



International Civil Aviation English Association

ICAEA Workshop 2018, Building on the ICAO
LPRs – Communication as a Human Factor

The Proceedings of the International Civil Aviation English Association (2018) Conference

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Roberts, Jennifer; Estival, Dominique Ph.D.; Monteiro, Ana; Pacheco, Aline; Tosqui-Lucks, Patricia; Bullock, Neil; Popa, Catalin; Ahmed, Ahmed Mahmoud; and Cox, Ashleigh, "The Proceedings of the International Civil Aviation English Association (2018) Conference" (2018). *International Civil Aviation English Association*. 1.

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Presenter Information

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BUILDING ON THE ICAO LPRS – COMMUNICATION AS A HUMAN FATOR

*New Perspectives on Aviation
English Training and Testing*

The Proceedings of the International Civil Aviation
English Association (2018) Conference
Hosted by Embry-Riddle Aeronautical University



Jennifer Roberts, Dominique Estival (eds.)

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Preface

The 2018 International Civil Aviation English Association (ICAEA)¹ hosted its annual conference at Embry-Riddle Aeronautical University² in Daytona Beach, Florida, USA. The conference, entitled “Building on the ICAO LPRs– Communication as a Human Factor: New Perspectives on Aviation English Training and Testing,” explored issues beyond the ICAO Language Proficiency Requirements (LPRs) including:

- incorporating communication strategies into best practices for training and testing,
- the effect of language and culture on communication as a human factor,
- considerations for future policy developments in language and communication.

The event featured plenary presentations, Q&A panels, interactive panel presentations, practical workshops, and poster sessions. With more than 120 participants from 35+ countries, this was one of ICAEA’s most internationally-attended recent events. Attendees included representatives from airlines, flight training organizations (FTOs), air navigation service providers (ANSPs), civil aviation authorities (CAAs), universities, and training and testing providers from all over the world.

These proceedings feature seven articles written by eight of the conference’s presenters, summarizing their practical experiences and research findings which were shared at the conference. This publication is recommended to anyone interested in aeronautical communication.

¹ The International Civil Aviation English Association (ICAEA) is a non-profit, non-partisan association that exists to

- facilitate exchanges between people and organisations involved in the use of English in aviation,
- raise awareness of language proficiency and its effect on aviation safety, service quality and industry efficiency,
- develop expertise about the use, training and testing of English in all aviation professions,
- promote the sharing of expertise and cooperation between professions, industry and training organisations.

To learn more about ICAEA, visit <https://www.icaea.aero/>.

² Embry-Riddle Aeronautical University specializes in aviation and aerospace, with over 130,000 graduates around the world, offering over 100 degrees in areas including aviation, engineering, applied science, and space. To learn more about ERAU, visit <https://erau.edu/>.

Exploring Intercultural Factors in International Pilot-Air Traffic Controller Communications: Validating a Taxonomy Using Mixed Methods Research

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Abstract

Effective communications and collaboration are essential in the multicultural, complex and dynamic context of international radiotelephony (RT) communications, in which pilots and air traffic control officers (ATCO) use aviation English (AE) as a lingua franca. Accidents that happened due to cultural differences in aviation have been investigated (e.g., Helmreich, 1994; Merrit, 2000), as well as cultural interfaces and cross-cultural factors in aviation safety (Monteiro, 2012). However, the impact of cultural background on interactions between pilots and ATCOs in English is still underestimated and the industry lacks a categorization of culturally influenced factors confirmed by aviation stakeholders. Therefore, with the purpose of providing the aviation industry with tools and strategies to improve language for communication as a human factor issue, this paper first describes a two-phase, exploratory sequential mixed methods study. It consists of a qualitative exploration of cultural issues arising from six scenarios of international RT communications, which informs a quantitative phase, aiming to validate the factors identified and to investigate pilots' and ATCOs' perceptions of their threat to aviation safety. Results are compared across groups and findings suggest that all constructs identified for each intercultural factor refer to situations that actually happen in RT communications and are considered relevant to safety. Secondly, the paper details the practical activities that participants engaged in during Workshop A, based on open-ended comments from the research study. Finally, workshop participants' contributions are presented, including suggestions for the training of pilots and ATCOs, both native and non- native speakers of English, and strategies to address the critical role of language and culture in aviation safety.

Keywords: intercultural pilot-ATCO communications; language and culture; intercultural communicative competence; aviation safety.

1. Introduction

The International Civil Aviation English Association (ICAEA) Conference hosted by Embry-Riddle Aeronautical University - Florida in May 2018, focused on the theme: "Building on the ICAO LPRs² – Communication as a Human Factor: New Perspectives on Aviation English Training and Testing". It was a great opportunity for the aviation industry to discuss important topics associated with aeronautical communications, which were organized in five different sessions:

- 1) The role of communication in human factors;
- 2) Tools and strategies to improve language for communication as a human factor issue;
- 3) Developing language and communication skills for safety;

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² LPRs is the short form of International Civil Aviation Organization Language Proficiency Requirements, established for aviation professionals involved in radiotelephony communications (ICAO, 2004a)

- 4) The long-term aim of the ICAO LPRs: Enhanced training for better communications and safety; and
- 5) Where are we heading with the ICAO LPRs?

My motivation to submit an abstract to this conference originated by the fact that I had previously written about cultural interfaces and cross-cultural factors in aviation safety (Monteiro, 2012). This included a discussion on two conceptual frameworks or models explored by ICAO (2004b) in the *Human Factors Digest N° 16*: the SHEL Model and the Reason Model³, which I addressed focusing on pilot-ATCO communications. In the same study, I investigated factors that can lead to misunderstandings between pilots and ATCOs, proposing a taxonomy of linguistic, discursive-interactive and intercultural factors. As a number of the identified categories may be culturally influenced, I decided to further explore the multicultural workplace context of international RT communications and the complex interface between language, culture and communication. Results from this research study were the focus of Workshop A, which I presented during Session 2 of the conference.

Therefore, the goal of the present paper is twofold: describe this exploratory research study and detail the practical activities that participants engaged in during Workshop A. As stated in Section 2 of the conference program, my purpose was to provide a tool (outcome of the study) and strategies (workshop participants' contributions) to improve language for communication as a human factor issue. By giving voice to domain experts from different 'linguaculture'⁴ backgrounds, the study and the workshop activities aimed to address cultural diversity, include multiple viewpoints and provide a more comprehensive analysis of the way the cultural background of pilots and ATCOs can impact intercultural RT communications.

2. The Research Study

The research study, which is part of a larger multiphase mixed-method research, is an attempt to draw on current research and generate empirical data in order to address a practical language-related issue in the context of intercultural communications between pilots and ATCOs. International RT communications in aviation take place in a complex framework of language use, in which native speakers (NSs) and non-native speakers (NNSs) of English use aviation English as a lingua franca. Although I acknowledge that in the field of English as a lingua franca (ELF) distinctions between NSs and NNSs are considered problematic (e.g., Baker, 2009, 2016) these terms are used in this paper because the International Civil Aviation Organization (ICAO) testing policy for pilots and ATCOs (ICAO, 2004a) clearly makes a distinction between them concerning formal language testing requirements. Specifically, the LPRs do not require "native and very proficient non-native speakers with a dialect or accent intelligible to the international aeronautical community" (p. A-2) to be formally assessed. As Douglas (2014) states, "native speakers of English are not assessed for their linguistic awareness or abilities to accommodate their use of English in the context of intercultural communications" (p. 2). Yet, the context of aviation English as a lingua franca demands, whatever their language background, that pilots and

³ The SHEL Model refers to an individual perspective and presents the interfaces of the Human element – Liveware – with the Environment, Hardware, Software and other Liveware. The Reason Model introduces a systemic perspective, directed at "identifying and mitigating these latent unsafe conditions on a system-wide basis" (ICAO, 2004b, p. 17)

⁴ The expression linguaculture was first used by Jenkins (2006), in her definition of English as a lingua franca (ELF), but Baker (2009) reinforces the relevance of the term "to highlight the language-culture connection and the importance of different languages and cultures in communication" (p. 569).

ATCOs interact appropriately with speakers who have different levels of English proficiency. When discussing the cultural aspect of language and ICAO standards related to the LPRs, Hazarti (2015) also argues that “attempts should be made to include intercultural communicative competence requirements instead of the sole language proficiency criterion to ensure that the standards are properly met” (p. 250). As Baker (2012) highlights, intercultural communications require additional strategies that he called ‘the skills of multilingual communicators’:

These include the role of accommodation in adapting language to be closer to that of one’s interlocutor in order to aid understanding and solidarity. Negotiation and mediation skills are also key, particularly between different culturally based frames of reference, which have the potential to cause misunderstanding or miscommunication. Such skills result in the ability of interlocutors to adjust and align themselves to different communicative systems and cooperate in communication. (p. 63).

Despite the standardized phraseology that pilots and ATCOs must adhere to, misunderstandings are still caused by communication breakdowns. The underlying rationale is that each professional belongs to a number of social groups or cultures, “carrying several layer of mental programming within themselves, corresponding to different levels of culture” (Hofstede, 1991, 10). These differences will influence what they say, how they say it, the responses they expect, and how they react to them.

In order to understand the influences of culture in the aviation context, a number of studies applied Hofstede’s (1991) cultural dimensions, i.e., individualism-collectivism, power distance, masculinity-femininity and uncertainty avoidance. Some of these works investigated pilots’ behavior inside the cockpit while others discussed their impact on aircraft incidents and accidents (Helmreich, 1994; Merritt & Helmreich, 1996; Helmreich and Merritt, 1998; Merritt, 2000; Hazrati, 2015). However, the impact of cultural background on RT communications between pilots and ATCOs interacting in the English language is still underestimated. According to Douglas (2014), “we have a professional/ethical responsibility to continue to study the phenomenon of aviation radiotelephony and the role of both native and non-native speakers of English in maintaining communication” (p. 10).

Recently, an independent research report (Clark, 2017) commissioned by the UK Civil Aviation Authority (CAA) mentioned issues related to language and cultural awareness and to politeness in aviation discourse. Two recommendations were clearly stated: i) “Incorporate cultural factors in future research on language-related miscommunication between pilots and controllers. This could involve ethnography, questions in surveys or interviews, or some other means” (p. 72); and ii) “Incorporate awareness of politeness markers into future research on miscommunication between pilots and controllers” (p. 73).

Responding to these needs, this research study aims to explore how the cultural background of participants can influence intercultural pilot-ATCO communications and may have an impact on safety, based on naturally occurring data combined with experienced professionals’ perceptions of the phenomenon. Discussions of a more dialogic, dynamic and emergent interaction of culture and language will advance the perspective of how participants, with their own set of expectations, assumptions, values, perceptions and interpretations, interact according to the various cultural groups they are inserted in. Apart from that, as the industry

lacks a categorization of factors confirmed by aviation stakeholders, it is crucial to develop a tool that can be used to improve intercultural communications within the aviation community. Specifically, the goal of this study is to answer the following two research questions:

1. What intercultural factors arise from international pilot-ATCO communications that can affect the way they interact in the English language?
2. To what extent do experienced pilots and ATCOs perceive the potential threats of intercultural factors to the safety of radiotelephony communications?

2.1. Theoretical framework.

In order to answer the research questions mentioned above, the analysis of data is underpinned by a theoretical framework that encompasses four areas of communication studies. Before drawing on each of them, it is important to explain how culture is approached in this paper. As Baker (2016) acknowledges, although English as a Lingua Franca research has adopted the more dynamic and fluid postmodernist approaches to the relationship between language and culture, tensions exist between this approach and national, essentialist positions. Therefore, following Keszkes (2014), in this paper both culture's a priori elements and emergent features are taken into account in a dialectical way, and interculturality is considered here as "a phenomenon that is not only interactionally and socially constructed in the course of communication but also relies on relatively definable cultural models and norms that represent the speech communities to which the interlocutors belong" (p. 14). In addition, Scollon and Scollon (2011) advocate for a discourse approach to intercultural communication, in which "virtually all professional communication is communication across some lines which divide us into different discourse groups or systems of discourse" (p. 3). In line with these conceptualizations and approaches to intercultural communication data analysis is conducted.

First, from the field of discourse and pragmatics, I highlight the concept of language as action (Austin, 1962), the notion of face⁵ and politeness strategies (Brown and Levinson, 1987), as well as the theory of impoliteness (Culpeper, 1996).

Second, Hofstede's (1991) cultural dimensions also integrate this framework, together with his notion of 'different levels of culture'.

Third, theories of cross-cultural communications added great insight into the exploration of aviation RT discourse, such as: i) face-negotiation theory (Ting-Toomey, 2005); ii) conversational constraints theory (Kim, 2005); iii) expectancy violation theory (Burgoon & Hubbard, 2005); iv) anxiety/uncertainty management theory (Gudykunst, 2005); and v) communication accommodation theory (Gallois, Ogay & Giles, 2005).

Finally, the fourth set of concepts is related to intercultural communicative competence (Byram, 1997; Deardorff, 2006; Lussier, 2007) and intercultural awareness (Baker, 2011, 2012, 2016). Their relevance to the present study is confirmed by Hazrati (2015), who emphasizes that "intercultural awareness and intercultural communicative competence also need to be enhanced in aviation frontline personnel including pilots and air traffic controllers" (p. 250), in order to

⁵ Face is defined by Brown and Levinson (1987) as "something that is emotionally invested, and that can be lost, maintained, or enhanced, and must be constantly attended to in interaction" (p. 63). It refers to the notions of "being embarrassed or humiliated, or 'losing face'" (p. 63).

prevent tragedies caused by a single misunderstanding.

2.2. Method.

2.2.1. Study design.

With the purpose of addressing this research problem, a two-phase, exploratory sequential mixed-methods design was chosen, with the priority placed on the initial qualitative phase. The qualitative information obtained during the exploration of the context under investigation built up to the quantitative data collection and analysis. The reason for collecting qualitative data initially is that there are few taxonomies of intercultural factors specific to the context of aviation radiotelephony communications.

By using multiple sources of evidence, it is also possible to combine the best of each type of data, qualitative and quantitative, thus increasing the validity of results. By giving voice to study participants to respond to my initial findings, through the examination of their perceptions of the phenomenon, my aim was to develop what Matusov (2007) called the “dialogic truth of the research” (p. 328).

2.2.2. Phase 1 – Qualitative.

2.2.2.1. Instruments.

The first phase of the study was a qualitative exploration of culturally influenced categories that arise from pilot-ATCO interactions which can pose a threat to aviation safety, such as differences in communication styles, power distance, reluctance to declare emergency, face saving, attitudes, politeness, non-compliance with rules, among others. Six audio recordings and transcripts of RT communication extracts were selected from publicly available aviation-related websites, such as www.youtube.com, where we can find extracts of recordings from www.liveatc.net with subtitles included, and www.planecrashinfo.com, where we can find transcripts from previous incidents and accidents. It was a purposive sampling, in the sense that I was looking for six scenarios in which culturally related factors, beyond language proficiency, could have an impact on the outcome of the communication. Thus, examples of RT communications involving interlocutors with varied language backgrounds were chosen (based on the country of the airline companies and location of ATCO facilities), in an attempt to capture how cultural differences may impact distinct types of interactions. Excerpts of the six scenarios are provided in Appendix A, with a more precise reference for each. The names of the airline companies involved have been removed.

2.2.2.2. Analysis.

The analysis of qualitative data followed Saldaña’s (2009) methods of coding. For the First Cycle Coding, I explored the data by breaking it down into pilot’s and ATCO’s *utterances*, my unit of analysis, which are limited by the change of speaking subjects and represent a link in the chain of speech communication, in relation to both previous utterances and to subsequent ones (Bakhtin, 1986). In order to answer my research questions, I needed to go deep into the participants’ emotions, values, conflicts, and judgements, which highlighted the need to employ Values Coding. According to Saldaña (2009), this affective coding method is appropriate to “explore cultural values and intrapersonal and interpersonal participant experiences and actions in case studies” (p. 90). During the Second Cycle Coding, Pattern Coding was employed to organize my First Cycle codes into sub-categories and categories according to similarity. At this

time, it was also necessary to draw on Maxwell and Miller's (2008) connecting strategies, by considering a more holistic dimension in the interpretation of data and approaching my data analysis as an iterative process. Looking for antecedents and consequences, I benefited from considering any unexpected relationships among the 14 sub- categories that had been identified and their contextual connections.

As discussed in Section 2.1, the analysis was informed by theories and concepts associated with discourse and pragmatics, national cultural dimensions, theories of cross- cultural communications and intercultural communication/awareness. Those theories and conceptualizations enabled me to assign "Values" codes, and to thematically organize them into a provisional taxonomy of intercultural factors that may affect pilot-ATCO international communications. In order to increase the reliability and validity of my research findings, I asked two other coders (one was a NS of English and experienced qualitative researcher, while the other was a NNS of English, and qualitative researcher with an aviation background) to independently code excerpts of the selected pilot-ATCO interactions that I had already coded. Inter-coder reliability was calculated using the SPSS Software, version 23, and Cronbach's Alpha provided a reliability measure of .921.

The emerging sub-categories from the taxonomy informed the development of a quantitative survey that was administered to a larger sample of participants. This was the purpose of Phase 2, detailed in the next section.

2.2.3. Phase 2 – Quantitative.

2.2.3.1. Participants.

Participants in the quantitative phase were the key stakeholders in international radiotelephony communications, pilots and ATCOs, both NSs and NNSs of English, males and females, experienced in international operations. Fully completed questionnaires were received from 38 professionals: 23 pilots and 15 air traffic control officers, comprising 28 males and 10 females. In terms of language background, seven participants speak English as a first language while 31 do not. Their nationalities are represented in the following way: American (5), Argentinian (2), Australian (1), Brazilian (20), British (2), Cape Verdean (1), Croatian (1), French (1), Irish (1), Japanese, (1), Nigerian (1), Portuguese (1), and Spanish (1).

2.2.3.2. Instruments.

A questionnaire (Appendix B) was designed to investigate the constructs highlighted in the proposed taxonomy. This was accomplished by transforming the codes that originated within each sub-category into questions, as a building strategy. Section I of the questionnaire contains nine items eliciting background/demographic information. In Section II, items 10-17 elicit responses regarding participants' perceptions of expected practices in international communications, which refer to more positive attitudes or behavior. In Section III, however, items 18-34 elicit responses on the participants' perceptions of not so desired attitudes and behaviors in radiotelephony communication, including their importance as a potential threat to safety. Table 1 shows how the questionnaire was structured, including two Likert Scale questions for each item and a qualitative component asking participants to comment on the same issue.

Table 1. Questionnaire structure

Example of questions for pilots – Section II							Research question
(1= Never; 6= Very frequently)							
11.1 How often do you encounter air traffic controllers who avoid getting involved in conflicts or arguments?	1	2	3	4	5	6	Q1
(1= Not important; 6= Very important)							
11.2 If you selected 2 or higher: In your view, how important is this?	1	2	3	4	5	6	Q2
11.3 Please comment.							
Example of questions for air traffic controllers – Section III							Research question
(1= Never; 6= Very frequently)							
28.1 How often do you encounter pilots who show impatience and/or sarcasm in their speech?	1	2	3	4	5	6	Q1
(1= Not important; 6= Very important)							
28.2 If you selected 2 or higher: How important, in your view, were these events as potential threats to safety?	1	2	3	4	5	6	Q2
28.3 Please comment.							

The Likert-scale items in Sections II and III of the questionnaire are operational definitions of each of the sub-categories, or constructs, identified in the qualitative phase. Thus, Table 2 was designed to portray the use of integration strategies, in the form of a joint display (Creswell and Plano Clark, 2011), by aligning the qualitative sub-categories with the questions in the quantitative instrument.

Table 2. Provisional taxonomy and alignment of sub-categories with 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	

By submitting their online survey responses, participants provided their informed consent. The study was considered minimal risk research and this phase began only after receiving approval

from the Carleton University Research Ethics Board (Project number: 103859).

2.2.3.3. *Analysis.*

Quantitative data from participants' responses were inserted into the SPSS software, version 23, and analyzed using descriptive statistics and frequency distribution (Vogt, 2007; Larson-Hall, 2016). The purpose was to extract mean values and frequencies, as a strategy of data reduction, by reducing the quantitative findings into manageable chunks of information.

Analysis of data considered all responses together, but also compared perspectives from different groups of participants, i.e., pilots vs. ATCOs, NSs vs. NNSs of English, and male vs. female. The focus of the analysis was directed toward participants' perceptions on the frequency of occurrence of the situations presented in the questions, as well as their opinions on the importance of those issues to the safety of RT.

For triangulation purposes, open-ended responses were thematically coded with the final goal of validating the questionnaire, validating the provisional taxonomy, and addressing the research questions. Following Saldaña (2009), Magnitude Coding was conducted by attributing: (0) when no comment was provided; (1) when the comment contradicted the sub- category; (2) when the comment was neutral; (3) when the comment validated the sub- category. In addition, Provisional Coding was used to identify if, within a comment, reference to other sub-categories from the draft taxonomy was present.

2.2.4. *Results and discussions*

The results from the analysis are presented and discussed in this section in relation to each research question.

2.2.4.1. *Research question 1.*

What intercultural factors arise from international pilot-ATCO communications that can affect the way they interact in the English language?

Evidence to answer this question was collected mainly from the qualitative phase of the study; however, findings from the quantitative phase and from the analysis of survey open- ended responses also substantiate my discussions.

First, the interpretation of the six scenarios suggests how the intercultural factors identified may affect pilots' and ATCOs' discourse in different ways. Worth noting is how safety may be compromised by a combination of culturally related factors, which can also be detected in interactions involving very proficient speakers of English. Table 3 summarizes the main factors associated with each scenario, which were organized into the 14 sub-categories and six broader categories, generating the taxonomy.

