaviors of effective communication – Evidence from transcripts and from I*ndicator Checklists*

| Skills/behaviors indicative of effective communication | Task 1 | | | | Task 2 | | | |
|---|---|---|---|---|---|---|---|---|
| | Morning | | Afternoon | | Morning | | Afternoon | |
| | QUAL | quan | QUAL | Quan | QUAL | quan | QUAL | quan |
| **Indicators of Professional (AE) competence** | | | | | | | | |
| 1.complying with the rules of use that characterize the domain (e.g., use of phraseology, read back/hear back, etc.) | T | VG | T | VG | T | G+ | T | VG |
| 2.demonstrating a professional attitude and tone | T | VG | T | VG | T | VG | T | VG |
| 3.communicating effectively in routine and in unpredictable situations | T | VG | T | VG | T | G+ | T | VG |
| 4.using plain English (when appropriate) for aeronautical RT communication | T | L | T | S+ | T | S+ | T | L |
| 5.producing and recognizing the language functions used in RT | T | VG | T | VG | T | VG | T | VG |
| **Indicators of ELF competence** | | | | | | | | |
| 6.accomodating to different accents and dialects | | G- | | L | | S- | | L |
| 7.adapting linguistic forms to the communicative needs at hand | T | L | T | L | | L | T | L |
| 8.complying with the safety-critical requirements of intelligibility | T | VG | T | G+ | T | VG | T | G+ |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 9.avoiding the use of jargon, idioms, slang and colloquialism | T | G+ | T | VG | T | G+ | T | VG |
| 10. adjusting and aligning to different communicative systems (e.g., new patterns of phonology, syntax, discourse styles) | T | G- | T | S- | T | G- | T | S- |
| **Indicators of Intercultural awareness/competence** | | | | | | | | |
| 11.showing openness and flexibility to different cultural frames of reference (e.g., communication style, conflict management, face-work strategies, etc.) | | L | | L | | L | | L |
| 12.engaging with politeness conventions | T | VG | T | L | T | VG | T | L |
| 13.engaging with and negotiating sociocultural differences | T | L | | S- | | S- | | G- |
| 14.showing willingness to cooperate and to relativize one's own values, beliefs and behaviors | T | S+ | | L | | S+ | T | L |
| 15.accomodating to difference and to multilingual aspects of intercultural communications | | S- | | G- | | S- | | G- |
| **Indicators of Interactional competence** | | | | | | | | |
| 16.eliminating idioms, cultural references and syntactic complexity from speech | T | S+ | T | G+ | T | S+ | T | G+ |
| 17.demonstrating a shared responsibility for successful communication | T | VG | T | VG | T | VG | T | VG |
| 18.accomodating to the constraints of the context and perceived ability of the hearer | T | VG | T | G+ | T | VG | T | G+ |
| 19.dealing adequately with apparent misunderstanding, by checking, confirming and clarifying | T | VG | T | VG | T | VG | T | VG |
| 20. using an appropriate participation framework | T | G+ | T | G+ | T | VG | T | G+ |
| 21. demonstrating tolerance and collaborative efforts | T | VG | T | G+ | T | VG | T | G+ |

*Note.* T indicates that the behavior was identified in the transcript of the role-play task.

VG, G+, S+, L, S-, and G- indicate the degree of agreement among raters using the *Indicator Checklist*.

VG: Very good agreement; G+: Good agreement (positive); S+: Some agreement (positive)

L: Little agreement; S-: Some agreement (negative); G-: Good agreement (negative)X

Green cells – convergence of QUAL and quan data

Red cells – divergence of QUAL and quan data

Source: Monteiro (2019)

Table 6 reveals a lot of instances of convergence (highlighted in green), a few of divergence (in red) related to the indicators of ELF competence and Intercultural Awareness/competence, as well as the absence of a few behaviors in the task performances. However, there was confirmation of all indicators of Interaction competence in the data. Data integration indicated that findings from the Indicator Checklists of behaviors agree with performance transcripts to a great extent and signposted the potential of the tasks to test the construct.

Similarly, joint displays were also built with evidence of language functions from the transcripts of task performances and Observation Checklists. Instances of convergence totalized the following numbers: Task 1- 43; Task 2- 35, whereas the total instances of divergence revealed lower figures: Task 1- 14; Task 2 – 19. These numbers suggest that quantitative results from the Observation Checklists agree, to a moderate extent, with transcripts of task performances. Applying the Observation Checklist of language functions and the Indicator Checklist of behaviors indicative of effective communication in the phase of pilot testing proved very useful as potential sources of evidence supporting the construct validity of the role-play tasks.

## 7. CONCLUSIONS

By exploring the multicultural context of international RT communications and by following the steps of the test development process, represented as layers and sub-layers of architectural documentation (Fulcher & Davidson, 2007, 2009), this study demonstrated how the communicative demands of pilots and ATCOs can be specified within a construct framework and operationalized as test tasks. This was accomplished with the engagement of key aviation stakeholders from different backgrounds, but who have a shared interest in successful RT communications, in a collective dialogue by sharing their experiences and perspectives in all phases of the study.

Recurring instances of intercultural tension in the aviation workplace were evidenced by findings in Phase 1, which also suggested that pilots and ATCOs in the sample analyzed perceived, to a great extent, the potential threats of intercultural factors to safety. Integration of findings indicated that the validation of the taxonomy of intercultural factors confirmed all 14 sub-categories (from Phase 1) and suggested an expansion to include 8 emerging sub-categories (in Phase 2). Also, the models of language use proposed in Phase 2 indicated that effective RT communications require competencies not addressed in prevailing models of communicative competence. They do require specific purpose language ability and background knowledge (AE), the need to speak English as a lingua franca and to adjust to the communicative needs at hand (ELF), to accommodate and negotiate sociocultural differences (ICA), and to solve misunderstandings between members of different cultures, while at the same time sharing responsibility for successful communication (IC). And most importantly, this applies to both first language (L1) speakers of English, and those who speak English as a second (L2) or additional

language. In addition, validation of the matrix of construct specification in Phase 2 by multiple stakeholders suggested that it is a good representation of the aeronautical RT context. In Phase 3, data from the pilot testing of the tasks indicated that the aviation RT-specific construct can be operationalized as test tasks, although further investigations are required.

I acknowledge some limitations of this study. In Phase 1, I highlight the small number of scenarios analyzed and the sample size in the quan strand. In Phase 2, only written transcripts were analyzed during the focus groups. In the pilot testing of tasks in Phase 3, participants were from the same L1 and cultural group, which altogether, indicated the need for further investigations.

In conclusion, this broader view of professional competence in aviation has some implications: it may enhance a better representation of the construct, thus increasing the validity of inferences drawn from tests, better decision-making and promoting a positive washback in teaching and learning practices. For L1 speakers of English, this would represent a significant shift in understanding and accepting that they should also acquire and be tested on the RT-specific competencies. Findings from this study could also add to current research in other contexts of LSP testing or serve as an example for test development endeavours in general, especially when dealing with complex constructs.