Table 3. Intercultural factors identified in the speech of pilots and ATCOs in each scenario

Scenario	Context	Pilot	ATCO
1	Male pilot who does not comply with female ATCO's orders and states readiness, when in fact he was not ready for departure, causes trouble for the ATCO and other aircraft in a busy airport.	concern with his own interests/non-compliance with ATCO's orders/competing conflict style/unprofessional tone	concern with efficiency/relations of power (resorts to own authority in an effort to solve the situation)
2	After four previous contacts requesting the ATCO to confirm information, the dialogue shows the way the ATCO reacted to a new request for clarification from the same pilot.	less-confident pilot/accommodating conflict style/confirmation seeking/face-work (restore face loss)	non-standard phraseology/condescending language/aggressive conflict style/impatient/sarcastic tone/judgmental attitude
3	This interaction between a NS air traffic controller and a NNS pilot is part of the transcript of a fatal accident. It had as one of the contributing factors the pilot's (First Officer) deferential and submissive communicative style, which may have prevented him from declaring an emergency.	deferential style/agreement to act despite operational limitations/failure to declare an emergency/issues of power distance and different attitudes towards authority in a busy and native-speaking environment inhibited the pilot from assertively stating his needs	professional, neutral tone/concern for efficiency/failure to question severity of problem/lack of critical information prevented the ATCO from acting according to the seriousness of the situation
4	A native-like ATCO asks many questions in sequence to the pilot, but does not accommodate to his communicative needs. Differences in expectations give rise to issues of impoliteness and power relations.	increased level of anxiety/face under attack/expectancy violations/reaction to disrespectful behavior	impatience and aggressiveness/non-standard phraseology/lack of accommodation and collaboration/conflicting style/impoliteness (blaming the other for lack of comprehension)
5	An ATCO with limited English proficiency had previously authorized the pilot to land via the Instrument Landing System (ILS) of runway 35, which had been out of service for years. This generated an operational limitation for the aircraft concerning fuel reserves, and a far from effective interaction between the pilot and ATCO.	dominant conflict style/assertiveness/concern for clarity and efficiency/power relations (resorts to higher authority after getting involved in an operational complication)	less powerful role due to language limitations/unclear, confusing information/fear of losing face/avoiding conflict style
6	Interaction between two proficient speakers shows how aviation professionals may react when their expectations are violated.	seeking support/concern for efficiency/expectancy violations/unprofessional tone/competing conflict style	unwilling to cooperate/unnecessarily conflictual/unprofessional tone/aggressive conflict style/no time to support, but time to reprimand

It is important to mention how the cultural dimension of power distance and inequality may affect the outcome of pilot-ATCO interactions. This may be due to distinct hierarchical posts (e.g., Scenario 3), differences regarding participants' professions (all Scenarios: pilot vs. ATCO), gender (e.g., Scenario 1), differing levels of language proficiency (e.g., Scenario 5), or to a combination of all these features, creating what Scollon and Scollon (2001) called sources of "power disparities in discourse" (p. 24). In some of the scenarios analyzed, it was

possible to note the relation between the more powerful participant and the freedom to use impoliteness strategies (e.g., Scenario 2 and Scenario 4), and, at the other extreme, how a deferential and submissive style contributed to a fatal accident (e.g., Scenario 3).

In addition, violations to the expected flow of communication or to expected attitudes may increase the levels of anxiety and uncertainty of pilots and ATCOs. As a result, conflicts may arise, as noted in some of the analyzed transcripts (e.g., Scenario 4 and Scenario 6). However, the way participants managed conflict situations, the face-work strategies they used, and how they continued communicating after a face-threatening act, varied according to their own cultural background. This may be because pilots and ATCOs have their own set of expectancies, according to their national, professional and organizational cultures, but also according to their individual values and assumptions. In regards to the organizational level, the safety culture of each organization can also shape certain attitudes, beliefs and values. Tolerance for non-compliance with orders or rules and for the use of non-standard phraseology are some of the negative examples.

Considering the limited number of scenarios analyzed, combined with the fact that they were not randomly selected, one might say that these were just localized examples, or even extreme instances that do not reflect the reality of daily practices in aviation around the world. Therefore, this set of concepts or constructs still needed to be validated or recognized by the professionals directly involved in RT communications, both on the basis of the frequency of their occurrences and also on their importance and potential threats to aviation safety. This was possible through the analysis of quantitative data from Phase 2. Responses to the questionnaire items ‘How often do you encounter pilots/ATCOs who...?’ corroborate to answer the first research question. Descriptive statistics of these responses, in terms of means (*M*) and standard deviations (*SD*), revealed the situations that were perceived as the most and least frequent in the participants’ opinion, as shown in Table 4. Nonetheless, a variation of *M* = 1.89 (Q32.1) to *M* = 5.38 (Q15.1) in a scale from 1 to 6, confirms that all situations do occur in RT communications, based on the sample analyzed.

Table 4. All respondents’ perceptions per section – Frequency of occurrence

All respondents	Least frequent	Most frequent
Section II – 10.1 to 17.1	Q 12.1 (<i>M</i> =3.00, <i>SD</i> =1.41)	Q 15.1 (<i>M</i> =5.38, <i>SD</i> =0.79)
Section III – 18.1 to 34.1	Q 32.1 (<i>M</i> =1.89, <i>SD</i> =1.06)	Q 33.1 (<i>M</i> =3.60, <i>SD</i> =1.35)

It was anticipated that responses from Section II questions (e.g., Q15.1 – compliance with orders/rules, and Q12.1 – be concerned with both parties’ images and group interests), would be rated higher as they presented expected practices in international communications, while Section III questions (e.g., Q32.1 – be unwilling to help) would probably be rated as less frequent because they included situations that may pose a threat to safety. Concern arises from the fact that Q33.1 (use of non-standard phraseology), was rated as the most frequent from Section 3. This means that many respondents from the analyzed sample are encountering pilots and ATCOs who are not complying with radiotelephony standard expressions, which may be a serious threat to safety, especially due to the increasing number of NNSs of English involved in RT communications around the world.

Apart from displaying results from all respondents (N=38), comparing different groups’ opinions on how frequently they encounter certain situations revealed a lot of similarities, but also some differences in perception of the impact of culture on RT communications. For

example, pilots and ATCOs agreed on the most frequent situations from both Sections II and III and the least common one from Section II, which are the same shown in Table 4, but had a different opinion on the least frequent situation from Section III. Interestingly, this pattern repeated for all three types of comparisons/contrasts that were conducted: pilots vs. ATCOs, NSs vs. NNSs of English, and males vs. females. Similar to pilots and NNSs of English, males considered Q32.1 (be unwilling to help) as the least frequent situation, whereas females, like ATCOs, ranked Q 24.1 (engage in upfront and aggressive conflicts) as the least frequent one. NSs of English, on the other hand, ranked Q27.1 (be reluctant to share critical information about a fact/state) as the least frequent situation in Section III. Comparison of perceptions across groups were also portrayed as graphic representations (for some examples, see slides 10, 11 and 12 of the Workshop Presentation, in Additional Files).

It was also possible to find evidence from the survey open-ended responses to support the validation of the sub-categories from the provisional taxonomy, and thus to answer the first research question. Figure 1 presents the number of valid comments for each sub-category organized according to the Magnitude Codes attributed, i.e., if the comment contradicted the sub-category, was neutral or validated it.

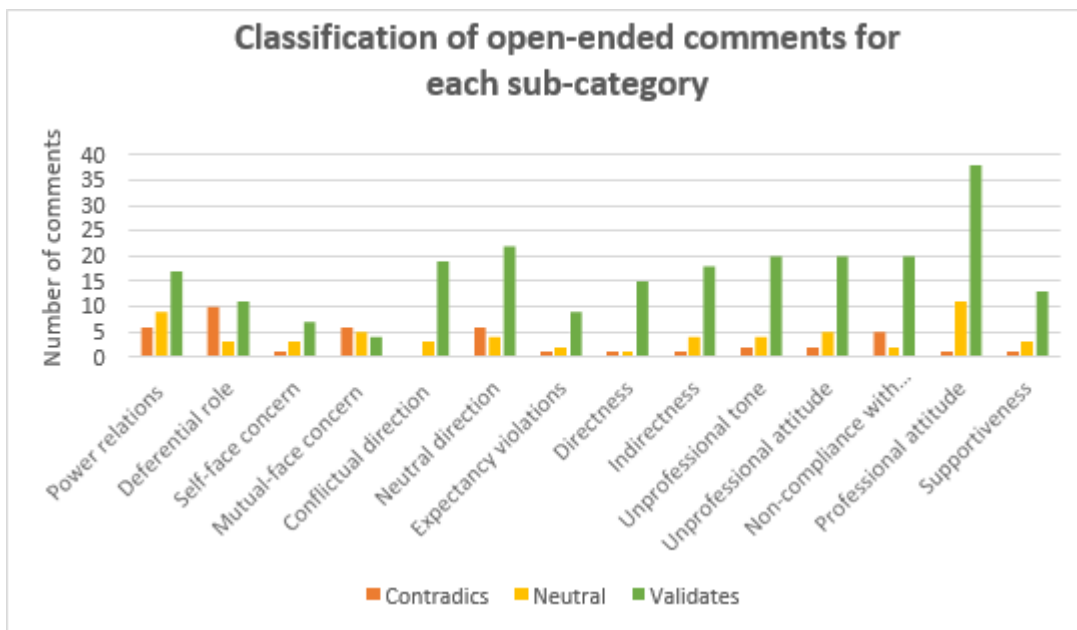


Figure 1. Summary of Magnitude Coding (Contradicts, Neutral, Validates) of survey open-ended responses

As can be seen, all sub-categories received more comments that validated the situations presented in the questions than contradicted them, except for the sub-category of mutual-face concern, operationalized in the questionnaire by Q12 (be concerned with both parties’ images and group interests). However, in six comments from other questions, reference was made to the construct operationalized in Q12, which contributed to its validation.

Participants’ use of expressions such as “very common in the USA”, “it’s easy to find”, “it happens sometimes”, “it still happens” in their comments, support the confirmation that the situations presented in the questions are real instances in international RT communications. Due to limitations of space, a detailed discussion of how participants’ open-ended responses support the validation of the sub-categories will not be presented in this paper. However, as

these comments were used in the workshop activities to trigger group discussions, a few of them have been selected and are presented *ipsis litteris* in Appendix C, as anonymous quotes. For the purpose of providing a better understanding of the participant’s perspective portrayed in the quote, the group (pilot vs. ATCO), gender (male vs. female) and language background (English as L1 vs. English as L2) of the respondent is provided.

To conclude, regarding the analyzed sample, the intercultural factors arising from international pilot-ATCO communications that can affect the way they interact in the English language are the ones displayed in the provisional taxonomy (see Table 2), as validated by survey participants.

2.2.4.2. Research question 2.

To what extent do experienced pilots and ATCOs perceive the potential threats of intercultural factors to the safety of radiotelephony communications?

Evidence to answer this question comes mainly from the quantitative phase, but also from participants’ open-ended comments. Responses to the questions ‘How important is this?’, in Section II, and ‘How important were these events as potential threats to safety?’, in Section III, provide the answer to this research question. Descriptive statistics of the survey questions revealed the situations that were considered the most and least important in the participants’ opinion, as shown in Table 5. Nonetheless, a variation of $M = 3.45$ (Q20.2) to $M = 5.97$ (Q14.2), in a scale from 1 to 6, indicates that all situations were considered important and related to the safety of RT communications, based on the sample analyzed.

Table 5. All respondents’ perceptions per section – Importance to safety

All respondents	Least important	Most important
Section II – 10.2 to 17.2	Q 12.2 ($M = 4.48, SD = 1.29$)	Q 14.2 ($M = 5.97, SD = 0.16$)
Section III – 18.2 to 34.2	Q 20.2 ($M = 3.45, SD = 1.54$)	Q 26.2 ($M = 5.56, SD = 0.82$)

The situation that was considered the least important as a potential threat to safety was the one presented in Q20.2 (respond in a deferential/submissive style and use excessive politeness), from Section III. Surprisingly, although politeness per se may not be a risk to safety, its excess might compromise effective communication and, above all, a deferential style coming from issues of power relations, may inhibit a pilot or ATCO to interact assertively. At the other extreme, Q14.2 (be concerned with safety and potential complications), from Section II, was rated as the most critical to safety. No doubt, this should be the driving force of all involved in aeronautical communications and operations: to strive for safety and be aware of and prepared to deal with unexpected situations. Moreover, Q 26.2 (speak in a confusing and unclear way) was considered the most important from Section III. In ordinary conversations this style is not desirable, much less in safety-critical communications as aviation radiotelephony, in which being clear, concise and unambiguous is the norm. However, certain cultures are known to be more direct, objective and right to the point, whereas others not so much.

Pilots’ perceptions of importance to safety were exactly the same as the ones presented in Table 5. ATCOs, NNSs of English and males, on the other hand, had a different opinion in relation to the most important situation from Section III. The three groups rated Q 34.2 (to encounter pilots who do not comply with ATCO’s orders/ATCOs who do not comply with

rules), as the most critical one as a potential threat to safety. In Section II, apart from Q14.2 (be concerned with safety and potential complications), females rated as equally important responses to Q16.2 (speak in a professional tone) and to Q15.2 (to encounter pilots who comply with ATCOs' orders/ATCOs who comply with rules). In relation to the least important situation, males' and females' opinions diverged in Section III. Males rated Q20.2 (respond in a deferential/submissive style and use excessive politeness) as the least important situation, whereas females considered Q22.2 (be concerned with preserving their own images and interests) as the least critical to safety. Comparison of perceptions across groups were also portrayed as graphic representations (for some examples, see slides 14, 15 and 16 of the Workshop Presentation, in Additional Files).

Participants' open-ended responses also illustrate their perceptions of the importance of intercultural factors to the safety of pilot-ATCO communications using the English language, as potential triggers of incidents and accidents. Statements such as "in the name of safety", "crucial for a better understanding and for safety", and "very important for safety", corroborate to answer research question 2.

In sum, it is possible to say that pilots and ATCOs in this sample perceived, to a great extent, the potential threats of intercultural factors to the safety of radiotelephony communications. Although to different degrees, participants considered that all intercultural factors operationalized in the questions are important to safety.

A last figure (Fig. 2), comparing the means for frequency and importance per question, discloses the fact that the frequency of occurrence of intercultural factors that can affect pilot-ATCOs communications was generally lower than their perceived importance as a potential threat to safety. However, based on the frequency means it is possible to state that all situations do happen in international RT, from the survey respondents' perspectives.

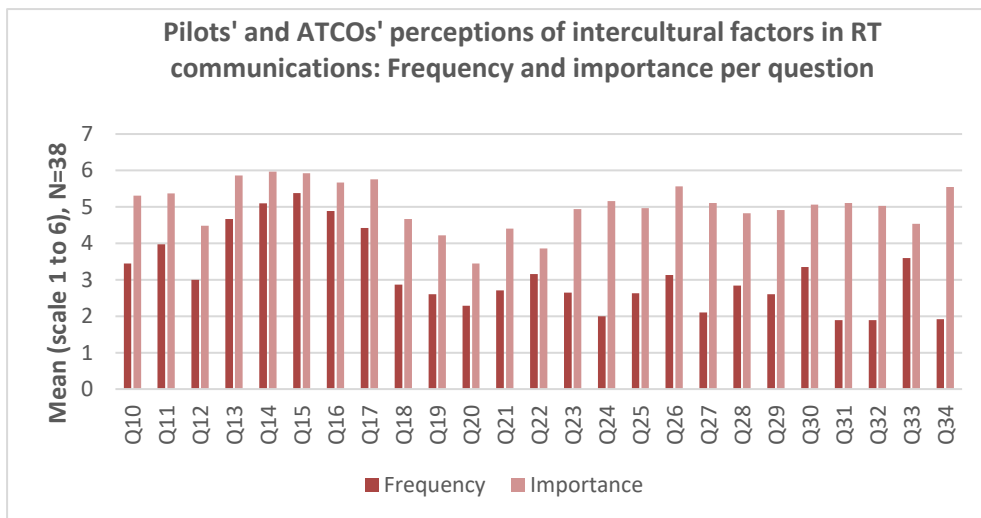


Figure 2. Comparison of means for frequency and importance per question

As a final comment, considering that most of the analyzed scenarios disclosed a combination of intercultural factors at play, which were validated by survey participants, interlocutors should be aware of their impact and develop skills on how to accommodate to differences and be effective intercultural communicators. Clearly, it is not just a matter of being proficient in the English language.

3. Workshop Activities

After presenting my research study on culturally influenced factors arising from international radiotelephony communications, workshop participants were invited to engage in group discussions based on research subjects' (i.e., pilots and ATCOs who responded to the online survey) open-ended comments, which expressed their perceptions of those factors and potential threat to aviation safety. My goal was to trigger insightful discussions among distinct groups of aviation stakeholders based on empirical data. Not only did I aim to raise awareness of communication problems that do occur in pilot-ATCO intercultural radio exchanges but also to provide an opportunity for consideration of possibilities to address those problems within the aviation community.

3.1. Participants.

Two sessions of my workshop (Workshop A) were conducted during the Conference, giving delegates the opportunity to attend Workshop B as well. Therefore, in the first session around 41 participants engaged in the proposed activities, whereas in the second this number increased to 47, including both native and non-native speakers of English from different regions of the world. Their professional background comprised pilots, ATCOs, AE teachers, AE examiners/test developers, researchers, regulators, Human Factors specialists, and Applied Linguistics specialists.

3.2. Materials.

Workshop participants were divided in groups and each group received: i) a set of 3-6 comments from pilots' and ATCOs' open-ended responses to the online survey; ii) a yellow handout, where participants wrote their responses, comments, suggestions, etc (Appendix D); a blue handout, containing the online survey questions and their respective numbers (Appendix B); and iv) a white handout, providing relevant definitions, theoretical framework and a list of references that appeared during the workshop presentation (Appendix E).

3.3. Procedures.

In Part I, workshop participants were asked to read and discuss in groups the set of comments they received in order to:

1. Identify the main themes that emerged from the comments;
2. Organize the comments per theme;
3. Decide which dimension(s) – awareness, knowledge, skills and attitudes – best corresponded to each comment; and
4. Rate their importance/significance to aviation safety, on a scale from 1 (Not important) to 6 (Extremely important).

In Part II, based on the themes identified in Part I, workshop participants continued the discussion with group members and were asked to:

1. Repeat the main themes;

2. Brainstorm possible training activities to focus on these themes; and
3. Discuss strategies to address/remediate these issues (e.g., through testing, policy change, regulations, sanctions, etc.).

The groups wrote their responses and comments in the yellow handouts, which were later compiled and analyzed by the researcher.

3.4. Contributions from workshop participants.

First, the themes or topics that emerged from discussions during the two workshop sessions were organized according to the taxonomy of intercultural factors presented during the workshop introduction. As some groups used the level of categories, others the level of sub-categories and some used the even more detailed level of codes while referring to the themes/topics identified, it was important to keep the hierarchy of the taxonomy while at the same time preserving participants' own expressions, but placing them in the associated category. By doing so, it was then possible to count the total number of occurrences for each category of the taxonomy. Table 6 presents these findings and reveals that the categories related to "Non-collaborative behavior", "Collaborative behavior", "Power distance" and "Conflict management" comprised the greater number of themes/topics identified by workshop participants. Two new themes/topics emerged from the discussions and appear in the last two lines of Table 6: expectations based on gender and lack of language proficiency. Although the first refers to one of the 'layers of culture' (Hofstede, 1991) or 'discourse systems' that we are members (Scollon & Scollon, 2001), the second is related to linguistic factors.

Table 6. Themes that emerged during group discussions and their importance to safety

Themes that emerged during group discussions	Number of Occurrences	Importance to safety (1-2-3-4-5-6)
Power distance	6	M=4.83, SD=0.82
Power relations/excessive authority/power	8	M=4.79, SD=0.81
Deferential role	3	M=6.00, SD=0.00
Sub-total:	17	
Face-work strategies	3	M=5.25, SD=0.35
Self-face concern	2	M=5.00, SD=0.00
Mutual-face concern	0	NR ^a
Sub-total:	5	
Conflict management	9	M=5.56, SD=0.49
Conflictual direction (arguments on the RT)	2	M=4.00, SD=0.00
Neutral direction (accommodation)	1	M=3.00, SD=0.00
Expectancy violations/communication expectations and reality	4	M=5.33, SD=0.58
Sub-total:	16	
Communication styles	7	M=4.64, SD=1.03
Directness (efficiency)	3	M=4.00, SD=0.00
Indirectness (linguistic behavior)	2	M=2.00, SD=0.00
Sub-total:	12	

Non-collaborative behavior	10	M=4.72, SD=0.75
Unprofessional tone (impatience/sarcasm)	2	M=4.00, SD=0.00
Unprofessional attitude (unwilling to help)	5	M=4.80, SD=0.45
Non-compliance with rules (lack of standard phraseology)	8	M=5.60, SD=0.89
Sub-total:	25	
Collaborative behavior	6	M=4.60, SD=1.08
Professional attitude (safety, seeking clarification, readbacks)	14	M=5.65, SD=0.41
Supportiveness	2	M=6.00, SD=0.00
Sub-total:	22	
Expectations based on gender	1	NR ^a
Lack of language proficiency	1	M=6.00, SD=0.00

^aNR= Not Rated

Second, the ratings related to the participants' opinions on the importance to safety of each comment (on a scale from 1 to 6) were also compiled according to the taxonomy organization. These data were inserted into the statistical software SPSS, version 23, and analyzed using descriptive statistics, in order to extract mean values (*M*) and standard deviations (*SD*) for each category and sub-category (see last column of Table 6). Thus, it was possible to distinguish the most critical themes/topics to the safety of intercultural air-ground communications from the workshop participants' perspective, namely: deferential role and supportiveness ($M=6.00$, $SD=0.00$), professional attitude ($M=5.65$, $SD=0.41$) and non-compliance with rules ($M=5.60$, $SD=0.89$). Only two themes were rated as 3.00 or below in terms of importance to safety in a scale from 1 to 6: neutral direction, specifically the act of accommodating to restore neutral/non-conflictual communication ($M=3.00$, $SD=0.00$) and indirectness, the act of speaking in a confusing and unclear way, which was considered by workshop participants as a linguistic behavior ($M=2.00$, $SD=0.00$). Paradoxically, pilots and ATCOs from the research study considered speaking in a confusing and unclear way as the most important situation as a potential threat to safety from Section III questions.

Further, in relation to the dimensions (awareness, knowledge, skills and attitudes) that best corresponded to each comment, their frequencies were summed up separately, so as to give an idea of the total number of references to each of the four dimensions. It is important to note, however, that the groups attributed more than one dimension to the majority of the comments they analyzed. This confirms that most of the time it is difficult to isolate only one dimension (e.g., awareness) that needs to be addressed when dealing with an intercultural communication issue, but rather a combination of them. In addition, it supports the fact that models of intercultural communicative competence (e.g., Byram, 1997) and explanations of its dimensions (e.g., Fantini, 2000) address awareness and attitude along with knowledge and skills. Considering the two workshops together, the total number of references to each dimension was as follows: attitude (AT) = 57, awareness (AW) = 35, knowledge (K) = 17, and skills (S) = 16, with very similar results in the two separate sessions.

Finally, the training activities put forward by the workshop groups were also organized in Table 7 based on the categorization of intercultural factors. These suggestions represent brainstormed ideas, which may assist teachers in the development of classroom activities, according to the needs of their students. In the same way, the proposed strategies to address or remediate issues related to the identified topics/themes may inform the development or amendment of regulations, manuals, training and testing policies, among other related actions.