Finally, I would also like to point out that my research is aligned with current publications and initiatives in the field. First, with Knock and Macqueen's (2020) book on Language Assessment for Professional Purposes, and also with a publication by Fox and Artemeva (2022), in which they discuss context in language assessment, focusing on transdisciplinary perspectives, social theories and validity. On a final note, recent opportunities for such collective dialogue and reflections were panel discussions promoted by the International Civil Aviation English Association (ICAEA) with experienced pilots, air traffic controllers and linguists, based on non-routine RT communication scenarios. Comments from panelists and participants evoked the issues I addressed in my study and corroborated some of its findings.

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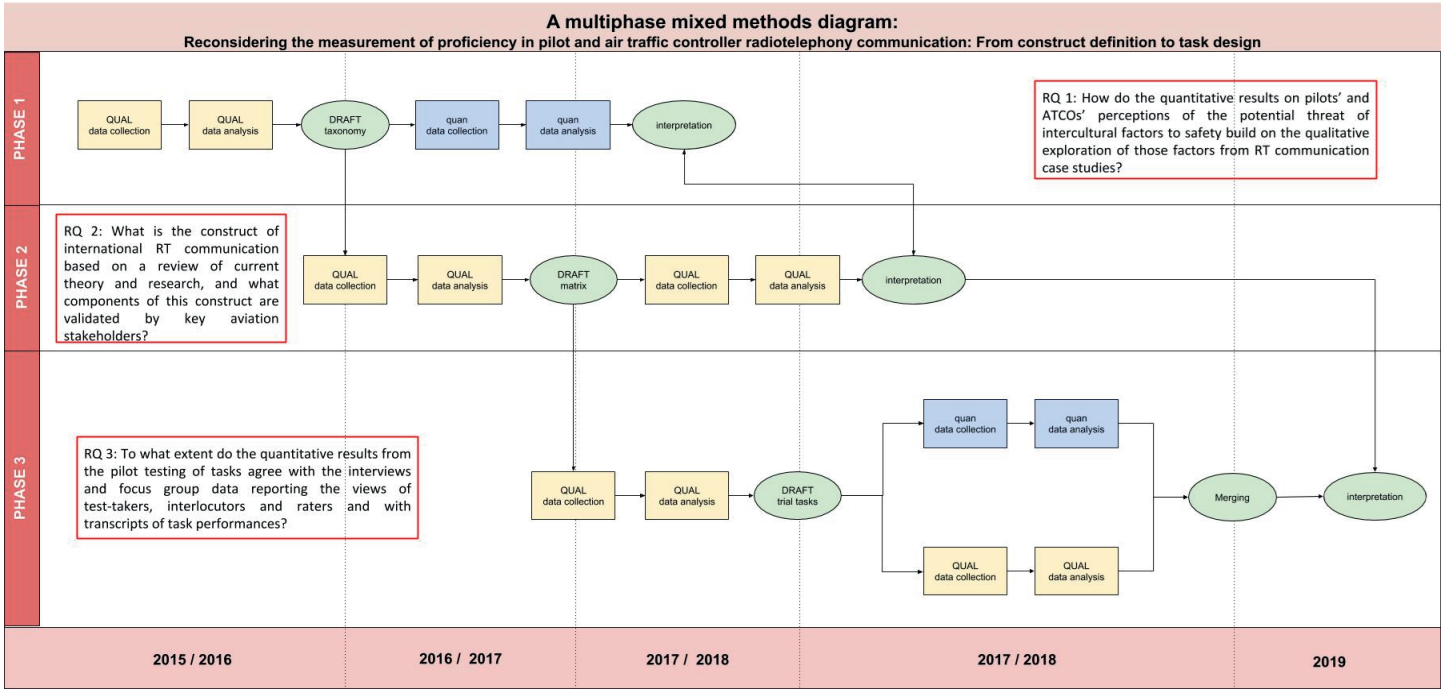
**Appendix.** Procedural diagram for the multiphase mixed methods design




Source: Monteiro (2019)

# CHAPTER 13

# THE ICAO SCALE AND LANGUAGE TESTING FOR *AB INITIO* CADETS: IS THERE A FIT?

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**ABSTRACT –** Currently, there is no research-based language requirement for entry on to ab initio flight training programmes conducted in English. Rather, organisations adopt their own admissions criteria, resulting in a wide variety of assessment practices and standards. In response, this study developed a language assessment aligned with the ICAO rating scale but contextualised to the specific linguistic needs of NNES ab initio pilots entering English-medium flight training. The test has a diagnostic function, classifying candidates into three levels of 'readiness': Ready, Minimally ready and Not ready. These levels are inferentially linked to indicative ICAO levels. This chapter addresses the implications of using the ICAO scale. Specifically, the methods used to investigate the reliability of using the scale within a training context and for a diagnostic testing purpose are examined as well as the procedures undertaken to articulate and define threshold levels of performance within the TLU domain, using subject matter experts (SMEs). These levels are linked to the ICAO scale. Findings suggest that the ICAO scale is not finely grained enough to distinguish levels of linguistic readiness among ab initio pilots, nor does it adequately reflect the knowledge, skills and abilities valued by SMEs within this domain, suggesting that a domain specific scale may be needed.

**KEYWORDS:** Aviation test development; Ab initio flight training; ICAO rating scale; Test validity.

## 1. INTRODUCTION

This chapter reports on the standard setting activities involved in developing and validating an online diagnostic language test designed to measure the linguistic readiness of non-native English speaking (NNES) ab initio cadet pilots to begin practical flight training in a country where English is the medium for instruction. Currently, there are no standardised measures of language ability nor is there an established threshold benchmark to assess linguistic readiness for flight training. Instead, each training organisation adopts their own entry requirements resulting in an ad hoc

approach, which hampers efforts to establish comparable quality standards across organisations (ALBRITTON, 2007; FRIGINAL et al., 2020; LYNCH; PORCELATTO, 2020).

Granting entry onto a flight training programme when a student pilot is not linguistically ready can lead to negative consequences experienced by the training organisation, the sponsoring airline and the student pilot. Consequently, the aviation education sector has signalled the need for a valid, reliable and standardised measure of ab initio language ability, calibrated to the International Civil Aviation Organisation's (ICAO) Language Proficiency Rating Scale (ALBRITTON, 2007; DUSENBURY; BJERKE, 2013; EMERY, 2015; FRIGINAL et al., 2020; LYNCH; PORCELLATO, 2020; ROBERTS; ORR, 2020). The Overseas Flight Training Preparation Test (OFTPT) was developed in response to these industry needs within a doctoral study.

## 2. THE OVERSEAS FLIGHT TRAINING PREPARATION TEST (OFTPT)

In the OFTPT, test takers must demonstrate their language ability in listening, reading, speaking and vocabulary. Test content was identified by subject matter experts (SMEs) (nine flying instructors, two Aviation English experts and one air traffic controller) and a survey of 56 ab initio pilots in an investigation of the Target Language Use (TLU) domain (TREADAWAY, 2021). This investigation was operationalised in test tasks which reflect the real-life target language use tasks and situations that are experienced within practical flight training. Test tasks simulate understanding and communicating with air traffic control, other pilots and flying instructors. In a subsequent phase of test development, a further twelve flying instructors and aviation English experts judged this test content as being highly relevant to the TLU domain, the testing purpose and the target test takers (TREADAWAY, 2021).