Table 7. Contributions from workshop participants – Training activities and strategies to address/remediate issues

Themes/topics	Brainstorming of possible training activities	Strategies to address/remediate issues (e.g. through testing, policy change, regulations, sanctions, etc)
1. Power distance	Workshops for both pilots and ATCOs to address communications and the promotion of safety culture Grouping of pilots and ATCOs to work together Problem-solving situations /Practice of real scenarios / Role-plays (change roles)	Team Resource Management (TRM) training
1.1 Power relations/excessive authority/power	Role-plays, switching roles Military experience transition training – awareness of military culture challenges Analysis of examples/scenarios Discussion of consequences Teaching of phrases to handle this situation Simple CRM training	
1.2 Deferential role	Role-play activities and debate of relevant topics Practice of word families to increase vocabulary	
2. Face-work	Recognition of positive face Simulation/role playing with further discussion	Team Resource Management (TRM) training
2.1 Self-face concern	CRM courses for pilots and ATCOs , showing examples of incidents and accidents Awareness raising activities Team work activities / Case study analysis	Policy change: testing and training Updating of procedures and manuals Study of conflict resolutions Sanctions? After investigations? Regulations update
3. Conflict management	Role-plays – reflection on personal responses to stress (neutral expressions?; ignore/respond with silence?) Simulator exercises on maintaining radio discipline Human Factors workshops – tolerance, respect, patience Workshops, scenario-based activities, role-plays Awareness raising / Recognition of markers of politeness Contrasting of examples across cultures/languages Video case studies Creation of inappropriate scenarios to identify problems	Conflict resolution course Pairing ATCOs and pilots Remediate with industry

3.1 Conflictual direction (arguments on the radio)	Cultural awareness Listening practice to identify issues/disagreements Listening activities to defuse and reduce tensions	
3.2 Expectancy violation/communication expectations and reality	Recognition and discussion of problems through listening of actual pilot-ATCO communication	
4. Communication styles	Reinforcement of procedures (drills?) Prioritization (decision-making task?) Awareness of intercultural communication language Role playing – teacher plays the ‘devil’ role	
4.1 Directness (efficiency)	Standard Operational Procedures (SOPs) – practice on how to stick to them and awareness of deviation problems	
4.2 Indirectness (linguistic behavior)	Development of scenarios of bad outcomes due to indecisiveness – discussion of solutions to improve the outcomes Rating exercise of the strength/clarity of expressions For NSs (monolingual) – workshops, so NS can put themselves in the shoes of NNS	
5. Non-collaborative behavior	Recognition and practice of language expressions related to being helpful ATCO + pilots workshops to share experiences Training of pilots and ATCOs with manuals, to reinforce procedures Analysis of samples with good and bad examples Discussion of possible reasons and explanation of this type of behavior	
5.1 Unprofessional attitude (unwilling to help)	Job familiarization between pilots and ATCOs to develop awareness of each other’s issues, pressures, procedures, etc. Role-plays	
5.2 Non-compliance with rules (lack of standard phraseology)	Use of standard ICAO language as course subject	
6. Collaborative behavior	ATCOs and pilots together: problem solving activities, acting each other’s role, brainstorming, using real life material and discussing in groups Role-play with different registers Distractors activity to the point that communication is not so frustrating when difficult situations arise Awareness raising to build pilots’ confidence Team work, group work, pair work / Problem-solving activities	Teaching of phraseology

6.1 Professional attitude (safety, seeking clarification, readbacks)	<p>Role-plays – put the professional in the other’s shoes (ATCO experiencing the difficulties of the cockpit and vice-versa)</p> <p>Scenario-based practical exercises in simulators – to be more assertive</p> <p>Dealing with conflicts – practice with interlocutor being difficult on purpose</p> <p>Awareness raising – CRM and psychological exercises</p> <p>Activities for efficient language use (role-play)</p> <p>Situations relevant to job (role-play then proposal of solutions)</p> <p>Use of real RT as prompt – teams develop solutions, all teams discuss these solutions and compare to original video</p>	<p>Incorporate “assertiveness training” into training program</p> <p>Bring pilots to teach ATCOs and vice-versa</p> <p>Training of NSs of English</p> <p>Standard phraseology training</p> <p>Pairing roles</p> <p>Recommend policy changes</p> <p>Phraseology needs to be re-tested (worst issue – use of non-standard phraseology)</p>
6.2 Supportiveness	<p>Team-work activities</p> <p>Cross-cultural awareness raising Development of scenarios for a team/have the team change roles/resolve the safety issue</p> <p>Responsibility sharing/roles</p> <p>Roleplay and discussions – comparison of supportive vs. non-supportive attitudes</p> <p>Training on awareness of cultural differences</p> <p>Training on ability to work in a multicultural environment</p> <p>Development of strategies aiming at successful communications</p>	<p>Cultural differences testing</p> <p>Policy to oblige pilots and ATCOs to be trained to deal with these issues</p>
7. Lack of language proficiency	<p>Continuous training</p> <p>Development of negotiating skills</p>	

4. Conclusions

By answering the research study questions and by exploring how the cultural background of participants can impact intercultural pilot-ATCO communications, some intercultural factors that can cause misunderstandings and threaten the safety of air-ground communications were identified and key stakeholders' perceptions of those issues became known. Similarities but also some differences in perception across groups of participants were observed, as well as complex connections and relationships that exist among the recognized sub-categories. Most importantly, questionnaire responses suggested that the constructs identified for each sub- category of intercultural factors refer to situations that do happen in international RT communications, which were also considered relevant to safety by the pilots and ATCOs sampled in the research study. Added to that, survey open-ended comments corroborated quantitative findings for each question and substantiated other sub-categories.

Despite sample size (N=38), validation of the provisional taxonomy was possible using mixed methods research. As more evidence was yielded throughout the study, this exploratory sequential MM design increased confidence in the findings and added further insights into the complex phenomena of multicultural RT communications in aviation. However, although comments related to gender issues and a topic referring to 'expectations based on gender' were alluded to in the workshop activities, at this point there is not enough evidence to confirm it as a new category in the taxonomy.

As stated in the purpose of this paper in the Introduction, some implications may be derived from the study's findings and workshop activities. First, the use of the proposed taxonomy as a tool to raise awareness of the identified intercultural factors within the aviation community may increase the effectiveness of pilot-ATC interactions. In addition, the development of pilots' and ATCOs' intercultural communicative competence, whatever their language background, may contribute to more efficient and safer radio communications. This can be achieved by taking into consideration the contributions of workshop participants related to the training of pilots and ATCOs, both NSs and NNSs of English, and also by integrating the strategies proposed to address the intercultural communication issues into policy making, in order to improve language for communication as a human factor.

Effective and efficient communication is not a matter of knowing the language, but knowing how to use the language appropriately taking into account its connection with one's own and others' cultures. Clearly, in the dynamic and intercultural workplace context of aviation RT communications, communicative success is impacted by several layers of culture and achieved through a combination of awareness, knowledge, skills and attitudes.

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Appendix A – Excerpts of the six scenarios analyzed⁶

Scenario 1 – Transcript (Available at <https://www.youtube.com/wATCOh?v=uWg7lpphPc8>)

5	ATCO	[] 845 proceed onto runway 28 now and vacate right onto runway 34, there is traffic behind you waiting to depart.
6	PILOT	Yep, we've just got a phone call standby...
7	PILOT	And [] 845, we are actually fully ready.
8	ATCO	[] 845, line up runway 28 and wait.
9	PILOT	Line up and wait 28, [] 845.
10	ATCO	And for future reference [] 845, err, I suggest you advise the, err, ground controller...that you are unable to take departure yet and you shouldn't really be taxiing out to E1 when you're not ready for departure...because there is traffic behind, waiting, that is ready.
11	PILOT	Standby.
12	ATCO	[] 845, are you fully ready for departure?
13	PILOT	Affirm [] 845, we're just doing the checks whilst err, whilst you keep talking over us, standby.
14	ATCO	Ok, negative! Turn right please onto runway 34. That's the third time I've asked you to vacate onto runway 34 if you are not ready, turn right onto runway 34.
15	PILOT	Madam, we are fully ready, we're just trying to complete the checklists, but err, you just keep interrupting our checks, standby.
16	ATCO	Negative! Turn right onto runway 34, I've asked you three times now! Turn right, to vacate onto runway 34.

Scenario 2 – Transcript (Available at https://www.youtube.com/watch?v=2t_NT7aUrE0)

33	PILOT	And...[] 7997, uh...just want to confirm you the point before Hartford, could you give me the name again, please?
34	ATCO	[] you gonna kill me, what do you want now?
35	PILOT	Okay, ground, (...) checking (...) our routing just the point before Hartford and Partham, could you give me the point again?
36	ATCO	Now sir, you've been given a change of frequency, you'd be talking to the same guy all night long, see? You're going back for a million questions, but let's go over it: MERIT intersection, that's spelled: Mike Echo Romeo India Tango; direct Hartford, that is Hotel Foxtrot Delta; direct Partham, that is Papa Uniform Tango, and then as filed. Do you have any further questions about your route, your taxi route, the route you gotta fly, anything else?
37	PILOT	Not for now, sir, thanks.
38	ATCO	...now. I'm sure in 30 seconds you'll have another one, but continue to the runway.
39	PILOT	Okay.

⁶ These excerpts refer solely to the main parts of each interaction analyzed, which were the ones selected for inter-coder reliability.

Scenario 3 - Transcript (Available at <http://www.planecrashinfo.com/cvr900125.htm>)

14 PILOT Approach, [] zero five, ah, two heavy, we just missed a missed approach, and ah, we're maintaining two thousand and five on the...

15 APPR [] zero five two heavy, [], good evening, climb and maintain three thousand.

16 Captain *(Advise him we don't have fuel.)*

17 PILOT Climb and maintain three thousand, and ah, we're running out of fuel, sir.

18 APPR Okay, fly heading zero eight zero.

19 PILOT Flying heading zero eight zero, climb to three thousand.

20 Captain *(Did you already advise that we don't have fuel?)*

21 FO *(Yes sir, I already advise him, hundred and eighty on the heading. We are going to maintain three thousand feet, and he's going to get us back.)*

22 *(Some time later...)*

23 APPR [] zero five two heavy, turn left, heading zero seven zero.

24 PILOT Heading zero seven zero, [] zero five two heavy.

25 APPR And [] zero five two heavy, ah, I'm going to bring you about fifteen miles northeast, and then turn you back onto the approach, is that fine with you and your fuel?

26 PILOT: I guess so, thank you very much.

27 Captain *(What did he say?)*

28 FE *(The guy is angry.)*

29 *(Some time later...)*

30 PILOT Ah, can you give us a final now? [] zero five two heavy.

31 APPR [] zero five two, affirmative sir, turn left, heading zero four zero.

32 PILOT [] zero five two heavy, left turn two five zero, and ah, we're cleared for ILS.

33 APPR [] fifty two, climb and maintain three thousand.

34 PILOT Ah, negative sir. We just running out of fuel. We okay three thousand. Now okay.

35 APPR Okay, turn left, heading three one zero sir.

36 PILOT Three one zero, [] zero five two.

Scenario 4 - Transcript (Available at <https://www.youtube.com/wATCOh?v=ZWOOKQIEe5s>)

1 ATCO [] 503, where you park?
2 PILOT Bravo 28, Sir.
3 ATCO Not taxiway, the LETTER!
4 PILOT Oh negative sir, we are on 22R holding short of Foxtrot.
5 ATCO What taxiway do you enter the ramp?
PILOT Okay, so we just exit the runway and we're holding short of Foxtrot on 22R.
6 ATCO You are not listening to what I'm asking you. What taxiway do you enter the ramp?
7 PILOT I'm not on the ramp yet, sir.
8 ATCO What taxiway do you enter the ramp. Tell me. What letter?
9 PILOT Okay we can enter at KILO for [] 503.
10 ATCO That's what I need get out of you. We talked like 6 times. Straight ahead and hold short of HOTEL, sir.
11 PILOT Straight ahead, hold short of HOTEL, roger.
(Some time later...)
12 ATCO [...] 503 follow [...] 222, hold short Juliette on the runway.
13 PILOT Yes, we'll follow the [...], and next time I would like you to be polite with me. Thank you.
14 ATCO Okay, but if I got to talk to you 6 times, and I got all other people I got to talk to, and you don't know what I'm saying.
15 PILOT (...)...nice day, polite with me. All right?
16 ATCO Are you impolite with me?
17 PILOT I'll make a report.
18 ATCO Go ahead!

Scenario 5 - Transcript (Available at <https://www.youtube.com/watch?v=P9WzQRxf3uM>)

1 PILOT Could you please confirm we are cleared to ILS 35?
2 ATCO Authorized ILS 35.
3 PILOT [] 417, could you confirm the ILS is serviceable, we are not receiving it.
4 ATCO ILS to 35....out of service, 417
5 PILOT 417,Roger. We are unable to continue this approach. I inquired about the ILS on runway 35 before. I want you to know that I asked you many times if the ILS 35 was operative and you said it was. Tell me, how can it not function anymore?
6 ATCO ([ATCO] does not respond)
(Some time later...)
7 PILOT I am declaring a low fuel.
8 ATCO ([ATCO] does not respond)
9 PILOT [ATCO], [] 417, did you copy?
10 ATCO Affirmative, Sir. Report established on localizer...
11 PILOT OK, we are taking heading 310 and I would like to see the authorities on the ground.
12 ATCO ([ATCO] does not respond)
13 PILOT Did you copy my request about seeing the people on the ground?
14 ATCO ([ATCO] does not respond)
15 PILOT Still low fuel. So I want priority for landing.
16 ATCO ([ATCO] does not respond)
17 PILOT Did you copy, [] 417?
18 ATCO Affirmative, 417.
19 PILOT I will be filling a report about this charade because it's quite amazing what happened.
20 ATCO Can you repeat, please?
21 PILOT I'll be filling a report against you, what happened is truly, truly amazing.

Scenario 6 - Transcript (Available at <https://www.youtube.com/watch?v=ZW00KQIEe5s>)

- 1 PILOT And [], we are VFR under the clouds right now. And if you could give me a (inaudible).
 - 2 ATCO You're not familiar with this airspace?
 - 3 PILOT Yes sir, I'm very familiar with this airspace. But just coming through the clouds now it would be easier if you just give me my heading for a moment.
 - 4 ATCO What kind of NAV equipment do you have on board?
 - 5 PILOT Slant Uniform, VOR sir.
 - 6 ATCO [] fly heading 150. Vectors Mile Square Park.
 - 7 PILOT Okay, we are currently 150 sir. Thank you sir, just wanted a little help. Thank you.
 - 8 ATCO Well, let me give you some advice. We are really busy. We've got one controller working all the airspace and a lot of inbounds coming in, the last airliners coming into John Wayne. I probably don't always have time to hold your hand. Sorry to say that, but that's the truth.
 - 9 PILOT 25 years I have been flying this airspace sir. I've never had a controller talk to me like that.
 - 10 ATCO Well, you are welcome to call me on the phone.
 - 11 PILOT Love to!
-

Appendix B – Questionnaire (Workshop blue handout)

ICAEA International Conference – ERAU, Daytona Beach – May 9-11, 2018
“Building on the ICAO LPRs – Communication as a Human Factor:
New Perspectives on Aviation English Training and Testing”

Workshop Title: Exploring intercultural factors in international pilot-air traffic controller communications: Validating a taxonomy using mixed methods research

Presenter: Ana Lúcia Tavares Monteiro

Organization: Carleton University (Canada) and ANAC (Brazil)

Online survey – Pilots’ and ATCOs’ perceptions of intercultural factors in international radiotelephony communications

Section 2:

I) How often do you encounter ...

Q10 ...pilots/ATCOs who, in a conflict situation, attempt to accommodate and restore neutral communication?

Q11 ...pilots/ATCOs who avoid getting involved in conflicts or arguments?

Q12 ...pilots/ATCOs who are concerned with both parties’ images and group interests?

Q13 ...pilots/ATCOs who are concerned with clarity and efficiency?

Q14 ...pilots/ATCOs who are concerned with safety and potential complications?

Q15 ...pilots who comply with ATCOs’ orders/ATCOs who comply with rules?

Q16 ...pilots/ATCOs who speak in a professional tone?

Q17...pilots who are aware of ATCO’s needs/ATCOs who are aware of pilots’ needs and willing to help?

II) In your view, how important is this?

III) Please comment.

Section 3:

I) How often do you encounter ...

Q18 ...pilots/ATCOs who demonstrate excessive authority or superiority in their speech?

Q19 ...pilots/ATCOs who resort to higher-level authority to solve a conflict?

Q20 ...pilots/ATCOs who respond in a deferential/submissive style and use excessive politeness?

Q21 ...pilots/ATCOs who avoid any kind of disagreement or demand in their speech?

Q22 ...pilots/ATCOs who are concerned with preserving their own images and interests?

Q23 ...pilots/ATCOs who dominate or compete during an argument?

Q24 ...pilots/ATCOs who engage in upfront and aggressive conflicts?

Q25 ...pilots/ATCOs who violate your expectations of a standard flow of communication?

Q26 ...pilots/ATCOs who speak in a confusing and unclear way?

Q27 ...pilots/ATCOs who are reluctant to share critical information about a fact/state?

Q28 ...pilots/ATCOs who show impatience and/or sarcasm in their speech?

Q29 ...pilots/ATCOs who show annoyance and/or arrogance in their speech?

Q30 ...pilots/ATCOs who do not accommodate to less proficient speakers’ needs?

Q31...pilots/ATCOs who seek disagreement and/or make the other feel uncomfortable?

Q32 ...pilots/ATCOs who are unprofessional and/or unwilling to help?

Q33 ...pilots/ATCOs who use non-standard phraseology?

Q34 ...pilots who do not comply with ATCO’s orders/ATCOs who do not comply with rules?

II) How important, in your view, were these events as potential threats to safety?

III) Please comment.

Q35. Please, share any additional comments regarding other communication issues that you feel pose a threat to safety.

Appendix C – A few open-ended comments from the online survey⁷ (Phase 2 of study)

Q21 – “Yes. Sometimes pilots contest our order specially because I'm a woman and this makes my frequency busy”. (ATCO 29, female, English as L2)

Q23 – “There is no room for such persons in aviation. Such behaviour can be very destabilising and threatening to a controller. The basis is generally cultural which thankfully is slowly changing (re CRM/TRM and inter-cultural behaviour programmes)”. (ATCO 4, male, English as L1)

Q24 – “Sometimes the controllers do not take into consideration the real outcome that there response might have”. (Pilot 10, male, English as L1)

Q26 – “Miscommunication might be a threat for aviation. One of such events almost led to a collision because a fellow air traffic controller failed to understand what the pilot really wanted”. (ATCO 5, male, English as L2)

Q26 – “Same comment as in previous question - very common in the USA. Once I've got, for instance the following question: "What can you give me". He was intending to know how fast could I fly. However, this is not the way they should address a pilot, moreover a foreigner”. (Pilot 10, male, English as L2)

Q27 – “It still happens specially when the issue is declaring emergency and that adds workload for the controller that works under the suspicion that he is not holding all the cards and that can really affect safety and efficiency”. (ATCO 13, female, English as L2)

Q28 – “By not showing respect one is not being professional. Impatience has been identified as one of the causes of fatal accidents”. (ATCO 7, male, English as L2)

Q29 – “Just not professional. The controller must accomodate a great deal of varied experience and pilots with different backgrounds”. (Pilot 25, female, English as L1)

Q30 – “Native speakers of English usually tend to take for granted foreing/non-native air traffic controllers. Some of the events I witnessed almost led to colissions”. (ATCO 5, male, English as L2)

Q30 – “It's easy to find this kind of behavior in regions OR countries where the mother language is English, the air controllers ONLY speak English and NEVER had the need to know how to speak another language, besides the English language (lack of empathy in communications with foreigners). For example, it happens sometimes with United States air controllers. Sometimes, it looks like that they don't care if they are being understood, and if the pilot ask "say again", they repeat the same words and they are not able to say the same information using another words (lack of the ability to paraphrase)”. (Pilot 8, male, English as L2)

Q32 – “Sometimes it happens. These pilots often think only about themselves and don't care about the possible problems that this attitude may cause. They want all the advantages to themselves. Controllers must be alert to this type of pilots so that they cannot interfere with his job and jeopardize safety”. (ATCO 3, male, English as L2)

Q33 – “Some times it happens, mainly between natives air controllers and pilots that use and accept the same slangs, but it's not good for foreign pilots using the same radio frequency, because may put in risk the safety of the flight”. (Pilot 8, male, English as L2)

Q33 – “It happens ALL time everywhere. Pilots are also guilty”. (Pilot 17, male, English as L2)

⁷ The comments have been copied *ipsis litteris* from the actual online texts produced by the participants, and have not been corrected for any typos or grammatical/lexical mistakes.

Appendix D – Workshop yellow handout

ICAEA International Conference – ERAU, Daytona Beach – May 9-11, 2018 “Building on the ICAO LPRs – Communication as a Human Factor: New Perspectives on Aviation English Training and Testing”

Workshop Title: Exploring intercultural factors in international pilot-air traffic controller communications: Validating a taxonomy using mixed methods research

Presenter: Ana Lúcia Tavares Monteiro

Organization: Carleton University (Canada) and ANAC (Brazil)

a) Please write the number of participants in your group according to their roles. If anyone has overlapping roles, include him/her in the option that best represents his/her main activity:

pilots ATCOs aviation English teachers aviation English examiners/test developers
 researchers regulators Human Factors specialists other: _____

b) Please write the number of participants in your group according to their language background:

English as L1 English as L2/foreign language

c) Do you consent to use your notes anonymously for research purposes? Yes No

Part I: Your group will receive 3-6 selected comments from pilots’ and ATCOs’ open-ended responses to the online survey. Discuss them with group members and:

- 1) Identify the main themes that emerge from the comments;
- 2) Organize the comments per theme;
- 3) Decide which dimension(s) – awareness, knowledge, skills and attitudes – best correspond(s) to each comment;
- 4) Rate their importance/significance to aviation safety, on a scale from 1 (Not important) to 6 (Extremely important).

Themes	Comments per theme	Awareness (AW), knowledge (K), skills (S), attitudes (AT)	Importance to safety 1 – 2 – 3 – 4 – 5 – 6
e.g., Power distance	e.g., Comment # 2	e.g., K	e.g., 5
	# 7	AW + AT	6
1)			
2)			
3)			

Part II: Based on the themes identified in Part I, continue the discussion with group members and:

- 1) Repeat the main themes
- 2) Brainstorm possible training activities to focus on these themes
- 3) Discuss strategies to address/remediate these issues (e.g., through testing, policy change, regulations, sanctions, etc.).

Themes	Training activities	Strategies to address/remediate issues
1)		
2)		
3)		

Thank you for your participation!!
If you have any further comment, do not hesitate to contact me at
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Appendix E – Workshop white handout

ICAEA International Conference – ERAU, Daytona Beach – May 9-11, 2018 “Building on the ICAO LPRs – Communication as a Human Factor: New Perspectives on Aviation English Training and Testing”

Workshop Title: Exploring intercultural factors in international pilot-air traffic controller communications: Validating a taxonomy using mixed methods research

Presenter: Ana Lúcia Tavares Monteiro

Organization: Carleton University (Canada) and ANAC (Brazil)

Theoretical framework:

➤ **Discourse and Pragmatics:**

Speech Acts Theory (Austin, 1962)

Facework and politeness strategies (Brown & Levinson, 1987)

Impoliteness theories (Culpeper, 1996)

➤ **National cultural dimensions (Hofstede, 1991)**

Individualism-collectivism, power distance, masculinity-femininity, uncertainty avoidance

➤ **Theories of cross-cultural communications:**

Face-negotiation theory (Ting-Toomey, 2005)

Conversational constraints theory (Kim, 2005)

Communication accommodation theory (Gallois, Ogay & Giles, 2005)

Expectancy violations theory (Burgoon & Hubbard, 2005)

Anxiety/uncertainty management theory (Gudykunst, 2005)

➤ **Intercultural communication:**

Intercultural communicative competence (Byram, 1997; Lussier, 2007)

English as a lingua franca (Jenkins, 2000; Seildhofer, 2001)

Intercultural communication: A discourse approach (Scollon & Scollon, 2001)

Interculturality (Kecskes, 2014)

Intercultural awareness (Baker, 2011, 2016)

Definitions:

Intercultural communicative competence (ICC) – “someone with Intercultural *Communicative* Competence is able to interact with people from another country or culture in a foreign language. They are able to negotiate a mode of communication and interaction which is satisfactory to themselves and the other and they are able to act as mediator between people of different cultural origins” (Byram, 1997, p. 71).

English as a Lingua Franca (ELF) – “an additionally acquired language system which serves as a common means of communication for speakers of different first languages” (Jenkins, Cogo & Dewey, 2011, p. 283).

Intercultural communication: A discourse approach – “Each of us is simultaneously a member of many different discourse systems. We are members of a particular corporate group, a particular professional or occupational group, a generation, a gender, a region, and an ethnicity. As a result, virtually all professional communication is communication across some lines which divide us into different discourse groups or systems of discourse” (Scollon & Scollon, 2001, p. 3).

Interculturality - “a phenomenon that is not only interactionally and socially constructed in the course

of communication but also relies on relatively definable cultural models and norms that represent the speech communities to which the interlocutors belong” (Kecskes, 2014, p. 14).

Culture is “neither relatively static nor ever-changing, but both” (Kecskes, 2014, p. 4). He argues that culture has a priori elements (ethnic or cultural marking in communicative behavior) and emergent features (co-constructed in the moment of interaction), which should be combined to approach culture in a dialectical and dynamic way (p. 5).

Intercultural awareness (ICA) – “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” (Baker, 2011, p. 202).

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What Should We Teach Native English Speakers?

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1. Introduction

While non-native English speakers (EL2) aviation professionals must attain ICAO ELP Level 4 and are tested for the comprehension of a variety of accents, native English speakers (NES) are not. This paper reports on the outcomes of a workshop held at the 2018 ICAEA Conference, titled “What should we teach Native English Speakers?”. Groups of Aviation English teachers, Air Traffic Controllers, pilots and representatives of aviation regulators explored the different ways in which NES and EL2 student pilots approach Aviation English and learn to communicate while learning to fly. The aims of the workshop were to foster a discussion of the ways participants may have already prepared NES to deal with EL2 pilots or ATC, and to elicit suggestions of what could or should be included in a syllabus for NES, with the aim of raising their awareness of the difficulties faced by EL2s and of ways to alleviate those.

The starting point was a presentation of the ICAO guidelines for Native English Speakers (ICAO, 2010), with specific questions about what they mean in practice. A participant worksheet (see Appendix) was then used to guide group discussions and to collect suggestions. The discussion focussed on specific approaches to prepare NES pilots and ATCs to not only master radiotelephony phraseology in their production, but also how to understand EL2 pilots and ATCs. Fifteen (15) groups of 2-5 people returned the worksheet after group discussion of the questions during the two workshop sessions. Section 4 presents a summary and an analysis of those answers, with a discussion of the suggestions proposed by the workshop participants. Unsurprisingly, there was agreement that training for NES pilots should include comprehension of a variety of accents and an understanding of the difficulties EL2 pilots may experience, confirming findings and recommendations made recently by Clark (2017) and Borowska (2017).

2. Background

Our research on Aviation Communication (Estival, Farris, & Molesworth, 2016; Jang, Molesworth, Burgess, & Estival, 2014; Molesworth & Estival, 2015; Wu, Molesworth, & Estival, 2018) explores the types of errors made by pilots under different conditions. In particular, our experiments in a flight simulator (Australian General Aviation pilots) and our later analysis of LiveATC data (Commercial Aviation) show different behaviours by NES and EL2 pilots at different stages of their training. Overall NES pilots made fewer

¹ Dominique Estival holds a PhD in Linguistics from the University of Pennsylvania. As a linguist, her research spans the computational modelling of language change, machine translation, linguistic engineering, spoken dialogue systems and aviation communication (Estival, Farris & Molesworth, 2016). As a pilot and a flight instructor in Australia, she has first-hand experience of student pilots’ difficulties with radio communication and she studies how pilot training, language background and contextual factors affect pilots’ ability to follow the mandated phraseology.

communication errors than EL2 pilots but the EL2/NES distinction was confounded by other factors.

In the flight simulator experiments (Estival et al., 2016; Molesworth & Estival, 2015), there was no difference between EL2 and NES pilots under conditions of higher information density and greater pilot workload, while faster ATC speech rate proved significant only for low qualified (i.e. PPL or less) pilots: not only did higher ATC speech rate have a significant impact only on low qualified EL2 pilots, but the type of error varied significantly between low qualified EL2 and NES pilots. Low qualified NES pilots made more mistakes than omissions (they need to be taught to think before speaking), while low qualified EL2 pilots made more omissions than mistakes (they need to be encouraged to speak). There was no significant impact of ATC speech rate for high qualified (CPL or higher) pilots, nor a significant difference on the type of error they made, showing that with higher qualification and more training, both groups perform equally well (with an accompanying decrease in mistakes for NES pilots and a comparative apparent increase in mistakes for EL2 pilots).

In the LiveATC data we analysed for Sydney Approach and Departures (Wu et al., 2018) we observed a significant impact of higher information density on the number of errors made by accented pilots, and a difference in the type and category of errors made by native English sounding versus accented pilots. For the type of errors, there were omissions in the readbacks of both native English sounding and accented pilots, but mistakes only in the readbacks of accented pilots. For the category of error, while there were more errors with words for accented than native English sounding pilots, there was no difference for errors with numbers.

Discussion about Aviation English is more often centred on the need to teach English to non-English speakers and on the most efficient ways to do so (e.g. Aiguo, 2008; Alderson, 2009; Farris, Trofimovich, Segalowitz, & Gatbonton, 2008; Henley & Daly, 2004; Kim & Billington, 2016; Kim & Elder, 2009; Moder, 2013; Moder & Halleck, 2009; Paramasivam, 2013; Tajima, 2004; Tiewtrakul & Fletcher, 2010) but the non-compliance of Native English Speakers with the phraseology is arguably as much a problem for international aviation communication as the difficulties that non-native speakers of English may have. For instance, Clark (2017) identified particular issues with the way NES produce radio transmissions: deviation from standard phraseology and not adhering to ICAO number pronunciation. She proposed several recommendations, as given in Table 1.

Table 1. Recommendations for NES (Clark, 2017:32)

<ul style="list-style-type: none">• Native English speakers should think of English in the flight deck or over the radio as not English as they know it, but instead as a different ‘language’.
<ul style="list-style-type: none">• On-going language awareness training should be implemented.
<ul style="list-style-type: none">• Language awareness training should emphasise the elimination of local slang and non-standard phraseology.
<ul style="list-style-type: none">• Language awareness training should incorporate awareness of non-native English listeners in training.

These recommendations echo and reinforce the guidelines provided by the International Civil Aviation Organization in Doc 9835 (ICAO, 2010).

1. The ICAO guidelines for Native English Speakers

ICAO has long identified as a potential problem for aviation communication the fact that, given the use of English as the international language of aviation, Native English Speakers not only have a perceived advantage over speakers from other linguistic backgrounds but may also have a different approach to aeronautical communication, taking it as licence to use conversational English instead when it is not appropriate. For that reason, ICAO provides specific recommendations and guidelines for NES (ICAO, 2010). More specifically, ICAO (2010) recommends: a) that NES production must be intelligible (see Table 2), and b) that NES must be aware of potential difficulties for EL2 (see Table 3)

Table 2. NES production must be intelligible (ICAO, Doc 9835)

3.3.3 [...] users with high proficiency must <i>accommodate their use of language</i> so as to remain intelligible and <i>supportive to less proficient</i> users.
4.5.3 [...] e) Proficient speakers shall use a dialect or accent which is <i>intelligible to the aeronautical community</i> .

Table 3. NES must be aware of potential difficulties for EL2 (ICAO, Doc 9835)

4.5.10 [...] native speech should not be privileged in a global context.
5.3.2.1 [...] the burden for improved communications should not be seen as falling solely on non-native speakers.
5.3.1.3 [...] Native speakers of English, in particular, have an ethical obligation to <i>increase their linguistic awareness</i> and to take special care in the delivery of messages.

We can say anecdotally that in countries where English is the official language, even senior flight instructors are rarely aware of these recommendations. In Australia, where there is testing of ELP for NES for comprehension of other English accents, awareness of the speaker's own linguistics characteristics is not emphasized. Meanwhile there is no training or testing of NES pilots for ELP in the US, in spite of the recent FAA circular which "clarifies the FAA English standard" (Federal Aviation Administration, 2017).

ICAO (2010) also spells out specific strategies for NES for better cross-cultural communications, as shown in Table 4.

Table 4. Strategies for better cross-cultural communications (ICAO, Doc 9835)

5.3.1.4 [...] b) native and other expert users of English can acquire <i>strategies to improve cross-cultural communications</i> ;
5.3.1.4 [...] c) native and other expert users of English can <i>refrain from the use of idioms, colloquialisms and other jargon</i> in radiotelephony communications and <i>can modulate their rate of delivery</i> ; and

5.3.1.4 [...] d) native speakers are under the same obligation as non-native speakers to ensure that their variety of English is comprehensible to the international aviation community.
5.3.3.2 In this context, native speakers aware of the challenges faced by speakers of English as a foreign language (EFL) can take greater care in their speech. Native and highly proficient speakers can, for example, focus on <i>keeping their intonation neutral and calm</i> , admittedly difficult at busy control areas, but a good strategy to calm the language anxiety of an EFL speaker. They can take particular care to be explicit, rather than indirect, in their communications and train themselves away from the use of jargon, slang and idiomatic expressions. They can ask for readbacks and confirmation that their messages have been understood. They can also attend more carefully to readbacks in cross-cultural communication situations, <i>taking greater care to avoid the pitfalls of expectancy</i> , where a pilot or controller expecting a given result unconsciously affects the outcome. Additionally, a slower rate of delivery seems to make speech more comprehensible; therefore, taking care to <i>moderate speech rate</i> is a common-sense approach to improving communications.
5.3.3.7 While accent can sometimes be difficult to control, speakers can control intelligibility by <i>moderating the rate of speech, limiting the number of pieces of information per utterance, and providing clear breaks between words and phrases</i> .
5.3.5.2 [...] While communication errors will probably never completely go away, disciplined use of ICAO standardized phraseology, compliance with the ICAO language proficiency requirements, alert awareness of the potential pitfalls of language, and an understanding of the difficulties faced by non-native English speakers will enable pilots and controllers to more readily recognize communication errors and work around such errors.

The question is whether this in fact happens and whether NES are even made aware of these obligations. The discussions during the workshop at ICAEA 2018, and the answers provided by the workshop participants on the worksheet (see Appendix 1) demonstrate that this is not the case.

2. Answers from the workshop participants

In total, 15 worksheets were returned at the end of the workshop. Most groups spent more time discussing the first question, and some did not answer any of the other questions. In the tables given below, the number of answers returned for each question is given in brackets. The full answers to all the questions can be found in the online document where they were entered by the author after collating the paper worksheets². As the answers to Question 1 and Question 2 were very detailed, Table 5 and 6 provide summaries as well as the breakdown of answers for those questions.

² <https://docs.google.com/document/d/1cTWn0Iyj0LJpMdeSzCBRUjOF0uBGyNfbEqrDaqLPCWM>

Table 5. Q1. What do you think are the most important requirements³ for NES regarding communication between NES and EL2 in the aviation context? [15/15]

Summary of answers to Q1	
Strategies for accommodation [8], e.g. simplification [14], speech rate [11], accent [6], paraphrase [3], cross-cultural strategies [3]	44
Awareness of the need to adapt in the international environment	10
Stick to the Standards, Procedures and to Standard Phraseology	7
Attitude: professionalism and patience	4
Training of instructors; Testing; Reviews	4

Breakdown of answers to Q1	
Rate of speech/speak slowly/pace	11
Accommodate/accommodation strategies	8
Stick to the standard. Doc 4444 (ICAO, 2016b), ch.12	6
Keep to essential words/simplify vocabulary	6
Simplify language	6
Accent intelligibility for international community/tone down (NES) accent	5
Cross-cultural strategies (40% pilots from Asia)	3
NES need more awareness of culturally-specific and figurative language / sensitivity to culture	3
Awareness of colloquial vs International phrases/words	3
Paraphrase more simply ('sideways')	2
Awareness of the need to adapt to EL2 / adapt fluency, rate of speech, rhythm	2
"authority" attitude towards EL2	1
Know how to paraphrase if EL2 can't understand	1
Empathy + care	1
Study the procedures where flying (PPs)	1
KISS	1
Exposed to different accents	1
Clarity	1
Enforce re-testing	1
Organising shift meetings as a review of ATC general performance	1
Commonalities across NES countries	1
Attitude (integrity, professionalism)	1
Good 'training the trainer'	1
Experienced instructors mentoring young instructors	1
Patience w/training EL2	1

For Question 2, which asked for instances of communication between NES and EL2, participants were more interested in giving examples of communication failures than examples of successes, with only 2 example of success: one involving the reverse image of the main causes of failure, i.e. good use of standard RT, and one showing the creativity of EL2 when their English vocabulary is failing.

³ The worksheet referred to 'requirements'. Elizabeth Matthews pointed out that strictly speaking, ICAO Doc 9835 (ICAO, 2010) does not give 'requirements' but recommendations and guidance. Only what is in the Annexes is required – and only from the States that have signed.

Table 6. Q2. Examples of NES interacting with EL2: failures and successes [14/15]

Q2.a. Main causes of failures [14/15]	
Summary of answers to Q2.a	
Lack of training in phraseology for NES, deviations from standard phraseology (e.g. “follow the greens”; “twelve ninety five”)	6
Use of slang/jargon/colloquialisms/idioms (e.g. “kill the rabbit”)	5
Attitude: lack of sympathy, lack of patience, culture of superiority towards EL2, non-supportive behaviour, arrogance	4
No exposure to different cultures, lack of awareness of cultural issues	2
Non-compliance with standards, non-compliance with rules	2
NES speech too fast	2
Too much information in the same message (more than 3 pieces); sometimes irrelevant information	1
Rote learning/checklists	1
Q2.b. Main causes of successes [2/15]	
Standard RT + Confirm, Clarify, Check	1
Innovative creation in unusual situation: “the earth going up and down” to express “earthquake”	1

The answers to Question 3, about whether and how NES are taught how to deal with EL2, demonstrate not only the lack of such training, but the perception of the need to provide explicit instruction to NES.

Table 7. Q3. Teaching those requirements to NES - In your own experience: [10/15]

Q3.a. Are they taught? [10/15]	
No	9
Yes	0
Sometimes	1
Q3. b. Which ones? (e.g. being intelligible, being aware of difficulties for EL2) [2/15]	
Given scripts of previous situation. Being aware of difficulties	1
not taught routinely	1
Q3.c. Where are they taught, and by whom? [5/15]	
They should be taught by instructors that are prepared for that and aware of its importance (most likely NNS, experienced pilots or instructors)	1
in cockpit	1
App being developed Beta stage software for self-study (Ohio University) – PlaneEnglish	1
English Language Specialist (Case Study, Test, Role Play)	1
not happening <u>yet</u>	1
Q3. d. How are they taught? (e.g. explicitly, by example, by correction, by rule) [2/15]	
Explicitly. Role Play	1

maybe... CAP-413 for British radiotelephony is an example to teach British pilots & ATCOs to stick to standards	1
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The answers to Question 4, about how NES should be taught, were very detailed and are given in full in Table 8.

Table 8. Q4. How should the ICAO requirements for NES be taught? [11/15]

Q4. How should the ICAO requirements for NES be taught? [11/15]
Standard Phraseology classes for NES, which should include: teaching accommodation skills by analysing samples of real life R/T communications, with breakdowns, with NES and NNES.
NES could be exposed to a variety of accents and there could be some tasks in which they had to understand and role play interactions with NNES.
They should be taught how to be aware, communication strategies.
Case studies
Native English speakers could start to learn other languages so they better understand the challenges
Listen to themselves
Clean up speech (Hesitations)
Teach on the ground first (vocabulary), then intersperse with flight training
Phraseology should be re-tested: <ul style="list-style-type: none"> - Level 4 every 3 years - Level 6 every 6 years
Textbooks based on ICAO for Pilots and ATCs
For ATC: classroom theory; online qualification
Phraseology refresher course
Phraseology testing as part of ground school
Workshop to raise awareness on limiting NES use of idiomatic and figurative in plain language interaction.
Simulator: Competency checks should involve a language element
CRM/TRM should include language as an element of training
For written manuals: expose authors to learning situation of readers/ mechanics
When doing line checks pilots should be evaluated. ICAO requirements should be added to line check
Built into training - initial and recurrent
Video, on line learning
Role-playing and open-ended scenarios
NES should be held accountable
Regulation
Initial training + recurrent training
Part of checklist on which you are assessed.
Case studies of risky situations
Role-play: on a sim position <ul style="list-style-type: none"> - Switch pilot-controller - Pilot-controller synergy training
Impossible to enforce unless it is regulated

→ All aviation authorities must impose RT training (refresher) and testing
It should be a requirement
Something like a short course like Dangerous Goods or Aviation Safety. Once per 2 years.

As shown in Table 9, the answers to Q5 mostly repeat those of Q.4 and confirm the need for explicit training, and testing of NES. The current recommendations would ensure adequate training if they were observed and put into practice.

Table 9. Q5. Should there be other requirements for NES in addition to those in ICAO Doc 9835? [5/15]

Q5.b. If so, what are they? [5/15]
NES shouldn't be automatically rated level 6 but they should undergo testing in Aviation English and Standard Phraseology, in which they would have to prove their ability to apply accommodation skills. If there are reports for communication problems, they should be re-tested.
It should be included in the testing policy (NES should be tested).
Training could also be a requirement (mandatory training)
Should be tested (S.P. for NES)
Incorporated as other task?
Level 6 never gets retesting. Recommend recurrent testing for level 6.
If the ones in 9835 now were adhered to, probably no need for more!
And these requirements should appear in the documents that pilots/controller read: <ul style="list-style-type: none"> - Manual of RTF (Doc 9432, 2007) (ICAO, 2007) - FAA Pilot/Controller Glossary AIM (FAA, 2018) - Doc 4444 (ICAO, 2016b) - Annex 10, vol II (ICAO, 2016a)
Q5.b And how should they be taught [1/15]
See answer 4

Conclusion

It is clear from the answers given by the workshop participants and shown in Tables 5-9 above that there is a strong feeling – at least among the workshop participants – that:

- NES should be taught Standard Phraseology
- NES should be tested regularly
- The recommendations in (ICAO, 2010) should be made mandatory
- Training for NES as well as for EL2 and NES would benefit from case studies and role-playing

Currently, Aviation English is not taught nor tested in the US, which is a serious issue for the rest of the world, where it is not only taught but tested as part of pilot and ATC licencing. Thus, there is compliance with the LPRs around the world, but not in the US.

Incorrect phraseology and miscommunications are not just an issue of safety, they are also a problem for efficiency of operations, causing delays, adding to costs (for the airlines) and inconvenience (for the passengers). Unsuccessful communication requiring repetitions and clarifications can also prevent distress messages from being heard, causing accidents or incidents that are not directly traceable to miscommunication (see also (Matthews, 2018)).

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Intercultural Issues in Air-Ground Communication: A Case Study – Triggers for Miscommunication

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Abstract

Air-ground communication and its intercultural nature is a rich field of analysis for linguists and professionals in the aviation area since it intrinsically encompasses a number of aspects to be taken into account at the moment of speaking. This article is intended to study a specific event, EVA Air Flight BR015, in order to analyze it through triggers for miscommunication - linguistic occurrences that are likely to have caused confusion which, in this case, turned out into a conflict that almost led to a mid air collision and a crash into a mountain. The poor language proficiency of the pilots is mostly evidenced by the lack of immediate compliance with instructions. The air traffic controller (ATCO) does not make use of standard phraseology in a context that would clearly require attention with the unfolding of the situation. Missed readbacks and hearbacks, change of call signs, multiple corrections are also evidence of the ATCO's confusion in this scenario. The identification of some real language features that have potentially accounted for a miscommunication episode is a relevant source of research and may actually be a good strategy for training professionals involved in aeronautical operations to raise their awareness towards the correct language to be used and to develop language and communication skills for aviation safety. Language is a factor in aviation safety and, as such, should be given more attention especially because it entails intercultural features that can be potentially harmful if not trained appropriately.

Keywords: Air-ground communication, Intercultural issues, Miscommunication triggers.

1. Introduction

The main goal of the article² - as was of the workshop, is to provoke some thoughts and discussion on language features that can be considered potentially harmful to trigger miscommunication episodes in the intercultural context of aeronautical communications, more specifically between pilot and ATC. By looking into a specific case, EVA Air Flight BR 015, we try to raise some examples that have accounted for the confusion that could have had a negative ending.

We agree with Farris and Molesworth (2016) when they say that is “important to take a proactive approach in examining the contexts in which these communications take place, for the purpose of understanding the conditions under which these interactions are most likely to be successful” (p. 92).

Our intention is to shed more light on discussions that approach miscommunication and interculturality in aviation, so that we can have more elements as teachers, researchers and aviation professionals to design curriculum and, ultimately offer our contribution to aviation safety.

As it follows, we will see that our case features most of the factors predicted by Prinzo and

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² This article is based on a workshop delivered in May, 2018 at the ICAEA Conference, hosted by Embry-Riddle Aeronautical University, Daytona Beach, FL, USA.