The OFTPT has a diagnostic function. Test scores can be interpreted as the readiness of test takers to engage successfully in practical flight training. The ICAO scale is used as the measure against which speaking skills are assessed and test scores on the listening and reading modules have been empirically linked to the ICAO scale. Readiness is conceptualised in three categories: Ready, Minimally ready and Not ready. Within the OFTPT score reports, these categories correspond to cut scores for that test, a probable level on the ICAO scale and a description which aims to capture the key aspects of performance within the readiness category. These elements were empirically derived from the standard activities, which are discussed in this chapter. The OFTPT score reports also contain a break-down of performance on each test task (their personal strengths and weaknesses, generated from their responses on test items). A description of the task's construct allows the test taker to identify the language abilities they need to focus on to improve. Finally, specific learning activities that target the areas of weakness are suggested. In this way, test takers receive a detailed, personalised action plan for their language development.

The target test population comprises NNES ab initio pilots, studying in aviation universities who intend to do their practical flight training in an English-speaking country. In general, most test takers will be in the latter stages of their theoretical training, having completed from one to two years already. This prior study means that candidates possess considerable content knowledge encompassing such core components as (a) Flight Operation Management; (b) the Airplane and Engine; (c) Navigation; (d) Aerodynamics; (e) Aviation Meteorology; (f) Flight Fundamental Theory; (g) Radio communications and English standard phraseologies for routine phases of flight.

However, typically, this theoretical input will have been conducted in their first language (L1). Therefore, a significant challenge is operationalizing this knowledge in English. Of those surveyed, test takers had been learning English for at least nine years and the 98 ab initio cadets who participated in test trials of the OFTPT (TREADAWAY, 2021) possessed a high intermediate level of English language proficiency, equating to around IELTS 5.5 or TOEIC 650 or B1+ on the Common European Framework of Reference (CEFR). For more information about the OFTPT, please visit the companion test website at: https://flexiblelearning.auckland.ac.nz/oftpt/.

## 3. THE DECISION TO USE THE ICAO LANGUAGE PROFICIENCY RATING SCALE

As already mentioned, the ICAO scale was adopted as the measure against which speaking skills are assessed. This decision was not made without reservation. Research has highlighted the problematic nature of the scale in terms of the construct it captures, the specificity of its descriptors and the theoretical and empirical methods used to develop the scale and set standards (KIM, 2012; KIM; ELDER, 2015; EMERY, 2017; ESTIVAL et al., 2016; KNOCH; MACQUEEN, 2020).

When these concerns are considered in the context of language testing within training environments, the construct captured in the ICAO scale significantly underrepresents the language skills required within ab initio training. Additionally, the descriptors in the scale have been criticised for being underspecified and superficial (GARCIA, 2015; EMERY, 2014, KNOCH 2009, 2014). This raised implications for the diagnostic testing purpose of the OFTPT because the performance descriptors in the scale provide little scope for providing granular and specific feedback to test takers to guide improvement. Finally, even though ICAO suggest that the scale can be used within training contexts to shape curriculum and track progress (ICAO, 2010, 4.4, 4.5.3), no guidance is given as to how the scale relates to a training TLU domain or could be used.

Despite these concerns, the ICAO scale was adopted for three reasons. Firstly, it is the current and only measure of language proficiency for pilots and air traffic controllers operating internationally. As such, all ab initio cadets who

intend to fly internationally will be tested against this measure at some stage within their career. Therefore, adopting the scale brought the OFTPT into the testing ecology of the ICAO Language Proficiency Requirements (LPRs).

Secondly, adopting the scale was hoped to enhance face validity for test users. This potential benefit is supported by the fact that there have been calls from within the aviation training sector for a language test aligned to the ICAO scale but tailored to the specific language needs of ab initio training (ALBRITTON, 2007; DUSENBURY; BJERKE, 2013; EMERY, 2015; FRIGINAL et al., 2020; LYNCH; PORCELLATO, 2020; ROBERTS; ORR, 2020).

Finally, the decision to use the scale had implications for standard setting, which facilitated a research agenda with three foci, thereby contributing to theory and practice within this domain. Before the research agenda is discussed, the specific rating procedures and scale familiarisation and standardisation activities developed for the OFTPT speaking test are presented.

## 4. BECOMING FAMILIAR WITH THE ICAO SCALE

The OFPT speaking test has three parts and lasts for approximately 20 minutes. The examiner also acts as the interlocutor and must take the role of an air traffic controller and a flying instructor in Part 2 and 3 respectively. To achieve consistent and accurate rating of the speaking tests in test trials, it was necessary for the author to devise training and familiarisation activities in preparation of assigning ICAO levels. These activities were shaped by the researcher's experience as a speaking examiner on the International English Language Testing System (IELTS) as well as two training frameworks: Performance Dimension Training (WOEHR; HUFFCUTT, 1994) and Frame of Reference training (HOLT et al., 1997; WOEHR; HUFFCUTT, 1994).

Performance Dimension Training was used to become familiar with the level descriptors and criteria within the scale. Once familiarisation had been achieved, the author rated 34 speaking test samples twice, over two weeks. The speaking samples were downloaded from the ICAO Rated Speech Samples Training Aid (RSSTA) website (ICAO, 2011). These samples represented 196 rating decisions, which were used as the frame of reference and gold standard against which the author's ratings were compared and standardised. The author rated the samples in batches of five and then compared her ratings with the official ratings, noting differences. Over the two rating sessions, intra-rater reliability was 92% (180 / 196 judgements).

While conducting these procedures, two concerns emerged. Firstly, when there had been discrepancies between ratings, the source of the discrepancy appeared to be in the interpretation of the adverbs of degree and frequency within the ICAO scale's criteria descriptors. As a solution, the ELPAC interpretation of these adverbs was adopted and applied (see Table 1). Secondly, because of the author's experience as an IELTS examiner, it

became clear that ICAO Level 3 and 4 captured a wide range of language proficiency, roughly equating to IELTS 4.5 – IELTS 6.5. Additionally, there were no samples of a Level 2 performance on the RSSTA website. These two factors raised implications for using the scale to rate test takers whose language proficiency was anticipated to be clustered within Level 3 and possibly Level 2. In addition, because the OFTPT is a diagnostic test, to produce meaningful, diagnostic information for these test takers, more granularity was needed in indicating where in Level 3 test takers were situated. This required a principled rating procedure.