Campbell (2008): As the volume of U.S. and foreign flagship carriers increases, so will the number of transmissions necessary to provide air traffic control (ATC) services. These services include clearances and instructions, as well as traffic and weather advisories, reports, and requests. Given that the present air-ground communications system is reaching pre-9/11 saturation levels during peak traffic periods, it is common for some controllers to send longer and more complex messages to reduce the number of times they need to communicate with individual aircraft (Prinzo, Hendrix, & Hendrix, 2006) and use non-standard phraseology to decrease the amount of time on frequency (e.g., go fast, good rate), or both. The ability to quickly decode, understand, read back, and comply with these messages can be a problem for all pilots, especially those who are unfamiliar with how ATC services are delivered by controllers in a particular region. (p. 1)

2. Analysis

EVA Flight BR 015

The case

EVA 015 performed by a Boeing 777-35EER, was bound to Taipei and departed Los Angeles, LAX Airport on December 16, 2016 at 01.25 local time.³ According to the flight plan, EVA 015 was assigned a Ventura 7 departure - which is 60km to the northwest of LAX.

When it switched to the SoCall departure frequency, it was instructed to climb to 7,000ft on the heading of 090°. The flight was cleared for an easterly heading, presumably, with the intention to turn it further south so that it could follow its prescribed departure route before beginning the oceanic path to the northwest.

The controller, then, cleared the flight to turn to 180° and continue the 7,000ft climb, which was read back by the pilot as “left turn 180°”, not heard back or challenged by the controller.⁴

Following a northerly heading caused a separation issue with another flight, Air Canada AC788. The controller ensured a safe separation by instructing AC to expedite the climb and EVA 015 to stop climbing. At this time, the flight was flying at about 4,800ft.

The controller issued EVA 015 an altitude of 7,000ft and urged it to turn south several times, which is, eventually read back by the pilots, but, for some reason, not complied. The ATCO made repeated use of language that is not comprehended by standard phraseology.

In the developing situation, the flight then headed Mt Wilson (where the highest terrain

³ More detailed information can be found at <https://aviation-safety.net/wikibase/wiki.php?id=192082><http://www.latimes.com/local/lanow/la-me-ln-faa-investigation-plane-wrong-direction-20161220-story.html>; <http://www.jacdec.de/2017/05/18/2016-12-16-eva-air-b777-flew-astray-and-close-to-terrain-east-of-los-angeles/>

⁴ Although “left”, for some reason, was cut on the live ATC audio, we assume it was said because of the pilot’s readback and from information given by an FAA spokesman that can be found at <http://www.latimes.com/local/lanow/la-me-ln-faa-investigation-plane-wrong-direction-20161220-story.html>

elevation is of approximately 5,500ft), coming very close to terrain- an altitude estimated between 6,200 and 6,700. It then picked up the assigned direction, landing safely 14 hours later.

In short, what is observed is a confusing set of instructions given by the ATC that were not immediately complied by the pilots, which caused a conflict and almost led to a mid air collision and a crash into a mountain. The incident is still under formal investigation by the FAA.

In the picture below, we have a depiction of the path the flight ended up taking.



Vasaviation⁵ features an illustration video based on LiveATC audios. Below, we present some selected parts from the transcripts, already labeled for our following analysis.

EVA 15: "Roger, EVA 15 heavy, climbing passing 1,900 for 5,000 "

SoCal Departure: "Hello Eva 015 heavy, SoCal Departure, radar contact, climb and maintain 7,000. Fly heading 090."

*EVA 15: "Climb and maintain 7,000 , **confirm heading ?**" (1)*

SoCal Departure: "Heading 090, to 7,000, EVA 015 heavy."

EVA 15: "Heading 090, 7,000 EVA 015 heavy."

...

*SoCal Departure: "**(unreadable)..180** (2), climb and maintain 7,000." EVA*

*15: "**Left heading 180**, (3)climb and maintain 7,000 EVA 15 heavy." EVA*

15: "EVA 15 heavy, request high speed climb."

SoCal Departure: "EVA 15 heavy, affirmative approved as requested."

EVA 15: " Approved, EVA 015 heavy"

⁵We highly recommend the reader to visit this page https://www.youtube.com/watch?v=tFdXax7Zh_g and watch the video to have more elements for the analysis

SoCal Departure: “..turn right, turn heading 180.”
EVA 15: “**Copied, right heading 180, EVA 15 heavy.,** (4)
SoCal Departure: „heavy, please expedite your right turn.”

EVA 15: “EVA 15 heavy, roger just passing heading 010, **continue right turn heading.,**

SoCal Departure:” Air Canada 788, expedite your turn. Stop your climb and turn -
correction - **expedite your climb and turn left heading 360.**”(5)

ACA 788: “Left 360, stop the climb at 7000’, Air Canada 788.”

SoCal Departure: “EVA 15 heavy, stop your climb !”

EVA 15: “Stop climb, EVA 015 heavy.”

SoCal Departure: Air Canada 788, expedite your climb. Climb and maintain 12000’. “

ACA 788: “Okay, confirm 12000’ for Air Canada 788.”

SoCal Departure: “**EVA 015 heavy, turn left, left turn to a heading of ah.. 29..ah, 270.**”(6)

EVA 15: “Left heading 270, EVA 015 heavy.”

SoCal Departure: “EVA 015 heavy, **what are you doing ?**, (7) turn southbound now !,
southbound now ! Stop your climb.,,”

EVA 15: “**Confirm, EVA 015 heavy, maintain 5,000, left..right, righth heading**
(unintelligible).”(8)

EVA 15 (different voice): “EVA 015 heavy, confirm the heading.”

SoCal Departure: “(unreadable) EVA 015 heavy, **turn southbound, southbound now.**” (9)

EVA 15: “Roger turn southbound now, EVA 015 heavy.”

SoCal Departure: “EVA 015 heavy, climb and maintain 5,000, **and are you southbound now**
? I see you’re going northbound, climb and maintain 6,000.” (10)

EVA 15: “..(unreadable)..south, maintain 5,000, EVA 015 heavy.”

SoCal Departure: “EVA 015 heavy, climb and maintain 7,000.” EVA

15: “Climb and maintain 7,000, EVA 015 heavy.”

SoCal Departure: “015 heavy, **I see you’re going southbound, turn south..cause I see**
you’re going northbound, turn south now, climb and maintain 7,000.” (11)

SoCal Departure: “Cathay 0- correction - Cathay 881, SoCal Departure, radar contact.
Climb and maintain 7000’.”

? **EVA015 “left turn” (12)**

SoCal Departure: “EVA 015 heavy, climb and maintain 7,000 and turn south NOW !”

SoCal Departure:”American 2452, turn right heading 210.”

AAL2452: “Right 210, American 2452”

EVA 15 (different voice): “..(blocked transmission)..right turn to southbound, continue
climb 7,000.”

SoCal Departure: “EVA 015 heavy, affirmative.”

EVA 15: “...continue right turn, climb to 7,000 to **heading 1-8-0. (13)**”

SoCal Departure: American 2552 (14), maintain 5000’ and contact Approach on 124.9 -
24.9; G’day.”

AAL 2452: “Was that for American 2452?”

SoCal Departure: “American 2452, affirmative”

AA2452: “Okay, climb for 5000’ now on 124.9, confirm, for American 2452.”

SoCal Departure: Affirmative, 124.9

EVA 15: “SoCal, EVA 015 heavy, 180, 7,000.”

SoCal Departure: “EVA 015 heavy, affirmative, **climb and maintain, maintain (15) 7,000.**”

EVA 15: ”Maintain 7,000, EVA 015.”

3. Possible triggers for miscommunication

The exchange above clearly shows evidence of confusion with key pieces of information that eventually turn out into a conflict. Analyzing it more carefully, we came up with some “triggers” - language examples that can be considered crucial to have caused miscommunication. The following chart shows (i) the trigger sentence/ word/ phrase extracted from the audio transcripts, (ii) who said that and (iii) the problem itself.

TRIGGER SENTENCE/WORD/PHRASE	SAID BY	PROBLEM
1. “confirm heading?”	The pilot	The pilot points at the necessity of clarification of a crucial unit of information: the heading. Too much information?
2. 1.17 - unreadable “... 180, climb and maintain 7,000”	The ATC	The audio does not show what is said at the beginning of the sentence.
3. “left heading 180”	The pilot	A readback, not confirmed / disregarded by the controller - hearback error
4. “copied, right heading 180, EVA 15 heavy” “continue right turn heading”	The pilot	Correct readback, but did not comply with instructions - did not turn right
5. “ XXX Correction XXXX” Stop X expedite	The ATC	Confusion (probably she is nervous, aware of a possible negative consequence)
6. “EVA 15 heavy, turn left, left turn to a heading of ah.. 29, ah, 270”	The ATC	Confusion use of a different direction in the instruction numbers (maybe, an evidence she is nervous)
7. “EVA 015 heavy, what are you doing? “	The ATC	Use of plain language

8. "Confirm, EVA015 heavy, maintain 5,000, left...right, right heading (unintelligible)"	The pilot	confirm ? - affirm or a request? "left... right" - evidence the pilots are confused
9. "turn southbound, southbound now"	The ATC	"southbound": non-standard phraseology
10. "are you southbound now? I see you're going north bound"	The ATC	Use of plain language non-standard phraseology situational awareness (she seems surprised he is not following)
11. " I see you're going southbound, turn South, ... Cause I see you're going northbound, turn south now,	The ATC	Confusion (she is probably nervous) Use of plain language / long sentence
12. "left turn"	The pilot	evidence of confusion in the cockpit
13. "continue right turn, climb to 7,000to heading 1-8-0."	The pilot	Heading: NOT read back by the controller ? background noise? terrain awareness alert?
14. "American 2552"	The ATC	confusion with numbers, challenged and corrected by the AAL pilot
15. "climb and maintain, maintain 7,000"	The ATC	confusion in the instruction climb

In general, we could say that the triggers point to failure to communicate both on behalf of the pilots and the controller.

The pilots' limited language proficiency is evidenced by the non-immediate compliance of instructions -most likely as a result of misunderstanding, and by the lack of immediate confirmation of instructions. DOC 9835 determines, through the holistic descriptors, that pilots must use appropriate communicative strategies to exchange messages, and that includes checking, confirming and clarifying information, which were clearly not performed by the pilots.⁶

⁶ Although this article is not meant to address neither the effectiveness of the ICAO language proficiency requirements nor the means by which some foreign pilots manage to get their language proficiency endorsement, it is intended to call the attention of all professional involved in aviation to the risks of sustaining aeronautical communications without the necessary proficiency. been working on the design of a taxonomy as a method to be used for a kind of analysis that requires an organization of factors that work as "causes" of miscommunication (Mathews, 2011) requirements nor the means by which some foreign pilots manage to get their language proficiency endorsement, it is intended to call the attention of all professional involved in aviation to the risks of sustaining aeronautical communications without the necessary proficiency.

The ATCO is clearly confused when not using standard phraseology, when failing in readbacks and hearbacks or issuing confusing instructions about directions – right and left being changed in a really short span of time. Not to mention some other minor mistakes, later corrected, which can be an evidence she was nervous and dealing with tremendous workload.

An important aspect to be highlighted here is the intercultural nature of the event. Aeronautical communications are expected to have multicultural agents and this poses the use of linguistic strategies in order to facilitate the understanding of both parties.

It is assumed that the professionals in aviation that are more specifically involved in operations are aware of that, and this is why there is the recommendation to use standard phraseology whenever possible and, most especially, in contexts where there is clearly evidence of confusion, which seems to be the case.

4. LHUFT Taxonomy

Trying to establish criteria for a more specific analysis, we have to think of a method that could account for particular factors in which the triggers could be referred to. The LHUFT (Language as a Human Factor in Aviation) Center at Embry-Riddle Aeronautical University has been working on the design of a taxonomy as a method to be used for a kind of analysis that requires an organization of factors that work as “causes” of miscommunication (Mathews, 2011).

If we think of triggers as actual language occurrences to which miscommunication may be associated with, we can go from triggers to factors that have caused a given miscommunication episode in order to have a broader picture of the language factors that actually account for aviation safety.

Prof. Elizabeth Mathews and her team, which I am proudly part of, have been working on this taxonomy so to improve it as best as possible. It is a very empirical study, based on the search of language occurrences from real data. Ultimately, we aim at having enough evidence to support the claim that language is actually a factor in aviation safety and, as such, has to be included in official documents of aviation accidents or incidents along with its specificities.

LHUFT Taxonomy



Source: Mathews (2018), personal communication.

This version of the taxonomy presents the analysis of aeronautical communications in four branches: technical, procedural, cultural and linguistic.⁷ Going through the triggers of EVA 015, the following factors can be highlighted:

- Procedural: blocked transmission; readback/hearback errors
- Cultural: organizational - Crew Resource Management (CRM) Training; Individual-lack of situational awareness and personal factors
- Language: Spoken – Speaking (Failure to communicate; Vocabulary - inaccurate use of ICAO (International Civil Aviation Organization) phraseology and use of slangs; Fluency – hesitations and tempo); Listening (comprehension - inaccurate readback)

5. Discussion

Engle (2000) states that the primary goal of CRM in multicultural crews is to reduce crew errors by improving interpersonal communications taking into account factors such as power

⁷Another version of the taxonomy can be found at <https://www.lhuft.org/taxonomy-of-communications-in-aviation>.

distance, uncertainty avoidance, individualism versus collectivism. Even though we cannot tell if there was a problem with the crew members judging by the audios, we can assume they were confused and it could make us wonder about an effective CRM training for these situations.

CRM is a proven method for enhancing the safety of airline crews, and thus airline operations. However, CRM does suffer somewhat from a cultural bias toward Western, 'low context', cultural values. When CRM methods are taught to airline crews from other cultures, the effectiveness of the training could be enhanced by tailoring CRM to the culture of these crews. (p. 114)

We assume Chinese pilots are trained to deal with situations of confusion with an American ATC both in terms of language and in-cockpit performance. However, the case seems to show that this training could be reinforced by raising awareness to the necessity of readbacks and confirmation of instructions whenever any possible miscommunication is sensed.

Triggers 3 and 4 illustrate that. The pilot reads back "left heading 180", which is disregarded by the controller⁸, who, shortly afterwards, starts urging him to turn right. Clark (2017) recommends that native English-speaking pilots and controllers should train in the use of ICAO phraseology in situations of stress and that language awareness training should incorporate awareness of non-native English listeners in training.

In this line, Merritt and Maurino (2004) point to the need of raising awareness of cultural interface via training and analysis, saying that "tying cultural interfaces to their management in the operating context is the bottom line" (p. 178)

Regarding communication, interculturality in aviation is a challenge for safety, and a solution for that is not to eliminate cultural interfaces but to manage the potential threats they pose through specifically designed programs that develop more cultural mediators.⁹

We assume that American ATCOs are aware of the fact they deal with non- native speakers of English who may not be as proficient as intended. Also, that they have, as part of their training, some kind of orientation through the use of communicative strategies in order to avoid miscommunication.

Borowska (2015) says that expert speakers make errors in the context of aviation communication and non-native speakers will accuse them of not using proper phraseology: "they are aware of their linguistic power, namely that they are able to think and work quickly in their mother tongue and in this way to manipulate it to their own advantage at the expense of those who do not have it" (p.67) These communication contexts feature a number of challenges. According to Farris and Molesworth (2016), an important challenge is that "Controllers are often very busy, and, as a result, particularly during periods when task demands are high, they may issue a number of instructions at a time to a pilot, in the interest of efficiency" (P. 97). They may be under high workload and have conflicting interests.

Another challenge is that pilots and controllers "may not only be strangers, but are often of very different sociolinguistic backgrounds, and cannot see each other, making it more

⁸ Presumably, not her intended heading.

⁹ The authors interestingly suggest that systematic research of the interfaces in different regions around the world will uncover strengths and weaknesses in the global system.

challenging to achieve mutual understanding and shared situational awareness”, which can result in controllers “trying to convey a lot of information in a single message and possibly not taking the time and attention required to listen carefully to pilots’ readbacks, failing to ensure that there are no errors contained therein.” (p. 102)

This remark seems to apply to the case study of this article. Trigger 1 could be considered an indication that too much information has been given. At the very beginning of their interaction, the controller gives information about the call sign and identification in detail, altitude and heading. When the pilot asks “Confirm heading?”, the controller could have assumed he had a problem understanding the last instruction. The unfolding of the events confirms the crucial importance of any kind of misunderstanding with regard to the “heading” issue. Trigger 8 is an evidence of the predicament the pilot is in, when he says: “confirm, EVA015 heavy, maintain 5,000, left...right, right heading...”

Barshi (1997) analyzed speech-rate, workload, message length as variables to readback accuracy and concluded that message length was a factor “controllers should limit the length of their messages to three commands or information units, in order to ensure accurate pilot comprehension and retention of controller messages”. (p. 104)

In another study, Barshi and Healy (1998) compared native speakers to proficient non-native speakers and low proficient native speakers and concluded that all participant groups performed less accurately in response to longer messages. In short, these results support the idea that “the robust message length effects obtained in this and in previous experiments could be attributed to basic cognitive processes (i.e. working memory constraints) as opposed to processes that are associated specifically with language or with a specific language” (p. 106)

The authors recommend that, when communicating with pilots of low EL2 proficiency, controllers should limit the length of their messages to two commands, in the interest of facilitating accurate comprehension.

Triggers 12 and 13 also show the pilots are confused with the heading. Trigger 12 is barely perceived in the audio due to a background noise that could be an alarm to alert a crash into terrain. Trigger 13 is an attempt on behalf of the pilot to confirm a correct information, not read back by the controller.

Barbara Clark (2017), in her study based on mandatory occurrence reports in the UK, pointed at the non-standard phraseology use as a key problem, and emphasized, as a key recommendation, the importance of using ICAO standard phraseology, whenever possible, to pilots and controllers, especially native English speakers.

The author concluded that “native speakers play a significant part in language-related miscommunication, most frequently by not adhering to ICAO standard phraseology and the overuse or over reliance on plain language” (p. 14) and that “Native speakers sometimes show impatience with non-native speakers, often reflected in increasing speech rate and volume” (p. 30)

This is clearly the case when the ATCO says “What are you doing?” as pointed in trigger 7, as well as in triggers 10 and 11, when she says “I see you’re going northbound”. These examples are not standard phraseology and are put in a nervous tone that can be perceived

not only by the audios but also by her mistakes (triggers 6, 14, 15) - minor errors, later corrected, that evidence she may be distressed.

The term “southbound”, constantly employed by the ATCO, is not supposed to be used as an indication of exact heading in standard phraseology. It is not clear enough, especially in that situation: the ATCO first sends the pilot to the left, then to the right, then back to the left, then southbound - to the left or right?

As previously mentioned, trigger 8 confirms this confusion, when the pilot says “confirm, EVA 015 heavy, maintain 5,000, left...right, right heading”. Shortly afterward, trigger 9 shows the ATCO saying “turn southbound, southbound now” as an answer to the third request of the pilot for heading confirmation. That is, the pilot had, so far, asked three times for heading confirmation and at this point of the events, she answers with “southbound”.

Research conducted at the Pontifical Catholic University of Rio Grande do Sul (PUCRS) adds further data to our discussion. Scholler (2017) brings an analysis of miscommunication in an environment with a multilingual background in aviation radiotelephony, by interviewing Brazilian pilots (who fly internationally) and Brazilian ATCOs.

In the charts below, we can see the frequency they perceive each other’s use of plain English instead of standard phraseology.

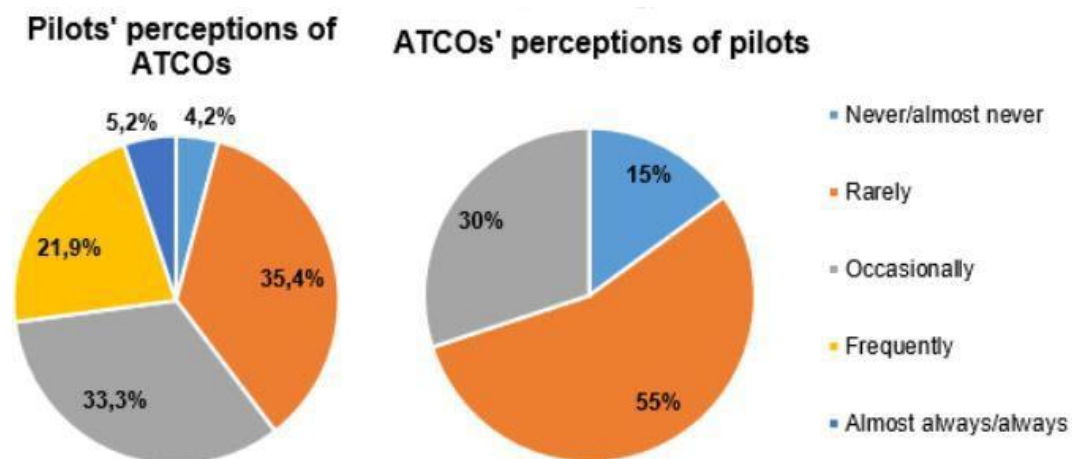


Chart 1: Frequency with which pilots and ATCOs perceive each other using plain English instead of standard phraseology. Source: Scholler (2017)

According to the respondents, pilots perceive more ATCOs (from Brazil and abroad) making more use of plain English other than standard phraseology than ATCOs perceive pilots - controllers reported hearing less plain English from pilots (35%) than the pilots from controllers (55%). Scholler (2017) says that there are a number of possible reasons for this, but “one candidate explanation is that controllers must more often issue instructions to pilots that require details, complements or repetition of information than pilots have requests with those demands.”

Our case seems to support this idea: the American ATCO used more plain English when standard phraseology was recommended and she was actually in charge of issuing detailed instructions.

A second chart shows that pilots consider it much harder to perceive ATCOs when using

plain English.