**Table 1:** ELPAC interpretation of adverbs of frequency within the ICAO LPRS taken from publicly available rating materials

| The percentage bands (compiled from many sources) offer a guide to the interpretation of these adverbs/descriptors of frequency helping you as an assessor to achieve harmonisation and consistency of application. | 10% - 20% | 20% - 40% | 40% - 60% | 60% - 80% | 80% - 100% |
|---|---|---|---|---|---|
| | rarely<br>seldom | sometimes<br>occasional<br>at times | not always | usually<br>frequently<br>often<br>generally<br>in general | consistently<br>mostly<br>sufficient |

Source: https://elpac.eurocontrol.int/docs/ELPAC-Paper-2-Rating-Scale-v6.0.pdf

To this end, the author decided to rate each speaking task separately and to show the ICAO levels for each criterion as well as an overall level for each task (Table 2). This was hoped to provide test takers with more granular information about performance on individual tasks, thereby allowing a test taker to identify the areas they may need to focus on in tasks that are linked to the communicative events they will engage in within the TLU domain. In terms of indicating where in an ICAO level a test taker was situated, the ICAO scale adopts a non-compensatory scoring model in which the lowest level awarded on any criteria becomes a test taker's final level (ICAO, 2010). The OFTPT also adopts this model. Table 2 indicates that the overall ICAO level for Part 3 of the speaking test is Level 2. However, in this example, if all levels are added and averaged, (3 + 3 + 3 + 3 + 2 + 3 = 17, $M$ = 2.83) the performance is in the higher band of Level 2. Therefore, the overall level is indicated as Level 2 (High). Using the same calculations, the descriptors 'mid' and 'low' are also used to describe the final level.

**Table 2:** Score report excerpt of OFTPT speaking Part 3, showing individual ICAO levels and an overall level

**Part 3 – Instructor-student role play**

| Pronunciation | Structure | Vocab | Fluency | Comprehension | Interaction |
|---|---|---|---|---|---|
| 3 | 3 | 3 | 3 | 2 | 3 |
| **OVERALL ICAO LEVEL for Part 3 – Level 2 (High)** | | | | | |

Source: https://flexiblelearning.auckland.ac.nz/oftpt/8/files/speaking_score_report_final_12012022.pdf

To arrive at the overall ICAO level across the whole test, the author took the mean performance level on each criterion, across all three tasks (parts), added each criterion mean and then averaged this sum. To illustrate this process with reference to Table 3, the performance results show Pronunciation across all three tasks averaged 3.33, Structure averaged 4, and Vocabulary averaged 3.5. In Task 2, Structure and Vocabulary are not rated rate due to the nature of the test task (a radiotelephony role play involving readback of ATC instructions in routine situations). Fluency averaged 4, Comprehension averaged 3.6 and Interaction averaged 4. The sum of these averages is 22.43 and the average of this sum is 3.74, indicating that this performance is situated in the higher band of Level 3. Therefore, the overall level would be recorded as Level 3 (High). In the OFTPT score report, this overall level is accompanied by a short descriptive speaking profile. This profile is a combination of the ICAO descriptors and the performance level descriptors, which were generated empirically in Stage 2 of the standard setting activities. These activities are presented in subsequent sections.

**Table 3:** Calculation of the overall ICAO level in the OFTPT

| | Pron | Structure | Vocab | Fluency | Comp | Inter |
|---|---|---|---|---|---|---|
| Task 1 | 3 | 4 | 3 | 4 | 4 | 4 |
| Task 2 | 3 | | | 4 | 4 | 4 |
| Task 3 | 4 | 4 | 4 | 4 | 3 | 4 |
| Mean | 3.33 | 4 | 3.5 | 4 | 3.6 | 4 |

Author (2022)

## 5. SETTING STANDARDS

### 5.1 Overview of the research agenda

As has been mentioned, the decision to adopt the ICAO scale

facilitated a research agenda for standard setting entailing three stages. The first two stages are presented in detail in subsequent sections. In summary, the first stage concerned examining the suitability of using a scale, primarily designed for certification of professional pilots and ATCs, to rate speaking tasks developed for a training TLU domain and a diagnostic testing purpose. This was accomplished by investigating the interrater reliability and agreement of the ratings of trial speaking tests which had been assessed by an ELPAC English Language Expert (ELE) speaking examiner and the author, in accordance with the rating procedures described in the previous section.

It was also crucial to establish the reliability of using the scale because this laid the foundations for postliminary standard setting activities. The objective in Stage 2 was to use the double rated speaking samples to identify threshold levels of performance within the TLU domain, capture these levels in Performance Level Descriptors (PLDs) and then relate these to the ICAO scale. The work in the second stage, in turn, enabled the objectively scored components of the OFTPT (the listening and reading modules) to be inferentially linked to the ICAO scale by means of the PLDs and an Ebel standard setting procedure, which determined cut scores based on the performance categories articulated in the PLDs. Each of these stages was conducted in collaboration with subject matter experts (SMEs).

In essence, the research agenda was concerned with investigating the correspondence of the ICAO scale with linguistic performance levels within the TLU domain, while setting reliable and valid standards for the OFTPT.

### 5.2 Investigating interrater reliability and interrater agreement

During test trials, 23 speaking tests were conducted and rated by the author using the ICAO scale. Of these tests, ten complete speaking tests, representing the range of ability, were selected for double rating by an ELPAC English language expert examiner. The samples included two Chinese and eight Japanese speakers. These participants were studying in major aviation universities in China and Japan and anticipated beginning their practical flight training within 7 months. The Chinese were within two months of beginning. Both Japanese and Chinese participants had similar levels of general English language proficiency.

All Japanese participants had taken a TOEIC test with scores ranging from 655 - 840, with a mean of 722. This average equates to around B1+ on the Common European Framework of Reference (CEFR) (EDUCATIONAL TESTING SERVICE, 2020). The Chinese participants had taken an IELTS test, both scoring 5.5. This average also equates to around B1+ on the CEFR (INTERNATIONAL ENGLISH LANGUAGE TESTING SYSTEM, n.d.).

In total, the 10 tests encompassed 190 judgements for comparison in an investigation of interrater reliability (IRR) and agreement (IRA). IRR analysis examines the degree to which raters rank test takers in the same order

(HALLGREN, 2012) while IRA analysis examines the extent to which raters provide scores that are similar in absolute value (LEBRETON & SENTER, 2008). Both IRR and IRA were investigated using the two-way, mixed model, single measures intraclass correlation coefficient (ICC). Cicchetti's (1994) frequently cited ranges of ICC estimates were used to evaluate reliability. ICC estimates of less than .40 indicate poor reliability. Estimates between .41 - .59 indicate fair reliability. Estimates between .60 - .74 are interpreted as good reliability and estimates of .75 or above indicate excellent reliability (CICCHETTI, 1994).

The IRR analysis single measures ICC was .80 with a 95% confidence interval from .69 - .9 ($F$ (19, 247) = 58.26, $p < .001$), indicating excellent consistency of the ranking of participants between the two raters (CICCHETTI, 1994). Similarly, the IRA analysis single measures ICC was .78 with a 95% confidence interval from .66 - .89 ($F$ (19, 247) = 58.26, $p < .001$), again indicating excellent absolute agreement between the ICAO scores awarded by the raters (CICCHETTI, 1994). The mean ICAO level awarded by both raters across all 190 decisions was 3.56 (range 3.35 - 3.78).

These data indicate that a standard interpretation of the ICAO scale was achieved for these 10 speaking performances and the 190 separate rating decisions they entailed. This comparability also provides a degree of validation in support of the specific rating procedures developed and applied during the rating of the speaking tests. The reliability also established a valid foundation upon which subsequent standard setting activities were to be based. Therefore, the findings of this investigation are promising in that they demonstrate it is possible to use the ICAO scale reliably for a test with a diagnostic purpose within a training context. However, the data are limited because only two raters were involved; hence a single measures ICC estimate was chosen, meaning that the estimates are specific to these two raters and no generalisation is possible.

### 5.3 Identifying threshold levels of performance - Performance level descriptors (PLDs)

With reliability demonstrated, the next concern was in articulating and defining three performance categories, which provide the basis for interpreting the OFTPT test scores. These categories are conceptualised in terms of 'readiness' to engage in practical flight training: a test taker can be Ready, Minimally ready or Not ready. The definitions were captured in Performance Level Descriptors (PLDs), which make explicit the TLU domain content, knowledge, skill and abilities within each category. The rationale underpinning the PLDs was twofold.

Firstly, the PLDs were to serve as a shared point of reference in conceptualising the performance of test takers, which was crucial in conducting the Ebel standard setting procedures in the next stage. Secondly, the empirical

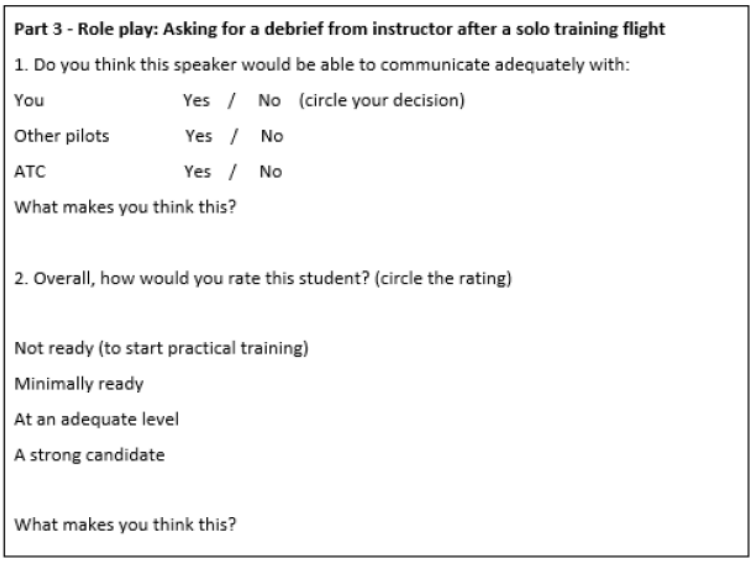
methods used to elicit the PLDs made explicit the correspondence between ICAO levels and the linguistic performance within the TLU domain. This meant that test scores on the objectively scored OFTPT listening and reading tests could be inferentially linked to the levels on the ICAO scale.

To develop useful PLDs, participants must have an intimate knowledge of the TLU domain content and the target test population (MILLS; JAEGER, 1998; SKAGGS; HEIN, 2020). To this end, six flying instructors working in private training organisations from across New Zealand were recruited to participate in two focus group discussions, each lasting for 1.5 hours. All instructors were actively working with ab initio pilots and had taught or were teaching NNES students. Experience instructing ranged from 2 years to 46 years. PLDs are most commonly generated by SMEs examining test content and extracting the knowledge, skills and abilities (KSAs) thought to underpin test items (HURTZ; AUERBACH, 2003; SKAGGS; HEIN, 2020; PERIE, 2008). However, one of the aims of developing the PLDs was to link the ICAO scale levels to performance within this TLU domain and to OFTPT test scores. Therefore, empirical methods, based closely on Knoch's (2009, 2014) validation study of the ICAO scale were employed.

Knoch's study (2014) provided a clear plan for eliciting SME commentary on 11 extracts taken from speaking test performances, which had been reliably double rated in the previous stage. The extracts included the range of abilities from the lowest to the highest ICAO levels awarded. The instructors were unaware that the extracts had been rated.

The primary aim was to uncover what criteria flying instructors considered important when assessing the linguistic competence of NNES students, in essence, to elicit the indigenous assessment criteria (JACOBY; McNAMARA, 1999) valued within this domain. The secondary aim was to establish what level of English language competence these SMEs deemed sufficient to begin practical flight training. To achieve these aims, while listening to the extracts, the participants completed the questionnaire shown in Figure 1. After each extract, a facilitated discussion teased out richer comment on the perceptions of the communicative ability and language skills of the speaker with regard to their readiness to undertake practical flight training.

**Figure 1:** Questionnaire completed by participants while listening to each extract



**Part 3 - Role play: Asking for a debrief from instructor after a solo training flight**

1. Do you think this speaker would be able to communicate adequately with:

You Yes / No (circle your decision)

Other pilots Yes / No

ATC Yes / No

What makes you think this?

2. Overall, how would you rate this student? (circle the rating)

Not ready (to start practical training)

Minimally ready

At an adequate level

A strong candidate

What makes you think this?

Source: Treadaway (2021)

The compilation of the PLDs was accomplished by iterative, thematic analysis. Whenever possible, the wording of the PLDs quotes the instructors verbatim. The criteria of the ICAO scale were used as a starting point for categories. However, further themes and foci emerged. In particular, comments reflected a broader concern for the impact of language ability on safety as well as the negative consequences experienced by individuals and organisations when training is delayed due to poor language proficiency.

Significantly, despite there being no weighting in the existing ICAO scale, Interaction and Comprehension underpinned by readily operationalised vocabulary were considered more important linguistic skills than other criteria. The weighting of these criteria was also confirmed by 24 other SMEs in Phase 1 and Phase 4 of the broader doctoral project (TREADAWAY, 2021). Additionally, trial test data confirmed that Comprehension, Interaction and Vocabulary were areas of weakness, with just over 50% of test takers being rated in the lower range of Level 3 or mid to high Level 2 (For a breakdown of test trial speaking test results, see TREADAWAY, 2021, p. 246, Figure. 31).

In general, participant contributions captured a broader construct than that reified within the ICAO scale. Instructors commented holistically on the overall performance of test takers, which encompassed an appraisal of how well a test taker could operationalise their content knowledge (of radio calls, forces of flight and aircraft systems). The ability of a test taker to deliver a clear and intelligible message was highlighted as being distinct from the construct

captured in the Pronunciation descriptor in the ICAO scale.

The participants also made general predictions about the communicative ability to interact with ATC, pilots and instructors. The final criteria captured within the PLDs across the three performance categories were: *Overall judgement, Content knowledge, Fluency, Vocabulary, Clarity of message and intelligibility, Structure, Comprehension, Pronunciation, Interaction and Prediction of communications with instructor / ATC / other pilots in the air.* The full PLDs are presented in Table 46 of the author's doctoral thesis (TREADAWAY, 2021, p. 273).

Because the extracts had been previously rated, it was possible to match the SME judgements of readiness with an ICAO level. In general, test takers judged as Not Ready, scored at ICAO Level 3 (low) or below; Minimally Ready test takers were rated between Level 3 (low) and Level 3 (high), and those assessed as Ready, were rated at Level 3 (high) and above (see Table 4). There was some overlap in these judgements, which appeared to be due to the tendency of participants to value content knowledge equally with linguistic considerations. This tendency has been noted in other studies eliciting indigenous assessment criteria and appears to be a characteristic of how 'insiders' assess performance in a specific purpose domain (ELDER et al., 2017; KIM, 2012; KIM; ELDER, 2015; KNOCH, 2014; MAVIN et al., 2013).