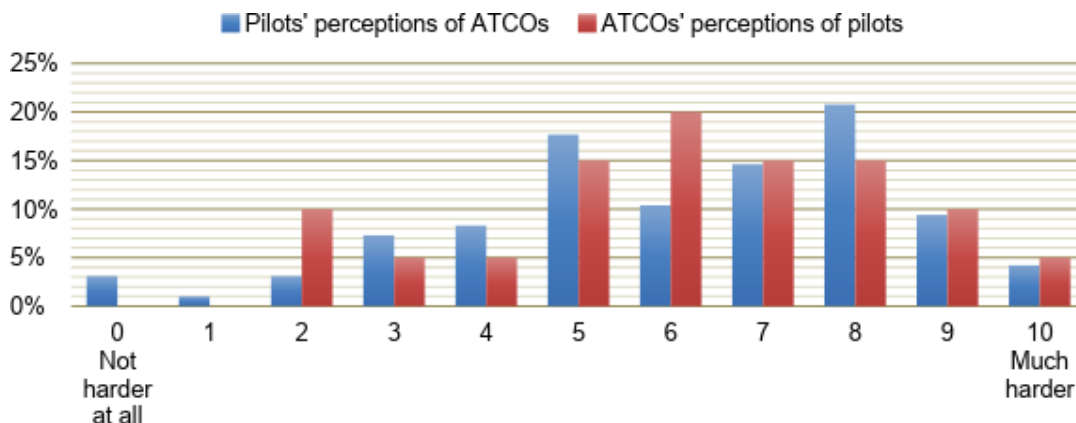


Chart 2: How much harder pilots and ATCOs consider each other to understand when the other uses plain English – on a scale from 0 to 10. Source: Scholler (2017)

In his study, Scholler (2017) concludes that pilots and ATCOs face a considerably high and equal amount of struggle when trying to understand each other in plain English. However, with our case in mind, we dare to say that the difference spotted in his research is actually meaningful due to the fact that, in this case study, the pilot seemed to have a harder time trying to understand the ATCO than the other way round.

Scholler (2017) also brings another remarkably relevant chart illustrating the main causes of miscommunication spotted by Brazilian pilots and ATCOs. Our attention should be drawn to the fact that the results represent information from interactions of these professionals interacting with each other and also with foreign pilots and ATCOs.

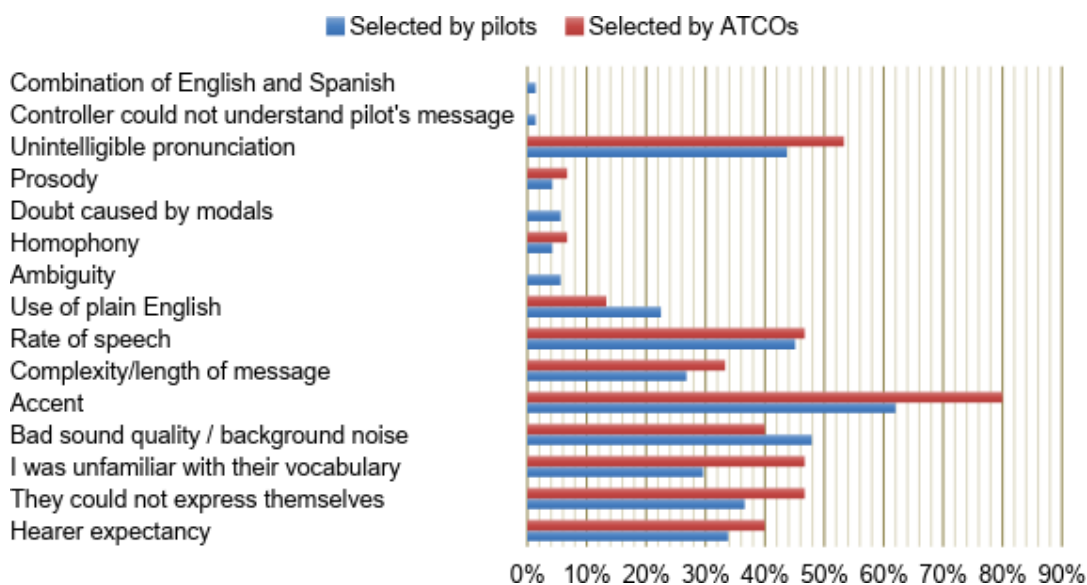


Chart 3: Main causes reported to have contributed to the understanding problem

As the author, we understand that pilots and ATCOs do not seem to face significant differences from each other given that the pointed factors are pretty much the same. Yet, regarding the case of EVA 015 and the use of plain English, the chart shows that pilots say they experience more problems with ATCOs use of plain English. In fact, the data is from pilots who fly abroad, who could be said to face the same problems as the Chinese pilot in our case.

The investigation is not finished and detailed information about the instructions (e.g. the original intention of the controller when issuing a left turn at first and the following constant changes) has not been made available as of yet.

A number of variables have been assumed by specialists who are intrigued by the event. As stated before, our goal here is not to blame the ATCO or the pilots, but to reflect upon factors that have strongly contributed to the confusion in order to work towards actions to mitigate episodes like this, developing language and communication skills for safety.

There are a number of teaching activities that can be developed in the aviation English training scenario which can widely contribute to that. Activities that could raise the awareness of student pilots or student ATCOs are a way to approach language as a factor in aviation safety. A recommended strategy is to use database from real accidents or incidents caused by miscommunication, having the students spot the possible triggers for a language problem, directly discussing what should have been said.

There is, undoubtedly, a need for more data and research in this field. At PUCRS, we are trying to build a corpus that we have been calling CORPAC – Corpus of Pilot and ATCO Communications, which is supposed to be a master corpus made of other corpora, so that we can actually count on real data to be more empowered to design curriculum that is closer to our reality in aeronautical communications. So far, we have been working on the CORPAC - RES (Real Emergency Situations). This specific corpus allows us to have a broader picture of the language used in emergency situations. The access to an organized database with the target language would allow for great improvements towards determining specific problems and improving training, eventually impacting in safer skies.

6. Conclusion

The aim of this article was to study a specific aeronautical incident, EVA Flight BR015, that featured a miscommunication episode in order to illustrate this issue through triggers - particular language occurrences that are evidence of the confusion that could have turned out tragically.

The analysis revealed that the constant use of non-standard phraseology, associated with lack of readbacks and hearbacks on behalf of the ATCO may have highly contributed for the non-compliance of instructions on the pilot's side. For instance, the multiple use of the term "southbound" in contexts where she could have used "right" may be taken as evidence that controllers are not properly trained to deal successfully with non-native speakers of English.

Consensually, the orientation is to stick to standard phraseology whenever possible and especially when in an emergency. And facts like the ones presented in the case study suggest that we should put more effort into raising the awareness of professionals involved in aviation operations to miscommunication that may derive from intercultural issues.

This data may work as a support for the claim that language is a factor in aviation safety and that interculturality is an intrinsic aspect of operations which should be seriously taken into account in training, screenings and test endorsements.

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The Evolution of Teaching and Testing Aviation English for Brazilian Air Traffic Controllers

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Abstract

In 2017, we celebrated 10 years of Aviation English Proficiency Requirements in Brazil. This paper will outline some interesting facts and information about a decade of air traffic controllers' training and testing in Brazil, concerning courses offered, staff trained on the job, test development and test applications. There will be some information about the Blended Learning Training Program, as well as the creation of a research group to support the practices. It will be possible to see the evolution of the processes through time. The numbers are impressive and reflect a country with the size of a continent.

1. Introduction

English is the 'lingua franca' of airspace and is indispensable for the provision of an effectively safe air traffic control service. There are rare cases of serious accidents caused by deficiencies in aviation English, but in the list of disasters that had language as a contributing factor, lies the most deadly one in the history of world aviation (583 deaths) - the collision of two Boeing 747 in 1977, in Tenerife, Canary Islands.

Communication is the basis of air traffic control. Any misunderstanding during pilot- controller communication, pilot-pilot or even controller-controller can have terrible consequences for aviation safety. Air traffic controllers (ATCOs) and pilots should speak "the same language". The concept of communication establishes a medium, a transmitter and a receiver, but the effectiveness of this process depends on the correct understanding of what one intends to communicate. In the field of aviation, investing in language proficiency is investing in safety and optimization of air traffic control.

The International Civil Aviation Organization (ICAO) recommends the use of standard international phraseology in English. However, given the dynamics and complexity of aviation, it is impossible that standard phraseology encompasses all atypical situations, such as situations involving medical problems with passengers or events such a bird strike, for example. In such cases, it is necessary to use plain language, defined by ICAO (2004) as the spontaneous, creative and uncoded use of a particular language, although limited by functions and topics proper to aeronautical communication. Inadequate use of plain English and low language proficiency lead to communication failure and jeopardize airspace safety, especially in non-routine and emergency situations.

In 2004, aiming at improving safety in air navigation, ICAO stipulated in Document 9835, entitled Manual on the Implementation of ICAO - Language Proficiency Requirements, a minimum proficiency in English for pilots, ATCO and aeronautical station operators of the agency's contracting states.

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By establishing a minimum proficiency parameter, ICAO has also developed a six-level proficiency grade in aeronautical English, which serves as a basis for assessment in this context. Level 4 is the minimum operational level.

There are two institutions responsible for implementing language proficiency requirements in Brazil: the National Civil Aviation Agency (ANAC) regulates actions related to pilots, and the Airspace Control Department (DECEA) is responsible for ATCO and Aeronautical Stations operators. In this paper we will focus on air traffic control training and testing measures.

2. DECEA's first actions

There are around 4,000 civilian and military ATCOs operating all over Brazil, working in 5 ACC, 47 APP and 59 TWRs - not to mention many other minor aeronautical station facilities. Brazil's airspace has 22 million square kilometers, considering the country territory and the maritime airspace.

In order to comply with ICAO's determination, DECEA's Air Traffic Management Division, in partnership with the Air Space Control Institute (ICEA) and the Center for Specialized Aeronautical Training (CIEAR), developed in the end of 2005, an ATCO proficiency assessment for all personnel that provided international air traffic services, so as to identify and document the situation at that time.

The controllers who obtained the best performance in this evaluation were invited to join a 'working group' responsible for carrying out training and evaluation actions, coordinated by ICEA language experts.

In 2006, ICEA started the process of training aviation English instructors, with the creation of the course "Preparation of English Instructors for Air Traffic Control (CTP009)". The students graduated in CTP009 began to teach English classes in several ATC facilities of the country, in a specific course called "Aviation English Intensive Course (CTP010)".

In that same year, DECEA published the 'Level Up Program in the English Language'. In addition to contracting general English courses and providing CTP009 and CTP010, DECEA established that all those who received any training provided in this program would undergo a proficiency examination by the end of 2007.

In 2008, the course CTP009 was restructured and received more aviation English specific content, called "Pedagogical Practice for Aviation English Instructors" (CTP011), focusing on pedagogical skills for Communicative Language Teaching, classroom management and language proficiency. Also in that year, there was the first edition of the Plan for the Implementation of Proficiency Requirements in Aeronautical English, a document issued by Brazilian Air Force making these training and testing measures mandatory all over Brazil ATC facilities.

The technology available at that time and the characteristics of Brazil, a country of continental dimensions, with a population of Portuguese speakers and more than three thousand controllers distributed throughout the national territory, made it difficult to

assure the operational level 4 of all air traffic control (ATC) personnel who deal with international traffic. Other countries were in a similar situation, including those with native English speakers, since aviation English is very specific and requires training. Therefore, the Council of the General Assembly of ICAO approved Resolution A36-11, authorizing countries with difficulties in implementing language proficiency requirements to take mitigating measures, but with a commitment to constantly update and disseminate those plans implementation on their website.

3. The development of an aviation English test

In 2007, ANAC and ICEA applied, for the first time, proficiency tests to assess the English level of Brazilian pilots and controllers.

ICEA played a leading role in the development and implementation of the first Aeronautical English Proficiency Examination of the Brazilian Airspace Control System (EPLIS). This exam, designed to evaluate the English speaking and listening skills of Brazilian ATC context, was developed by highly qualified professionals, following the international requirements for language proficiency of ICAO.

Initially, EPLIS included air traffic controllers and aeronautical station operators. Three years later, in 2010, DECEA extended the application of the test to professionals directly linked to the activities of Aeronautical Information Services (AIS) and Search and Rescue (SAR), since clear communication with these operators is also fundamental for the safety of operations. Currently, only air traffic controllers and aeronautical station operators that are effectively acting with the provision of international air navigation service are evaluated.

ICEA's English Language Division has always been committed to ensuring the continuous improvement of the exam, by meeting the stringent international quality standards listed by ICAO and the International Language Testing Association (ILTA). To this end, a validation process was initiated in 2009, conducted by a team specialized in language assessment, under the coordination of Professor Dr. Matilde Scaramucci, a post-doctoral specialist in Language Testing from the University of Campinas (Unicamp), Brazil. This process is maintained today by ICEA's English Language Division, whose task is the continuous search for the reliability and validity of the EPLIS, as well as the investigation of the effects of the exam in the teaching-learning process and its impact on professionals, in the system and in society in general.

4. Connecting the whole country through Distance Learning

In 2015, ICEA implemented three distance courses for ATCO in order to expand the scope of aviation English training throughout the national territory: a specific course for ACC controllers (CTP016); another for APP (CTP017); and one for TWR (CTP018). The objective was not to replace the face-to-face course (CTP010) - which has proved to be very beneficial due to its interactive nature, but to complement the training, taking advantage of the technological resources available to develop and practice oral comprehension skills as well as vocabulary, structure and pronunciation, as recommended

by Circular 323 (ICAO). Thus, the face-to-face course can devote more time to the development of fluency and interaction. This blended-learning program is called "Go4it".

While in 2007 there were only 275 professionals with operational or higher level 4, in 2010 this number had already reached the mark of 1,545 professionals with the linguistic proficiency required by ICAO. This was the result of a joint effort by DECEA with the various regional bodies that complemented the training in aviation English provided by ICEA, through workshops, conversation classes, courses etc., all over the country.

5. Brazil: host of major sports events

The eyes of the world have turned to Rio de Janeiro in 2012. Heads of State and Government of the contracting states of the United Nations gathered for the United Nations Conference on Sustainable Development, Rio + 20. The event tested ATCO's English- language knowledge of the operational professionals involved, as there was a significant increase in the number of flights and non-routine situations. The result was extremely positive and served as a model for major upcoming events, such as the World Youth Day, the FIFA World Cup and the Olympic and Paralympic Games. Another event also held in 2012 was the forum "Training and Testing: The Same Aim" conducted by the International Civil Aviation English Association (ICAEA) in partnership with ANAC, in Brasilia. On that occasion, Language professionals from ICEA presented to the international aeronautical English community the process of implementing the aviation English proficiency requirements in Brazil, the measures adopted and the main challenges faced at that time.

Also in 2013, Brazilian Air Force made an even greater effort in order to attend two other major events hosted by Brazil - the World Youth Day and the FIFA Confederations Cup 2013. To do so, there was a lot of training in favor of the full capacity of professionals involved in air traffic activities.

Analogous planning was done to meet the demands of the 2014 FIFA World Cup.

After the World Cup, EPLIS was applied for the first time to students of the last series of Air Traffic Control Course (BCT) at the Air Force Specialist School (EEAR). The exam was developed taking into account the students' lack of experience in air traffic control and addressing the vocabulary and situations concerning both the Aerodrome Control Tower (TWR) and Approach Control (APP) and also to the Area Control Center (ACC) - the three possible areas of operation. It's the *ab initio* version of the test, which has been applied since then, with increasing good results. This implementation has provided some changes in *ab initio* teaching too, which is much more ATC content-based nowadays.

The last major events hosted by Brazil took place in 2016. The Rio 2016 Olympic and Paralympic Games significantly increased aerial movements. In the period from August 4 to September 19, 2016, the main Brazilian airports registered about 150 thousand aerial movements.

Once again, unusual aviation situations that required good English proficiency of the ATCOs emerged, which again demonstrated the excellent training provided to them.

6. Aviation English Research Group

In 2013, ICEA English teachers, committed to continuous improvement, created the "Aviation English Research Group" (GEIA)², registered in the National Council of Scientific and Technological Development (CNPq). Since its inception in 2013, the group has sought to gather research that aims to study different aspects of aeronautical English in the Brazilian context, as well as its relations with teaching and learning and evaluation. Today, the group has more than 20 members, 13 academic studies concluded, and 09 academic studies in progress, including theses and dissertations.

Since 2014, ICEA hosts GEIA's annual event. It's a one or two-day seminar when aviation English researchers present their results and exchange ideas and experiences to an audience of around 100 people, including DECEA's staff of aviation English instructors and testers, but open to pilots, controllers, researchers, aviation authorities and stakeholders from other aviation institutions in Brazil. There are always invited speakers, renowned professors from Brazilian Universities who talk about ESP, Language Testing, Gamification, Technology and other inspiring topics.

To mark the ten successful years, in October 2017, ICEA and ANAC held the "ANAC- ICEA Commemorative Symposium: 10 years of Aviation English Proficiency Requirements in Brazil". The event took place at ICEA and was attended by 130 participants among agency and institute staff, language proficiency examiners, air traffic controllers, pilots, aviation English teachers, airline managers and directors, and administrative personnel of accredited entities for the application of proficiency tests.

During the event, the Fourth Aviation English Studies Group Seminar (GEIA) was also held, which promoted presentations on aviation English from an academic perspective – such as the development of a glossary for radiotelephony communications and reflections on pronunciation activities in aviation English textbooks, considering the speakers of Brazilian Portuguese. Another engaging activity was the adaptation of three workshops delivered at the ICAEA 2017 in Dubrovnik, when delegates had an opportunity to share experiences. At the event, participants were also able to get to know some ICEA facilities, visit the simulation labs and 3D Tower and learn more about how air traffic controllers are trained.

GEIA and ICEA members also usually attend ICAEA Forums and Events, as well as Applied Linguistics events relevant for their area of work and research, such as: LTRC, AILA, AACL, TALC, and TESOL conferences, among others.

In 2018, GEIA published its first book: "Aviation English Research in Brazil", with the results of 12 pieces of research, including Master's Degrees theses and PhD dissertations conducted by the members of the group, with topics including the use of Corpus Linguistics for language data analysis; Aviation English course book evaluation; needs analysis for Brazilian pilots and controllers; Wash back effect; Studies about the language testing and the ICAO rating scale; a Taxonomy of language-related Accidents and Incidents, among others. The book also presents an English-Portuguese Glossary with definitions and translations of the most important aviation language terms.

² More information in: <http://pesquisa.icea.gov.br/geia/home.php>

Future actions

Recently, ICEA has started a virtual learning environment, called ATC English Portal. Still under development, the portal has areas focused on the continuous training of instructors and students. It aims to be another resource that allows real-time communication between students and teachers.

The use of forums, chats, and individual messages is also being developed through apps and mobile phones, in an attempt of virtual approach that surpasses the physical distances and reaches more students at the same time, in an individualized and personalized way.

The courses and the test are constantly revised, updated, validated by the language experts and subject matter experts who always work in tandem and connected both with the academic and international aviation English community most recent findings and with the final users, the Brazilian ATCOs.

This paper presented the main actions taken in the last 10 years of aviation English teaching and testing for Brazilian ATCOs. Even though there is still much to be done, the increase of professionals with proficiency level 4 and above from 5% in 2007 to around 50% in 2017 assures that the measures are effective. The good performance and the absence of accidents during periods of massive international air traffic also allow us to say that it is safe to fly over Brazilian skies.

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Evolving Teacher Training Programmes through Integrating Contextual Factors for Language Learning as Part of Aeronautical Communication

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Abstract

Since the introduction of the ICAO Language Proficiency Requirements (LPRs) over 10 years ago, language as an isolated element has often predominated as the key focus of improving communications in learning and testing for pilots and Air Traffic Controllers (ATCOs). This has, arguably, been to the detriment of an understanding of the complex system of elements that makes up the air-ground communicative process, of which language is, no less an important, but an integral part. An effect of this has been, quite naturally, to put the responsibility for improving communication and language training of pilots and ATCOs on the shoulders of language teachers.

By definition, however, such language is clearly defined as a "Language for Specific Purpose" (LSP) and training to acquire the necessary linguistic skills required necessitates a clear appreciation, not just of the communicative processes involved, but a broad understanding of the technical knowledge and operational environment that creates and helps form discourse between a pilot and an ATCO. It therefore goes without saying that even someone with many years' experience of teaching language may find venturing into the highly complex technical domain of pilot/Controller dialogue somewhat challenging with little real understanding of the multiple factors and specific purpose language that are used to produce efficient and effective communication. Indeed, a pre-conference survey carried out by the International Civil Aviation English Association (ICAEA) in 2017 showed a notable disconnect between those responsible for carrying out the training and those receiving the training. This is troublesome in the sense that learners are not being afforded the training they require for communication in the real world. More critically, as in any professional domain, if training is not matching the learners' objectives then, arguably, a less effective and efficient communication process may well undermine the LPRs rationale and thus impact on safety.

This paper offers a fresh perspective from research and practice I have carried out since 2016 supporting a greatly increased face validity of both learning and testing by explicit inclusion of multiple-factor real-world communication between pilots and ATCOs in place of the more typical, but limited, language-only approach. It forms the basis of a new perspective for training teachers and trainers of language and communication skills in aviation contexts², particularly that of radiotelephony communications between pilots and ATCOs. It adopts a contextual framework based on a learning continuum for determining what communication is required by learners in their every-day operations. It offers a methodology inclusive of the many interdependent factors that effect communicative competence where language is seen as an integral, not a stand-alone, element and can aid practitioners in preparing curricula, materials and interactive activities for the training room.

1. Introduction

Spoken communication is a multi-disciplinary human activity reliant on, amongst other elements, context, knowledge and socio-cultural influences (Fan, et al, 2015). Context and

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² This article avoids the use of the term 'Aviation English' due to its ambiguity in what is a Language for Specific Purposes (LSP) domain, and the often mis-used reference to the ICAO defined *standard phraseology*. Such language is defined more in terms of the air-ground communication process between pilots and ATCOs, which is constructed from *standard phraseology*, as well as general and specific purpose plain language – ie: the use of less- and non-coded spontaneous language used interdependently with *standard phraseology*.

knowledge are themselves influenced by physical and cognitive abilities, length of exposure to, and experience in the domain, as well as socio-professional roles (Holmes, 2008; Raman, 2011). These are all internal elements which create many determinant factors in communicative competence. They are all manageable by human interaction reliant on a certain degree of proficiency in all these areas working interdependently. A person's communicative proficiency is therefore multi-faceted, variable and, by definition, ambiguous (Lieberman et al, 2017).

In addition to the many internal factors, which are by and large, individually manageable (exposure, experience, training, schooling, social awareness, etc.) external factors also play an important role in any communication (Barshi, 2013). These are, by and large, governed by a limited manageability and therefore not so easy to decipher in terms of how one person will react to another when they affect a communication process (Howard, 2008). Technical, environmental, political, and socio-cultural issues are all extraneous affective factors that have an important influence on how interactional competence is affected.

2. Language

We know that plain language proficiency is a 'fundamental component of radiotelephony communications' (ICAO, 2010, p4-2) and is a 'unique kind of communicative event' (ICAO, 2010, p4-5). In the daily operations of pilots and ATCOs, however, spoken communication happens because of, and within, a multitude of variable external and internal factors (Moder, 2013; Kim, 2018). Usually language serves as a conduit to effect this communication in a collaborative process, and so is governed largely by many factors working interdependently, both *manageable* (internal) and *influential* (external).

To assist, therefore, in aiding learners to consolidate and improve their plain language proficiency in real-world communication, it is not sufficient to know lexical items or structural forms in isolation. Kim (2018) suggests that the interactive skills of the ICAO LPRs – *Pronunciation, Comprehension and Interactions* – may well be more important than the purely linguistic ones – *Fluency, Vocabulary and Structure*. She also questions the fairness and validity of focussing on linguistic factors alone, whilst Douglas (2000), points out that language knowledge and specialist knowledge are inseparable. Having the 'opportunity to take part in genuine communicative needs in realistic second language situations' (Canale & Swain, 1980, p27) must therefore be taken into account for learning and testing, whilst learning language for such a specific purpose (ESP) should be 'oriented to the specific needs of the learners [...] appropriate to the specific activities the learners need to carry out' (Paltridge & Starfield, 2013, p6). Hedge (2000, p47) even alludes to more specific skills such as: 'linguistic' – the language, 'pragmatic' – knowing when and how to use it – and 'strategic' – knowing how to accommodate, rephrase, repair and negotiate meaning, so that communication can be effected. This is perhaps most evident when remembering that air/ground communication takes place in *voice-only* settings and must be replicated in language training and testing.

As a valid base from which to consider new learning perspectives, such theory emphasises a rudimentary need for communicative and interactive competence above a general linguistic version in the very complex and dynamic process of pilot/ATCO communication. Such competence evolves from an integrated learning process that identifies and feeds off the context of the target language use (TLU), not simply linguistic knowledge in isolation.

Bullock (2015) demonstrates examples of methodologies and activities suitable for learners of real-life communicative language in an aviation context.

3. Contextual factors

In order therefore to try and identify some of the contextual factors inherent in radiotelephony communication, consideration should be given to understanding the background of such situations where communicative competence is required. As the language proficiency requirements were developed mainly to increase communicative skills in plain language during *non-routine* and *unexpected* situations, I randomly brainstormed with groups of various Subject Matter Experts (SMEs – pilots and ATCOs) during training courses, situations they deem as factorial elements in communication during non-routine situations. All those who took part in this research had more than 10 years experience in their professional roles, which enabled elicitation of as much information as possible from their own occupational knowledge.

Each group was given three typical non-routine events – one on departure (engine failure of twin-engine airliner), one on the ground (unruly passenger) and one in-flight problematic weather situation). Although non-routine, the events were chosen as those likely to have been experienced by both groups and can be seen as some of the most common. The course participants were asked to think of as many concurrent manageable and influential activities as possible that could affect how both a pilot and an ATCO would communicate during such non-routine events.

Because of the complexity of each area, as well as the subjectivity of given responses, the factors are divided simply into *manageable* and *influential* in alphabetical order. The key areas are shown in *Fig.1*. Those primarily affecting ATCOs are on the left and those affecting pilots, on the right. The list is certainly not exhaustive and more in-depth research and data would be needed to construct a comprehensive taxonomy, with full supporting evidence.

What the results do show, however, is an awareness from both groups of SMEs that even at a simplistic level, oral communication between pilots and ATCOs is influenced by many elements, of which a large amount are, as previously mentioned, interdependent.

ATCO	Pilot
Manageable	Manageable
Anticipation / preparation / planning	Controlling, managing aircraft
Listening (other frequencies /colleagues)	Flight preparation
Phone calls	Language proficiency
Planning – mental/external	Listening to more than one frequency / aircraft
Reacting	Negotiating / informing / instructing
Scanning – screens, aerodrome, weather, etc	Problem – SARPS/checklists/problem solving
	Technical issues
	Expectancy
Influential	Influential
Emergency situations – 3 rd parties	Cultural influences
Equipment limitations and serviceability	Multiple discourse communities: – passenger, cabin crew, ATC, Operations, Handling agent.
External events (Volcanic Ash / Strikes / Weather)	Specifics of a situation (technical issues, passengers, weather)
Flight plan management	Technical limitations of communications / ground facilities
Language proficiency of other speakers	TWR/GRD/ACC/APP – ATCO workplace
Sub consciousness	

Fig. 1 – manageable and influential contextual factors for pilots and ATCOs in air/ground communication.

The exercise also saw some characteristics in more general emerging themes such as multiple simultaneous communicative tasks, situational awareness, lack of visual cues between speakers, and the potential technical limitations of equipment. Such factors also reveal the key influence and importance of technical knowledge and professional experience, the uncertainty of unexpected events, cultural norms and hierarchy and, perhaps the most often overlooked, communication between speakers with differing levels and perceptions of proficiency, including those for whom English is their principal or sole language, a point alluded to by Kim & Elder (2015) and Kim (2018).

For a teacher with little or no operational knowledge of the complexity of pilot/ATCO communication, unaware of the many contributory factors stated above, not to mention being able to handle the complex rationale of what constitutes the various levels on the ICAO Rating Scale and the effect that this has on communicative dialogue, this can be extremely challenging. Communication is taking place in an extremely specific referential context with shared meaning developed through lengthy training and professional experience. This must be broadly understood to be able to extract the necessary language and communicative skills that learners will need. If learning is based around a traditional general-purpose language framework with some bolt-on lists of technical vocabulary, and a traditional *right or wrong* grammar approach, devoid of any contextual reality and appropriate functional language and strategies, learners will not acquire the necessary communicative and interactional competence for their real world objectives.

Teacher training thus requires a different approach to assist learners in achieving their objectives. Such training must be more focussed on the real-world authentic language contexts that learners need to operate efficiently and effectively. It should strive to adopt a

methodology and curricula that increase learners' intrinsic motivation and takes into account the specificities of what constitutes air-ground communication, with all the influential and manageable factors that work interdependently. Furthermore, expanding on general purpose language to include relevant and contextually specific purpose language in the context of given aeronautical settings is crucial to this process of learning and developing the required communicative skills.

To this end, a simple continuum can be used to develop course programmes, source material and prepare appropriate and authentic communicative tasks in the classroom. As shown in Fig. 2, the *a priori* consideration must be a given context. Without knowing the context, it is not possible to know the communication taking place, and thus what language use is helping to form this communication. Without knowledge of this language use, learning is arbitrary and out of context and therefore of little use for students in their intended operational situations.

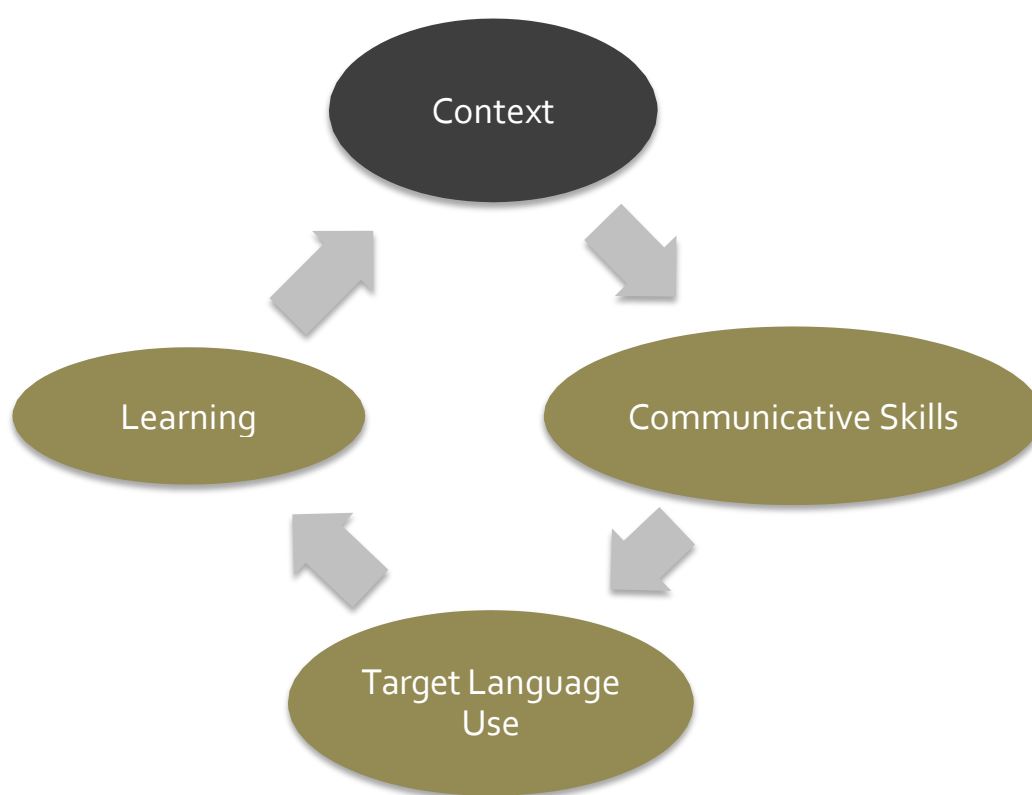


Fig. 2 – Context based continuum for language learning programmes

Context based learning relates directly to the likely situations during which learners will have to communicate in their operational roles. In order to identify and exploit such situations in preparing curricula, material and tasks for learners, ICAO Doc9835 (2010, appendix B, *Part ii*) provides a very good reference tool. The given inventory of events, domains and sub-domains characterize most of the day-to-day communications between air traffic controllers and pilots. They represent situations, routine or non-routine that all controllers and pilots must be able to handle and which may also require familiarity with other domains linked to any given situation.

Depending on students' contexts such a tool can be given either as a checklist during a needs analysis interview – students tick or highlight those situations they are most likely to

encounter – or as a warmer in a group or pair discussion activity, usually in the first training session, which acts as a 'live' needs analysis. As this activity is directly related to the communications that learners will need to engage in during their operational tasks, there is a direct personal connection and, thus, a very high likelihood of inherent motivation at this early stage. This is critical in establishing a base for meaningful learning from which the training course can operate.

Once the needs analysis has been established then the teacher can start to identify how to source authentic contextual communication to ensure a final curriculum includes as much of the learners' target language use (TLU) as possible. It is suggested basing a series of lessons on one domain (*approach situations, health problems, Aerodrome/airfield environment*) and then sub-dividing the group of lessons so each one focuses on one specific event from that domain eg: Approach situations: *go-around procedure; types of approach; holding procedure; VFR entry into CTR; airfield closure; etc.* As previously mentioned, many domains and associated events are interlinked and so a certain reference to others is always relevant in understanding the context. Learners are thus exposed to a much greater awareness of likely events taking place rather than one-off events in isolation.

Once the domains and events have been established then teachers need to source as much information as possible from experienced SMEs as to how the likely given scenarios unfold. This can be done with a series of simple questions.

- i) what actually happens before during and after the event?*
- ii) what are the normal procedures for pilot **and** ATCO? (understanding the roles and activities of the other is extremely important in helping to manage the situation).*
- iii) what manageable and influential factors affect the events?*
- iv) what communication is taking place and what communicative skills are required?*
- v) who is the pilot/ATCO also communicating with at the same time?*
- vi) what standard phraseology is required and how will this need to interact with plain language to effect the communication?*
- vii) what other domains will likely be affected by this specific situation?*
- viii) what are the L1s of the speakers and likely levels of language proficiency in English?*

The number and type of questions is of course endless and teachers may decide, depending on their own experience of the domain, to ignore certain ones or add some of their own. What is crucial at this stage is to solicit as much information as possible from SMEs to identify the exact communication taking place, particularly what are the affective factors, and what language is being used to effect the process (See *Fig 1*). This can then be transferred to methodology, material, and training room tasks.

4. Integrating a rationale for teacher training

The rationale behind this process formed the basis for teacher training workshops given by the author, one of which was run during the ICAEA conference at Embry Riddle Aeronautical University in Florida in May 2018. In general, participants were teachers of English in an aviation context, and the rationale was to help guide participants to better establish the contexts and associated factors involved in the real-world communication of their learners. Using the continuum in *Fig. 2* as a principle, participants were invited to identify the communication and language, then to think about preparing curricula, methodology and materials for their learners. As each workshop differed slightly in length,

number of participants and outcomes, the rationale and structure is described below from a generic basis. Given responses were not specific to any one group, but are cited to show the kind of response that each task was intended to elicit.

Participants of each workshop were normally divided into groups of four and the workshop itself divided into two parts.

Activity 1 – *engaging with the communicative context* (See Appendix 1a)

Activity 2 – *engaging with the target language use* (See Appendix 1b)

In Activity 1, each group was given four titled picture cards, with each title referring to a pre-identified specific authentic interaction between a pilot and an ATCO in a non-routine situation. The four situations were:

- 1) Pilot incapacitation
- 2) (Suspected) Tail strike on departure
- 3) Bird strike on departure (aircraft airborne)
- 4) Destination closed due blocked runway

Each participant was given one card and a worksheet with 5 tasks. They had 10 minutes on their own to think about what happens during such an event and then time to complete the 5 tasks in their own words. Each group then had 10 minutes to discuss their individual situations together and elaborate on what the whole group thought would happen in each situation. Examples of the worksheets are given in Appendix 1a and 1b. Once this was completed a class discussion was held for 15 minutes to identify key areas for each situation according to the responses of each group.

The group then continued on to Activity 2 where the authentic scripts for each communication were handed out to the groups. The scripts did not include the full communication but sufficient utterances from the interaction to be able to identify the context, with the key communicative skills and language used. As for Activity 1, each person was then given 20 minutes to prepare – 10 minutes to read and reflect on their given script and respond to the tasks 6-10 on the worksheet, then 10 minutes together to discuss and brainstorm ideas.

The workshops were aimed to provide only a very short but focussed input for teacher training and would ideally form part of a more intensive and longer session to investigate further how the thoughts and ideas from the workshop participants better reflect on each individual's teaching environment. Additional studies would need to be carried out during a full teacher training course to evaluate an *a priori* and *a posteriori* impact analysis on individual classrooms.

5. Outcome and further discussion

Reaction and responses to the tasks are given below with additional commentaries to highlight how such tasks can be expanded on in longer teacher training courses.

Activity 1

Task 1.

Most participants were able to generate a lot of specific information here relevant to the situation given. However, few mentioned the need to look at the effect that one incident

would have in the immediate future on other routine events and normal procedures for both ATCOs and pilots. Any non-routine event takes place in the context of routine situations simultaneously, and this must also be factored in, including the effect on other communications taking place at that time.

Task 2

The results here showed a broad appreciation of the type of material that could be introduced as a warmer, such as audio, video, reports, training manuals, etc. Care must be taken, however, to identify the broader based subject initially to allow as much elicitation as possible of knowledge and personal experience and enlarge the thought process of learners to include all possible scenarios and options. Such broader elicitation also allows teachers less versed in the operational domains to benefit from the operational experience of the learner's as SMEs. As mentioned earlier, individual TLU domains include many specific situations and each situation can cross multiple domains. Careful preparation should always be considered by teachers when sourcing material and subjects to ensure technical accuracy and a certain ease of operational knowledge with the given situation.

Task 3

Notably, many participants included the need for role-plays and interactive tasks. Developing knowledge of the language in context is clearly part of the process for specific purpose communication, however, learning how to use it is arguably the most critical. Additionally, brainstorming the function and content of language in each situation before the role-play, allows learners to connect with the context and gives the possibility to reflect on what might be said and what they themselves may have to produce during the interactive tasks. Learners should be exposed as much as possible to using what they have learned with the additional possibility to provide and receive peer feedback. Furthermore, the necessary use of standard phraseology in such role-plays acts as an vital learning tool for operational environments in helping students to practice the basics of effective and concise standard radiotelephony communication.

Task 4

It is assumed that the language proficiency scale adopts a 'one size fits all' for language competence. That is to say that the proficiency for every pilot and ATCO must fit somewhere between ICAO Level 1 and Level 6. ICAO themselves did not want to distinguish or prejudice speakers whose primary language is English. However, there are many additional socio-cultural elements that effect how language is used in inter-cultural communicative competence, and these are not necessarily factored in on the ICAO rating scale. Workshop participants clearly identified the potential differences in language competence between English L1 and L2 speakers of multiple nationalities, as well as power distance between speakers and expectations during communications. Understanding communicative competences and the, perhaps, subtle differences between multiple users of the same language are extremely important in such safety critical contexts. Lack of competence in 2nd language acquisition from English L1 speakers may also be considered as a causal factor in poor communicative skills. Monolingual speakers, however high their perceived level of language is, may not have certain developed communication skills that multilingual speakers will more likely have. Additionally, having the highest, or at least a very high, level of proficiency can be misleading and can often, paradoxically, through slang, speed of delivery, redundancy, and idiomatic phrases amongst other constrictive elements, be a barrier to communicating. It is not sufficient to achieve a wide variety of vocabulary and developed structural skills, if the speaker lacks the strategic skills to accommodate speakers with a lower

level of proficiency by failing to paraphrase, or express slowly, clearly and concisely what they mean.

Task 5

As in question 1, participants identified many specificities of both pilot's and ATCO's tasks. Whilst identifying such items is of a clear advantage, teachers should look to develop this further as to why the tasks are being carried out and what affect this ultimately may have on the communication taking place. It not only enhances the ability to understand the whole communicative picture but also allows learners to educate teachers in the operational specificities of the many given situations.

Activity 2

Tasks 6-8

Most participants when guided, were able to distinguish the different types of language used in the four scripts:

- i) Phraseology
 - *Roger; affirm; request; cleared for ILS approach; MAYDAY; report; etc.*
- ii) plain technically specific and referential language
 - *we have a bird strike; alert emergency services; we'll have to divert; aircraft is blocking the runway; anyone on the ground; do you have a gate yet?; I called OPS Control; would you need to dump fuel; etc.*
- iii) plain general purpose language - (i) formal register: *I'll speak to you; at your discretion; in the meantime; a male of age 50 years; give me a second sir; just to inform you that ...; how much time will you need?; when convenient change frequency...; etc.*
- iv) plain general purpose language - (ii) functional (request, offers, giving information, instructing): *do you have...?; would you like us to...?; we're going to need to...; I'm just going to call; What is the problem?; Could you do that for us?; We would like to...; etc.*

Discourse analysis of pilot/ATCO radio communication clearly shows these distinct elements in the language used. The four scripts included a mixture of nationalities and L1s all communicating in English, but it was not known what the actual English language proficiency level of each speaker was. One script included interaction between two English L1 speakers whereas in another, it was noticeable that the ATCO had some considerable difficulty in expressing himself in English, which, in turn, appeared to exacerbate the stress level of the pilot concerned, as evidenced by the pilot's rising intonation in trying to communicate to the ATCO a serious technical issue with the aircraft.

Discourse analysis of authentic scripts also allows learners to clearly see the type of language used and in what circumstances. Authentic scripts allow teachers to focus on the four specific linguistic categories mentioned above when preparing curricula, course content as well as material and tasks for learning. Furthermore the inclusion of real-world communication enables students to really see the value of learning about communicative competence, leading to increased motivation and acceptance of the need for interactional skills in their jobs. Additionally, it provides a platform for discussing all contributory factors to such communication and widens the scope towards a better understanding of what forms and affects pilot/ATCO communication via the radiotelephone.

Tasks 9-10

As mentioned in Activity 1 Task 3, one of the best ways of helping the learning process for students is to practice using the target language through relevant and appropriate tasks such as role-play, and this again was clearly identified by workshop participants. The use of authentic transcripts should be identified by the teacher before the course begins. Teachers unfamiliar with many of the technical terms and references should always seek advice from an SME. Similarly, teachers not acquainted with standard phraseology may also like to consider participating in a Radiotelephony course in their institution, where possible.

For learners with lower levels of language proficiency and for those ab-initio students with higher levels of general purpose language, but lacking a developed operational linguistic knowledge, initial exposure to the operational language can be done through any number of simple interactive tasks in the classroom which should be oriented towards the target language. As language proficiency and communicative confidence grow methodologies can change to preparing more complex role-play activities based on the likely events from sourced transcripts and the list of non-routine events as given in ICAO Doc9835. Students can even be invited to develop their own scenarios based on personal experience, which can then be facilitated by the trainer.

6. Conclusion

The objective of giving the workshops was to highlight one integral part of a complete teacher training course. The specificity of the workshops was centred around recognition of factors that affect communicative competence between a pilot and an ATCO and which are both *manageable* and *influential*. The workshops created a simple awareness of the role of such factors and how these can be integrated into course curricula and methodologies for learners, as well as to the importance of discourse analysis of the TLU and the use of authentic communications in the classroom. From the outcome of the tasks completed by the workshop participants, the objective was largely met. Reflections were possible on issues other than simple linguistic elements during the communication, and considerations were given through authentic task-based material and how this can be integrated into learners' training.

Such workshops, however, only provide a broad overview of what teachers need to be fully at ease in working with students in such specific purpose language and communication training. Much more integrated and in-depth training should always be considered as part of a teacher's professional development. This was reflected in feedback received from workshops participants. It is also suggested that continuing research is undertaken to exploit such work in the pursuance of much more authentic and appropriate material for both training and testing of communicative competence in the aeronautical environment.

What this paper shows is that a more appropriate and focussed teacher training in such specific purpose professional environments enhances the ability for teachers and trainers to provide learners with effective and appropriate methodologies and course content. This refers not simply to learning their target language, but on how to use it effectively to improve interactional competence which, in turn, helps to create a safer environment for radiotelephony communication between pilots and ATCOs.

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Appendix 1a

Worksheet Activity 1

Activity 1: (20 minutes) CONTEXT – Engaging learners with the context and communicative factors in pilot/ATCO interaction during non-routine events.

Each group member has one contextual domain card for Activity 1.

i) Each member reflects, individually, about what happens during the situation on their card and completes their question sheet as fully as possible. (Time = 10 minutes).

ii) Then, as a group, discuss and brainstorm all ideas from the four domains and add further thoughts and ideas to your answer sheet. (Time = 10 minutes).

1 person from the group of 4 should write a completed sheet to be handed in at the end of the workshop.

1) Understanding the context: Discuss how the situation on your card could operationally affect both pilots and ATCOs.

2) – What material/media could you use to introduce the subject to learners both new to & experienced in their domain? (examples: texts, videos, audio, reports)
– What activities would you then use to engage learners with the content of this context? (examples: reading, discussion, pair work, internet search)

3) What activities would you consider to make this learning relevant to the learners' own specific communication needs? (think of actual instances in your own teaching activities and/or operational domains – and relate what happens)

4) Who are the speakers and what socio-cultural factors could affect the communication? (examples: backgrounds, hierarchy, relationships, cultural references, language levels.)

5) What tasks are the speakers simultaneously performing and how might these tasks affect the communication? (think about **all** the tasks that both the ATCO and Pilot could be doing at this moment)

Appendix 1b

Worksheet Activity 2

Activity 2: (20 minutes) CONTEXT – Engaging learners with the language in aeronautical communication

Each group member is given the transcript relating to their domain card for Activity 2.

- i) Each member reflects, individually, on the language used during the situation on their card and completes their question sheet as fully as possible. (Time = 10 minutes).
- ii) Then, as a group, discuss and brainstorm all ideas from the transcripts in the four domains and add further thoughts and ideas to your answer sheet. (Time = 10 minutes).