**Table 4:** A summary of the ICAO level and participant judgements of readiness

| Part (of the speaking test) | Extract | ICAO level (assigned in Stage 1) | Judgement of readiness by participants (in Stage 2) |
|---|---|---|---|
| 1 | 1 | 4 (low) | Ready |
| | 2 | 2 (mid) | Not ready |
| | 3 | 3 (mid) | Minimally ready |
| 2 | 4 | 3 (low) | Minimally ready |
| | 5 | 3 (mid) | Ready |
| | 6 | 2 (high) | Minimally ready |
| | 7 | 3 (mid) | Minimally ready (4) /ready (2) |
| | 8 | 4 (low) | Ready |
| 3 | 9 | 3 (high) | Ready |
| | 10 | 2 (high) | Not ready |
| | 11 | 3 (low) | Minimally ready (2) / Not ready (4) |

*Note.* Numbers enclosed in parentheses in the judgement column represent participant numbers when the judgement was not unanimous.

Source: Treadaway (2021)

The correspondence of these ICAO ranges with the evaluation of readiness was empirically derived. However, it is important to note that anecdotal comments from aviation language specialists and flying instructors made in the subsequent Ebel standard setting session indicated that these ranges are probably too low and higher levels of proficiency are likely required.

Therefore, it must be acknowledged that the threshold levels of language proficiency captured in the PLDs represent a linguistic starting point from which to build language skills. Similarly, the indicative ICAO levels represent a starting point in determining a research-based benchmark for entry into practical flight training programmes, something that up until now has been lacking in this domain (FRIGINAL et al., 2020). Clearly, further validation studies are needed to investigate the impact of these indicative ranges on performance within practical flight training.

## 6. IMPLICATIONS AND CONCLUSIONS

Currently, official ICAO ratings make no distinction between test takers who achieve in the lower, middle, or higher range of an ICAO level. Rather, these distinctions were made as part of the rating procedures developed specifically for the diagnostic testing purpose of the OFTPT, firstly, in recognition of the fact that Level 3 and 4 captured a wide range of proficiency, and secondly, based on the assumption that the proficiency of most NNES students would be concentrated within Level 3. Test trial data confirmed the accuracy of this assumption with 71% of test takers being rated as Level 3 in speaking test trials (see TREADAWAY, 2021, Fig. 31, p. 246 for a breakdown of the overall ICAO levels for all parts of the speaking test separated into low, mid, and high levels of achievement).

These test trial data, together with the indicative ICAO ranges raise implications for flight training organisations that use the ICAO scale as an entry measurement. This is because the three threshold levels of readiness are all encompassed within ICAO Level 3, which indicates that the scale does not contain the level of granularity needed to distinguish between students who are Ready, Minimally ready or Not ready to begin practical flight training.

In addition, the prior investigation of the TLU domain in Phase 1 of the broader study together with the process of eliciting the PLDs revealed that the ICAO scale underrepresents the language construct required for ab initio flight training. This means that important knowledge, skills and abilities, valued by SMEs within the domain, may not be adequately considered when granting entrance on to programmes. Therefore, while it was demonstrated that the ICAO scale can be used reliably within this TLU domain and for a diagnostic testing purpose, for the reasons stated above, it is not an ideal measure of ab initio language proficiency.

In light of these conclusions, potential solutions may include developing a domain specific scale in conjunction with SMEs, training organisations and

sponsoring airlines. Even though the PLDs in this doctoral study were not intended for use as a scale, their contents, derived empirically in conjunction with SMEs, could form the basis for such a scale. Ideally, any measurement tool developed specifically for a training domain would need to be aligned with the existing ICAO scale. It would also need to be endorsed by ICAO in order to be adopted by training organisations internationally. If not, the same industry concerns of establishing comparable entry standards for practical flight training would endure.

Another possible solution might be to augment the existing scale by expanding the construct and granularity of the descriptors at lower levels. For example, reading could be included in the comprehension criteria. Interaction, Comprehension and Vocabulary could be weighted to reflect SME perception of their relative importance within the domain. The levels could also be broken down to include higher, mid and lower bands of proficiency. The model for such an undertaking could be drawn from the development and validation of the CEFR-J (NEGISHI et al., 2013). The CEFR-J is a version of the original Common European Framework of Reference for languages (CEFR) developed within Japan. It divides the A1 - B2 levels into 10 (Pre-A1, A1.1, A1.2, A1.3, A2.1, A2.2, B1.1, B1.2, B2.1, B2.2) in recognition that Japanese learners tend to cluster at lower levels of proficiency. A similar modification of the ICAO scale would allow training organisations to track progress more accurately at lower levels of proficiency while providing motivation to test takers who would be able to discern their progress more easily.

Clearly, these solutions would require a coordinated research agenda with cooperation across training organisations, sponsoring airlines, ICAO and national aviation authorities. While this may be challenging, the mandatory retirement of pilots is changing the demographic characteristics of the pilot population, meaning that many more young, NNES ab initio pilots will need to be trained to fulfil post-COVID recruitment requirements worldwide (KAY, 2019). Therefore, contextual factors may drive a change in language assessment practices. In the meantime, in any event, the OFTPT represents a principled and operationalised attempt to address calls from industry for a standardised, valid language test, calibrated to the ICAO scale yet tailored to the specific language needs of ab initio pilots.

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# INTERVIEW WITH DR PATRICIA TOSQUI-LUCKS

Dr Patricia Tosqui-Lucks was interviewed by An Eye on You, an Instagram profile that focuses on aeronautical English tips (see chapter 8), and talks about her experience with English for Specific Purposes, GEIA, and the importance of corpus linguistics and academic studies to the practice of teaching and testing aeronautical English. The interview was transmitted live on November, 23, 2021, and conducted by Natalia Guerreiro, responsible for the Aeronautical English Section of the Regional Center of Airspace Control Southeast (CRCEA-SE).

**You've been teaching and researching English for ATC for 12 years now [13 years in 2022], but you are originally a linguist and language teacher. How did you get interested in aviation?**

It's true. I am a Linguist and my PhD was in the field of ESP - English for Specific Purposes. Before working with aviation, I already had a career in ESP, teaching English to professionals of other areas in various contexts. I taught English for Tourism at undergraduate level at the São Paulo State University (UNESP), for almost 8 years. In 2009 I had this wonderful opportunity to work for the Brazilian Air Force at ICEA, the Airspace Control Institute, in a federal career. ICEA is responsible for training ATCOs and other professionals, and English is one of the areas of training. Since then, I have been working at the Aeronautical English Training Sector, and I have fallen in love with aviation. To be honest, I didn't know much about Air Traffic Control before that and I found it fascinating. It's been 12 [13] years and almost every day I learn something new, or I hear about an incredible situation that happened during a flight that a controller from our group was controlling. I say group because we have a team of teachers and ATCO and we work together to develop and deliver the training sessions. At the Aeronautical English Sector, not only we do the ESP teaching but we also develop courses for face-to-face and online instruction. On top of that, we offer teacher training courses. Something else that is important to mention is that ICEA is responsible for EPLIS, the Aeronautical English Test for Brazilian ATCOs, and I am an examiner, too. So there's no routine, we are always involved in different tasks, and sometimes we need to travel to deliver the courses or the

exam. Because of that, I've been to many different cities in all regions in Brazil and made many friends too. And in 2013, I started a research group, GEIA, so I can say I never really stopped doing research — it's in my blood as a Linguist and University Professor.

**You have compiled a corpus of radiotelephony English in Brazil. Can you explain to our audience what a corpus is and what it can be used for?**

Sure. A corpus is a collection of authentic texts, which can be written or spoken and which are added to a software where we can do different types of analysis. The software makes it possible to process a lot of data in seconds. One of the most famous software programs is *Wordsmith Tools*. A popular free program is *AntConc*, but there are many others. The methodology used and the kind of analyses depend on the purpose of your corpus. Corpus Linguistics (CL) is not something new: it has been used for more than 20 years, and the main publishers of dictionaries and grammar books, such as *Longman*, *Cambridge* and *Oxford*, have been using CL to make decisions about how they present content regarding language use. So, if you have a dictionary at home, most likely the examples you read came from a Corpus. My postdoc adviser, Prof Stella Tagnin, says that CL is used to replace the "armchair linguist" or teacher — that means that instead of making up sentences, these reference books can profit from authentic sentences that were produced by real speakers of the language in different contexts. These corpora are usually composed of newspaper and magazine articles, fiction and non-fiction books, websites, etc. But you can compile a corpus with any kind of text. There are many corpora of academic texts, used to help researchers write better academic papers to be accepted into international journals, for example. So, in the case of radiotelephony (R/T), we transcribe the pilot-controller communications and we can start analysing empirical data, such as collocations (word combinations), frequency, word order, word use, etc. In my case, I have been working with different aeronautical English (AE) Corpora. The first corpus I compiled was the "SISCEAB Corpus", with transcripts of communications between Brazilian ATCOs from all regions and facilities and international pilots. Most of this corpus comprises routine situations and standard phraseology. But it helps me identify, for example, problems in pronunciation, some strategies used to negotiate meaning, code-switching — because our controllers use both Portuguese and English —, the situations that are most frequent in different facilities and regions, etc. I must say that there are other RT corpora compiled by other GEIA researchers. Malila Prado compiled the RTPEC, which is based on transcriptions from the *Live. ATC website Interesting recordings section,* with emergency and non-routine situations from all over the world. Aline Pacheco compiled the CORPAC, based on *VAS-Aviation*, a *YouTube* channel with non-routine and emergency situations, too. So we have a kind of "partnership'': when we need to analyse,

for example, the use of a word, term, expression, or a grammatical topic, we usually check it in the 3 corpora and compare the results. The fact is that it is very time-consuming to select, transcribe and prepare the texts that will form the corpus, especially when it comes to oral communications. Last year [2020] we started a project of a collaborative corpus called AEROCORPUS. We carried out a webinar for ICAEA and we called the participants to join us: each person would have to transcribe at least one piece of RT communication following certain guidelines, and at the end we shared all the communications, the budding "corpus", with everybody. And during the webinar, we taught some strategies to use the *AntConc* software, which is free and user-friendly for people with no previous training in CL. This webinar is still available on the ICAEA website.

**How about corpora of radiotelephony in other countries? Are there any?**

Yes, there are some, but not many, and they are not available. As I said, it is difficult to compile an RT corpus. First, because a spoken corpus needs to be transcribed, and it is very time consuming, as sometimes we don't understand what people say, there's background noise, we don't know the context, we need the revision of a subject-matter expert (SME), etc. Besides that, there is the issue of exposing the professionals. It is not common to have access to real pilot-controller communications, and when we do have it, we are usually not allowed to share the audios or even the transcriptions. So, for example, to answer your question, a researcher called Stephanie Lopez compiled a corpus of communication in the French airspace in 2013. The corpus is not available, but the results of her PhD research are. She investigated the use of nouns, pronouns and other grammar categories comparing what happens in real communications and Standard Phraseology (SP). Another dissertation, by the Italian researcher Sara Alizieri, used a corpus with communications from the 1990s of three airports in the USA and a simulation European corpus, and proposed some pedagogical applications. So this is what often happens: we can't access the corpora, but we can see the published results and compare them to the results we have. There are some other corpora compiled in Europe and in the USA, and I discuss them in a chapter I wrote for the GEIA book *Pesquisas sobre Inglês Aeronáutico no Brasil* (2018). Sometimes the communications of these corpora come from simulators or training because it is easier to have access to this kind of recording. That kind of corpus is different from the one with real pilot-controller communication during a real flight. But this is not a problem, as long as you are aware of that and consider this when planning your research. As a matter of fact, nowadays I have been working on a "learner corpus". It is a corpus made of transcriptions of learners speaking English. In my case, I use the transcriptions of our Brazilian ATCOs speaking English during our AE courses.

**How have these corpora helped ICEA develop courses and training sessions?**

The learner corpus has been used in our fresh-from-the-oven training! In this case, we checked the most frequent errors our students make and prepared five different trainings, based on the ICAO rating scale categories, namely: Structure, Vocabulary, Pronunciation, Comprehension, and Fluency and Interactions. For example, our students many times say "your" meaning "his", "her", "its", or "their", because in Portuguese the word "seu, sua" can be used for all of those. So they say "The pilot changed your flight level" instead of "his/her", "the" FL, or just FL. Another example: Brazilians tend to use the singular when English requires plural for generalization, so they sometimes say "call the firefighter or the fireman" instead of firefighters or firemen. Teachers know that and tend to ask learners often to use the plural or to vary the verb, for example, "deploy". But in actual fact, what we can see in the AE corpora is that it is more common to say "call the fire brigade" or "the firefighting service". In other words, the corpora can be used to help identify the gaps in students' production on one hand and offer more natural options, based in real life use. Incidentally, 'call' is the most frequent collocate in general English corpora too. Another example: corpus showed that many students still say "have conditions" meaning "be able to", but there are examples of "being able" used correctly too, which shows that the learning process is happening.

**When we listen to radiotelephony from all over the world, we often come across non-standard phraseology use. Do the different corpora from all over the world show that, too?**

SP is extremely important and all pilots and ATCOs working with international traffic should master it. Consequently, I think more emphasis should be given to SP training and testing. And a very important aspect of it refers to native speakers (NS) of English. When we check different corpora, it is very clear that NS often depart from SP, use complex grammatical structures and even slang at times, speak very fast, and show impatience with non-native speakers (NNS) when they are slow to understand or request clarification, which usually happens during non routine or emergency situations, making it even more dramatic. I believe there should be some training for NS that deal with international traffic too, so that they become more aware of the importance of SP and of the characteristics of ICAO levels 4 or 5, as well as more used to different accents because, in the context of AE, English is considered a "lingua franca". On the other hand, we know that SP has its limitations, too. Corpus research has also proved that it is a fine line that keeps SP and plain language apart, as we have just seen some speakers at the GEIA Seminar last week say [October, 2021]. In 2013, a researcher called Swinehart analysed the word "right" in his corpus and observed that, while in SP it only refers to a direction — "direita" in Portuguese (right side) —, in actual RT it was used with as many meanings as it has in spoken

general English: “all right”, meaning everything is OK; “right?”, for checking understanding; or for emphasis, such as “right on time!” We can’t just ignore it and pretend people will act like machines. I think above all communication must be effective and efficient. SP is the main tool to guarantee that, but it is not always enough. Pilots and controllers need to be trained to be able to communicate and negotiate meaning considering different cultural aspects, pragmatics, intentions… to be proficient AE speakers, regardless of their first language.

**If we use corpora in our Aeronautical English courses and some of it has non-standard phraseology, what can we do -- as teachers or materials designers -- to make sure we don’t encourage the use of non-standard phraseology?**

First of all, as ESP teachers and material designers, it is our job to know our students and prepare our classes carefully. That means that we need to think about the aims of our classes and prepare the material in order to reach them. The corpus can be an amazing tool to help teachers get the authentic examples they sometimes struggle to find. But it doesn’t mean they will expose students to a lot of samples without guidance or assistance. If there is an instance of non-standard phraseology and it is something that may cause a problem in communication or even risk safety, the best thing to do is to show it to students and raise their awareness. But if the teacher feels it is not the best time to raise this discussion and that it will veer from the aim of that class, or if s/he is not sure about that specific use, s/he can just adapt the example and correct the sentence and tell the students about it. It is still real-life communication but the material was adapted for teaching purposes, and personally I don’t see a problem in doing it.

In my experience, I would say that in ESP classes our students are the SME and they know much more than we sometimes think. We usually deal with experienced professionals, who know SP and many times will spot the problem and offer a solution to it. In ESP classes, we need to train our students to be ‘researchers’ too in the sense that they need to know how to find the information they need. So if the problem is whether SP was properly used or not, we can always ask them to check the correct form, teach the right way of saying that, but above all remind them that they will communicate with real people and this kind of thing could happen to them, too.

**Many controllers who follow us say they have problems understanding authentic radiotelephony audios. As a teacher, what do you suggest for them to improve and better prepare for EPLIS Paper 1?**

I know what they mean: it is hard to understand authentic RT for many reasons. Sometimes the quality of the audio is not very good, there’s excessive background noise, the accent of the speakers may be not familiar

to them, or they speak too fast, there is no shared context… When I started listening to RT, I found it very difficult too. But you know, practice makes perfect. If they have problems because of the reasons I just mentioned, all the more reason to listen to RT more frequently. There are many videos of RT on *YouTube* with closed captioning in English or comments in English that will help them understand what's going on. Other things that help are to listen to people talking about Aviation, be it on TV shows, podcasts, documentaries, etc.,to get used to different accents and to the vocabulary. And study the vocabulary - comprehension and vocabulary are strongly connected. So I would recommend they follow AEOY and watch ICAEA webinars, there are very interesting discussions about pilot-controller communications and the speakers are from all over the world.

Ah, and I'd like to say that we at ICEA are planning a new phase for the Comprehension training focused on EPLIS Paper 1!

**You lead a Research Group on Aeronautical English, called GEIA in the Portuguese acronym. First, why Aeronautical English, not Aviation English? Are they any different?**

Aviation English is a very broad term that can refer to the use of English by any aviation professional: cabin crew, mechanics, engineers, etc. The communication between pilots and ATCOs during a flight is very specific and the English they need, as we have been discussing, is different from what the other professionals need. The ICAO Doc 9835 states that, and makes clear that it is focused on pilot-controller communication only. So, we believe it deserves a different name to avoid confusion and misunderstanding: Aeronautical English. It has implications for teaching and for testing too. If it is not clear, a controller can go to an Aviation English course and get something called "general aviation English", where they will waste time and money learning something they won't need, such as talking to passengers, writing reports, reading manuals, talking about his last vacation or ticket prices, etc. I've seen books and courses like this. We have adopted the term "Aeronautical English '' since the beginning of GEIA, in 2013, and soon EPLIS and ICEA's Aeronautical English Section changed their names too in accordance with this. We are not the only ones, though. There are other researchers that use this term, such as Ana Lígia Silva in Brazil and Ana Borowska in Poland. Gradually, more and more people are becoming conscious of the importance of this distinction.

**Now that we know the difference, what are the lines of research in GEIA? Can you give us examples of research that has been carried out in such lines?**

GEIA has three research lines: the 1st one is language description and analysis. That's where most studies in CL are. But there are other topics

related to language description, such as translation and terminology, which can use CL or not, and language as human factor. The second one is teaching and learning AE. There's research about needs analysis for pilots and ATCOs, material design, analyses of AE books found in the market concerning pronunciation, use of images, etc. Some studies have been carried out in Aviation English too - for aircraft maintenance, flight attendants and other professionals, And some of them use CL too! In fact it is very difficult to label the research papers in only one of the lines. Some of them could go under more than one line. For example, there is a study about the washback effect of EPLIS on ab initio controller training. This is both teaching and testing. Finally, about testing there is the definition of construct, task design, intercultural aspects, needs analysis, validity, etc.

**You said GEIA has a line of research on assessment and testing. In your opinion, how can research help ICAO exams such as EPLIS and Santos Dumont?**

The researchers are the people directly involved in designing and developing these tests, at ANAC, ICEA, and DECEA, and are eager to share their findings with their teams and implement new things as much as possible. Some studies are easier to apply, others may be more theoretical with no immediate applications. People usually wish for immediate results, but research can be for the long term too. When ICAO developed the rating scale and the guidelines for training and testing in Doc 9835, more than 10 years ago, there weren't many studies about AE testing. Today the scenario is very different, so we hope ICAO considers these new studies when revising their publications and recommendations too. Change can seem slow, but the important thing is to keep moving forward. AE is high stakes and involves the whole world ─ we can't forget that. I am sure Brazilian researchers are doing an excellent job.

**Who are the members of the group? Can air traffic controllers and pilots become members of the group? How?**

GEIA is interinstitutional, which means we have researchers and students from different institutes related do aviation: ICEA, DECEA, ANAC, EEAR, as I said, but also from Brazilian Universities: USP, UNICAMP, PUCRS, ITA, UNITAU, etc. To be a member, it is necessary to be doing academic research about AE. We've had some ATCOs and pilots who did research, for their Master or PhD degrees, but the SMEs always have a very important role as collaborators.

**Do you believe GEIA contributes to aeronautical safety? How so?**

Absolutely! I am sure we are giving our share of contribution to aviation safety. Communication is a very important factor during a flight, but

sometimes underestimated or included in the general label of “human factors” when there’s an incident or accident. Initiatives like this live, AEOY and GEIA raise people’s awareness about the importance of language in aviation and help make this area of ESP more known outside the academic circles. GEIA Seminars bring together the academic researchers and the professionals of aviation too. This dialogue is very important, as we need to talk to each other and reach a broader audience. I believe this is the greatest contribution GEIA offers.

Thank you!

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