1 person from the group of 4 should write a completed sheet to be handed in at the end of the workshop.

6) In the communication transcript, identify (using highlighters/colours to help identify different types):

- i) radiotelephony
- ii) technically specific plain language
- iii) general purpose language

7) In the plain language, what language functions are used? (examples: requests, orders, giving info, exchanging info, etc.) What technical collocations¹ & compounds² can be identified?

i) Collocation: a group of words that go together and normally used in a fixed phrase. e.g.: *to carry out a missed approach procedure*

ii) Compound: two or more nouns that are used together where the words to the left of the final word (head noun) act to describe the final word. e.g.: flight information service.

8) What additional influences does the language of each speaker have on the efficiency of the communication? (Examples: First Language influence / regional variations of English / levels of proficiency between speakers).

9) What methodology, activities & materials could be used use to teach the language analysed in the above communication?

10) What real-world based interactive tasks could be considered for learners to best practice and further learn this type of communication?

Appendix 2 – Tapescripts used during the workshops. All recordings were sourced from publicly available internet sites of which the sources and access dates are referenced before each one.

Exercise 1 : Pilot = EN (UK) / ATCO = EN (US) Event – Pilot Incapacitation (departure)

source: <https://www.clip.fail/video/MH1551Y4zAk> (accessed - 24th March 2018)

1	Pilot	<i>Tower BAW24R we're gonna have to take a few minutes would you like us to hold on Lima or on the left somewhere?</i>
2	ATCO	BAW24R you can stay on Lima to Alpha Alpha and there's no departures behind you.
3	Pilot	<i>Ground BAW24R be advised we're gonna need to return to stand and we're gonna need some medical assistance to meet the aircraft, the captain's not feeling very well.</i>
4	ATCO	BAW24R at your discretion turn left on Alpha Alpha turn left on runway 10L and taxi eastbound and er keep me advised.
5	Pilot	<i>Can I just take two seconds to give the company a call to er I can't get hold of them on the radio ... I'm just going to SAT call them. I'll let you know when I'm starting to taxi BAW24R ... just wanted to ask for medical services from you coz I can't get hold of anyone on the ground.</i>
6	Pilot	<i>And er ground sorry Tower BAW24R I am now ready to taxi to stand</i>
7	ATCO	BAW24R roger turn left on Alpha Alpha turn left on runway 10L
8	Pilot	<i>Left on Alpha and left on 10L</i>
9	ATCO	And do you have a gate yet?
10	Pilot	<i>Er negative I haven't been able to contact our ground staff ... I called OPS control in London trying to get hold of them ... so I have no gate.</i>
11	ATCO	We're gonna try ... locally, find out what your gate is but join runway 10L and we'll see what we can find out.
12	Pilot	<i>Thank you very much Alpha Alpha and 10L BAW 24R.</i>
13	ATCO	BAW24R we've called locally to find out about a gate ... in the meantime we'll get you back at least next to the international terminal so if they don't have something it'll be possible to try...
14	Pilot	<i>That's wonderful thank you very much BAW24R and just entering 10L now.</i>
15	ATCO	Er yes, join 10L and when you get a chance they'd probably like the information about the captain's age and possibly what the issue is ...
16	Pilot	<i>OK thanks very much I'll speak to you when I'm just taxiing down the runway</i>
17	Pilot	<i>Tower BAW24R Captain is er male of aged 50 years old he's suffering from severe abdominal pains er maybe gastroenteritis, he's also grey and clammy, no other symptoms as yet.</i>
18	ATCO	Roger copy all.
19	ATCO	BAW24R there's no need to speak with ground and just for flying purposes we've extended your flight plan so it's good for three hours from now.
20	Pilot	<i>Ah, that's wonderful but we're two crew so we're going nowhere tonight BAW24R.</i>

Exercise 2 Pilot = Swiss German / ATCO = Russian Event – Bird Strike (take-off)

source - <https://www.youtube.com/watch?v=llCb8p9SvVM> (accessed 13th December 2017)

1	Pilot	SWR1311 mayday, mayday, mayday bird strike climbing to 2000ft... proceeding straight ahead
2	ATCO	Roger mayday SWR1311 would you like RWY10L ?
3	Pilot	<i>OK climbing now to 3000ft and request radar vectors, say again the heading</i>
4	ATCO	SWR1311 Turn left heading 100
5	Pilot	<i>Left heading 100 SWR1311</i>
6	ATCO	SWR1311 what is the problem ... mayday
7	Pilot	<i>Bird strike ... bird strike</i>
8	ATCO	SWR1311... you... did..catch... bird?
9	Pilot	<i>Affirm we have a bird strike</i>
10	ATCO	What you situation, SWR1311
11	Pilot	<i>I have vibration 1 and 2 engines ... 2 engines</i>
12	ATCO	SWR1311, because... catch... bird?
13	Pilot	<i>Bird strike, affirm, SWR1311</i>
14	ATCO	SWR1311 turn left heading 300 ... clear ILS approach RWY28R
15	Pilot	<i>Clear ILS approach RWY28R and request fire brigade</i>
16	ATCO	SWR1311 we ready for emergency landing and alert emergency services
17	Pilot	<i>OK thank you very much, SWR1311 and confirm situation mayday now</i>
18	Pilot	<i>We have 2 engine problems, 2 engine problems SWR1311</i>
19	ATCO	SWR1311 RWY28R visibility 4000m ceiling 200ft
20	Pilot	<i>Thank you</i>
21	ATCO	SWR1311 report localiser established you're on final
22	Pilot	<i>Will do</i>
23	ATCO	SWR1311, contact Tower 118.1

Exercise 3: Pilot = French / ATCO = Spanish (Mexican) Event – Destination closed (APP)

source - <https://forums.liveatc.net/index.php?action=dlattach;topic=14018.0;attach=9487> (accessed 9th November 2017)

1	Pilot	<i>Copied that ...five miles south of MATEO three four zero radial inbound ABC123</i>
2	Pilot	<i>I would like to request change runway for five left ... we want to do the visual</i>
3	ATCO	Uh okay give me a second sir, I'm a little bit uh occupied I will check it
4	ATCO	AFR178... right now the airport is ... has been closed ... we're looking for further information
5	Pilot	<i>and you don't have for the time being ... any open ...</i>
6	ATCO	That's correct sir I don't have information. At the moment the airport is closed
7	Pilot	<i>AFR178 we have about fifteen minutes ... possible to wait uh before landing otherwise we'll have to divert to mike mike quebec ... so fifteen minutes waiting then we have to divert.</i>
8	ATCO	Understand sir uh and you got fifteen minutes for waiting ... stand by, I will look for information. At the moment uh I don't have any.
9	ATCO	AFR178... uh we got aircraft with a incident and uh it's over the runway zero five right ... this delay is gonna be longer than the one uh five minutes that you got left for waiting.
10	Pilot	<i>And is it possible to find out if any other runway available?</i>
11	ATCO	No sir we ... we are gonna be with the zero five right runway closed at uh more than one five minutes ... due to aircraft that is blocking the runway zero five right ... it's gonna be not open faster than one five minutes.
12	Pilot	<i>Okay we understand ... so we have to divert now to mike mike quebec tango. Confirm we proceed from now to mike mike Quebec tango?</i>
13	ATCO	That's correct sir you're cleared to proceed with a left turn direct to mike mike quebec tango.
14	Pilot	<i>'kay and uh we stay to one three thousand feet?</i>
15	ATCO	Uh I will call you back for higher ... what is gonna be your requested altitude to quebec tango?

Exercise 4: Pilot = Indian / ATCO = Dutch Event – (suspected) Tail Strike (take-off)

source <https://forums.liveatc.net/index.php?action=dattach;topic=13867.0;attach=9381> (accessed 31st August 2017)

1	Pilot	<i>Schiphol Departure hello JAI234 climbing passing one thousand nine hundred for six thousand feet</i>
2	ATCO	JAI234 hello climb flight level one three zero advise able to further climb two seven zero
3	Pilot	<i>Climb FL130 wilco Jet Airways 234</i>
4	ATCO	JAI234?
5	Pilot	<i>go ahead uh 234</i>
6	ATCO	JAI234 colleague from the tower uh thought you had uh slight tail strike on uh on rotation the runway controller didn't see any so just to inform you.
7	Pilot	<i>Okay ... confirm we had a tail strike on uh rotation? uh JAI234.</i>
8	ATCO	JAI234 just one colleague ... thought he uh he see that but the runway controller didn't see.
9	ATCO	JAI234 Amsterdam?
10	Pilot	<i>Go ahead for JAI234?</i>
11	ATCO	Uh your mode sierra call sign is not showing could you dial in JAI234 into that please?
12	Pilot	<i>Uum say again the callsign is not showing?</i>
13	ATCO	Uh we we have a read out of your mode sierra information including your heading final level but also ... your callsign your callsign is not showing it's showing as all zeros.
14	Pilot	<i>Uh JAI234 uh would like to climb ... maintain one five zero.</i>
15	ATCO	JAI234 stop level one five zero ... the reason?
16	Pilot	<i>Due technical JAI234 we'll get back to you.</i>
17	ATCO	Okay please advise .
18	Pilot	<i>JAI234 we'd like to divert uh back towards uh Schiphol Airport now.</i>
19	ATCO	JAI234 you would like to divert back to Amsterdam, that is copied ... continue present heading ... would you need to dump fuel?
20	Pilot	<i>Yes uh we'd like to dump fuel uh and uh we need a lot of airspace to carry out the checklist.</i>
21	ATCO	Okay you can turn right onto heading three two zero that'll be vectors and please advise when you would like to start dumping fuel and how much time you will need to dump fuel for.
22	Pilot	<i>JAI234</i>
23	ATCO	JAI234 you have all the time in the world and I will shortly switch you to a separate frequency that will no have, no other traffic so that we dedicate it to you ... stand by for the transfer to that frequency.
24	Pilot	<i>Roger JAI234 now maintaining level niner zero maintaining heading .</i>
25	ATCO	Roger JAI234 when convenient change frequency one one eight decimal eight zero five.
26	Pilot	<i>Okay changing right now to one one eight eight zero five JAI234 thanks for all your help</i>
27	ATCO	Not at all

Overview of The ICAO Requirements for English Proficiency – Impact on Aviation Safety

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Introduction

Aviation remains a key factor in the globalization process and is the major mean of transport, with a significant impact on economic growth and sustainable development. The air transport network has a strong impact on people's life, bringing the world closer, allowing business development across nations, creating travelling opportunities and generating a one world environment.

With 3.5 billion passengers, 50 million tons of freight, some 1 400 commercial airlines, 26 700 aircraft in service, 4 130 airports, 173 air navigation services providers, and 100 000 daily flights around the world, aviation affects all sectors of the world economy.²

Aviation Safety is one of the major concerns of the industry. For ICAO, safety is one of the strategic objectives, as ICAO serves “as a global forum of States for international civil aviation. ICAO develops policies and Standards, undertakes compliance audits, performs studies and analysis, provides assistance and builds aviation capacity through many activities and the cooperation of its Member States and stakeholders”³.

Through this objective, ICAO aims to enhance global civil aviation safety, with a focus on the regulatory oversight capabilities of States. One of the main expected results is increasing the level of implementation of ICAO SARPs, including the ICAO standards dealing with language proficiency.

Language Proficiency Requirements – General overview

The decision to address the language proficiency for pilots and air traffic controllers was first made during the 32nd session of the ICAO Assembly in September 1998 as a direct response to the fatal accidents in which the contributing factor was lack of English proficiency.

In March 2003, the ICAO Council adopted a comprehensive set of amendments to the Standards

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² ICAO Business Plan 2017 – 2019, First Edition – 2016, page. 1.

³ ICAO Mission, in line with the provisions of the 1944 Convention on International Civil Aviation (Chicago Convention), see <https://www.icao.int/about-icao/Pages/default.aspx>.

and Recommended Practices (SARPs) concerning Language Proficiency Requirements (LPRs). Amendments to Annex 1 – Personnel Licensing, Annex 6 – Operations of Aircraft, Annex 10 – Aeronautical Telecommunications, Annex 11 – Air Traffic Services, and ICAO Doc 4444 – PANS-ATM, to ensure the flight crew, air traffic controllers and aeronautical station operators comply with language proficiency rating scale were expected to be implemented by Member States into their national legislation by 5 March 2008.

The contribution of the work of ICAO in the language proficiency area is so far identified in the implementation, understanding, and the standardization of all the elements leading to the achievement of a minimum operational level, equally valid within all Member States. The main objective of a uniform approach in language proficiency is to ensure that English Language Proficiency Level 4, once achieved, it is a 100 % at the same quality level, standardized, for all Member States. The goal is extended as well as for the other levels of proficiency and qualifications (tests builders, raters, examiners, etc).

The obligation for language proficiency has its root in the Chicago Convention, article 33, requesting to the flight crew to prove language proficiency. Furthermore, the ICAO provisions covering LPRs are divided into two categories, standards and recommended practices. As standards, ICAO has adopted:

- Annex 1 – *Personnel Licensing* - which specifies the applicable language proficiency requirements and the level of proficiency for the language used in radiotelephony communications. The requirements apply to pilots, air traffic controllers and aeronautical operators operating in international operations.
- Annex 6 – *Operation of Aircraft*, Part I – International Commercial Air Transport – Aeroplanes and Part III – International Operations – Helicopters – specifying the role of operators in ensuring that the flight crew demonstrates the ability to speak and understand the languages used in RT communication to the level specified in Annex 1.
- Annex 10 – *Aeronautical Telecommunications* (Volume II - Communication Procedures including those with PANS status) - containing specifications regarding the use of the English language (Chapter 5.2.1.2);
- Annex 11 – *Air Traffic Services* – a similar statement for air traffic service providers, containing specifications regarding the use of the English language (Chapter 2 / para. 2.30).

When it comes to means and processes on how to achieve the desired level of implementation of standards, ICAO has developed support materials:

- Doc. 9835 – *Manual on the Implementation of ICAO Language Proficiency Requirements* (first edition in 2004);
- ICAO Circular 318 - *Language Testing Criteria for Global Harmonization*;
- ICAO Circular 323 - *Guidelines for Aviation English Training Programmes*.

The emphasis of the work of ICAO is on the correct use of ICAO standard phraseology in all situations. Clarity, timely response and accuracy are key elements in achieving the desired level

of English proficiency. Both native and non-native English speakers need to be able to communicate and understand clearly what is being communicated; therefore, a common standard is needed.

In support of the LPRs standards and recommended practices, the Organization conducted lots of efforts in the promotion and explanation of the provisions. ICAO has organized two symposia, one technical seminar, and numerous workshops, released several State Letters related to LPRs developments, as well as several journal articles. ICAO has also published an electronic support (CD) with the ICAO Rated Speech Samples CD and, together with the International Civil Aviation English Association (ICAEA), it has made available the “rated speech samples training aid” (RSSTA).

Oversight of the LPRs

Within the ICAO Universal Safety Oversight and Audit Programme (USOAP), some Protocol Questions (PQs) were developed to assess, for each of the Member State, the level of LPR’s implementation. At first glance, looking to the general result, it is shown that ICAO’s work is done, effective implementation being overall above 70% and, in particular cases, over 90% or even 100%. And yet the question, if the overall objective has been met in this respect, has not received an answer yet.

In a logical development, ICAO is finding itself now in the position to change hats and further address the issue beyond standards. What and how is to be done to achieve not only the quantity but the quality of the implementation of the LPRs needs to be further analyzed.

In order to address this question efficiently, thinking outside the box approach needs to be embraced by ICAO. Therefore, seeking what the users are looking for in order to cover the requirements and contribute to the increase of the level of safety through the common use of English language at a professional level by the whole aviation community might be an appropriate action.

Future work

Having this in our mind, the general opinion is that the establishment of the core legal framework is finalized. ICAO finds itself at the stage where quality, effectiveness and better implementation are priorities. At this point, one option might be listening to the feedback and proposals made by the industry as well, seeking the appropriate and widely accepted and applicable solutions.

Towards this achievement, ICAO was and is still fully aware of the situation that the quality of the implementation for LPRs may be a challenge for some of the Member States due to:

- lack of testing expertise;
- unregulated testing industry;
- in some cases, limited resources at the state level.

Consequentially, ICAO develops projects and tools like the Aviation English Language Testing Service (AELTS) or the ICAO Homepage for the English Language Proficiency Programme (i

HELPP). In order for such programs and tools to properly work and the objectives be achieved, they need to be populated with data and information, and active contribution is widely encouraged. Unfortunately, the participation from the industry or the Member States is not at the expected level today, affecting the usefulness of these tools and leading to questioning the validity of such instruments in the support for LPRs. Furthermore, some answers to the above issue triggered new issues about what is needed to be done and how it should be done to reach the desired objectives.

In conclusion, the way forward is close cooperation between ICAO, its Member States and the industry. In such way the language proficiency issues will all be addressed properly, gaps identified as well as best practices, with the objective to develop new tools or improve the existing ones, for quality and efficiency of LPRs be obtained, as a significant contribution to aviation safety enhancement.

Egyptian Air Traffic Controllers' Perceptions of Hedged Statements Expressing Emergency

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Abstract

Clear communication between air traffic controllers and pilots is an important safety factor, especially in emergency situations. It has previously been found that norms of direct or indirect statements can be tied to culture (Trosborg, 2010), and that there are varying degrees of mitigation in aviation communication (Linde, 1988). This study focuses on the mitigation strategy of hedging, using words like “might” and “maybe” that decrease the directness or certainty of the statement, in aviation. Hedging can be used for mere pragmatic purposes when the speaker is actually certain of what is being said, even in aviation (Linde, 1988).

In this study, the issue of the human factor of air-ground communication is addressed by examining how air traffic controllers perceive hedged statements about emergency situations, focusing on Egyptian perspectives. Quotes that express problems using hedging were gathered from real conversations between pilots and air traffic controllers around the world, and Egyptian air traffic controllers were surveyed, rating the urgency of each statement in the quotes. Two interviews with an Egyptian air traffic controller were also conducted about his experiences communicating with pilots from different cultures in urgent situations.

Answering the question of how Egyptian air traffic controllers perceive urgency in hedged statements could have pedagogical implications for aviation English instruction. It may be important to teach pilots to consider how air traffic controllers from different cultures will perceive hedged statements. Pedagogical implications based on the results of the study are discussed.

1. Background

Indirect statements in conversations between air traffic controllers and pilots has been studied previously. For example, Howard (2008) found that miscommunications occur in conversations between air traffic controllers and pilots when aviation English standards are not followed. Linde (2017) found that mitigated statements made by aviation personnel lead to safety problems because mitigated suggestions are not taken as seriously as direct statements. Since cultural norms may influence how people perceive indirectness (Trosborg, 2010), we decided to focus specifically on how Egyptian air traffic controllers perceive indirect statements from pilots and co-pilots. Some statements might sound less urgent than others because of the words that pilots use. Air traffic controllers from different cultures might not perceive indirect statements or hedged sentences the same way as the speaker might expect. Thus, the situation could be treated with a different degree of importance or emergency. It is important to understand how air traffic controllers from various cultures perceive real statements that pilots and copilots have made expressing emergency indirectly to identify the possibility of dangerous miscommunications due to hedged statements in the future.

2. Methods

Participants were eight air traffic controllers from Egypt who work at a major airport in Egypt. First, an Egyptian air traffic controller was interviewed about his experiences using Aviation English to gather preliminary data. Then, quotes that indirectly expressed emergency to air traffic controllers

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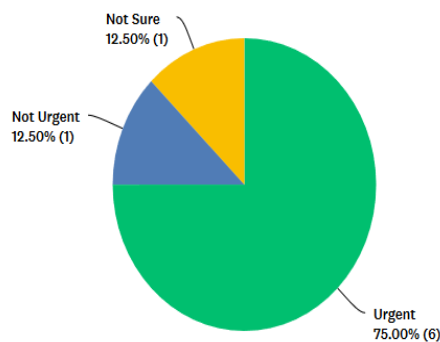
² Ashleigh Cox is an ESL instructor at Georgia State University. She got her masters from Georgia State University in 2018. She is interested in aviation English, intercultural communication, sociolinguistics, and TESOL.

were gathered from transcripts and recordings of conversations between ATC and pilots available online (BestClips Tube 2016; Cockpit Voice Recorder Transcripts 2018; Last Words 2017). Egyptian air traffic controllers were surveyed about their perception of whether or not the quotes were taken from an emergency situation. The survey was given electronically using SurveyMonkey (SurveyMonkey Inc, 1999-2019). The survey presented the selected emergency quotes and asked participants to click “urgent,” “not urgent,” or “not sure.” There was a comment box for each question asking participants to explain their answer. After collecting survey data, an air traffic controller was interviewed about his perceptions of the quotes and how they were similar or dissimilar to conversations he has with pilots and co-pilots.

3. Results

Hate to bother you guys, but, any word on the delay here? Because we're running kinda tight on gas.

Answered: 8 Skipped: 0

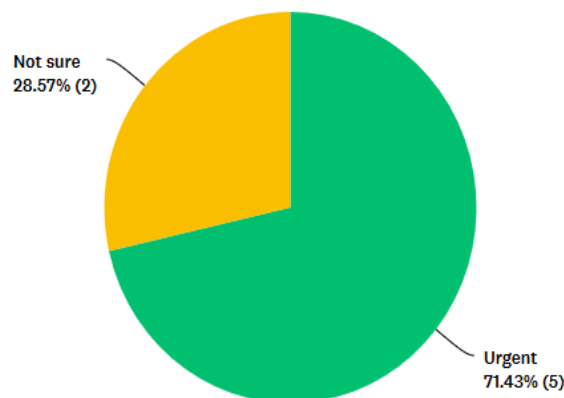


The first statement, as shown on the left, was, “*Hate to bother you guys, but, any word on the delay here? Because we're running kinda tight on gas.*” Six out of the eight participants chose to rate the situation as urgent. However, one participant was not sure if this situation was urgent or not, while another one thought it was not an urgent situation. The participant interviewed mentioned that he would treat

the situation as urgent because of the word “gas,” as they take fuel issues very seriously.

I'm not sure if we can make any runway

Answered: 7 Skipped: 1

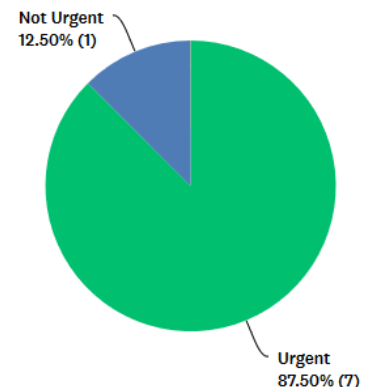


The second statement, as shown on the left, was, “*I'm not sure if we can make any runway.*” One participant did not respond to that statement. Out of the other seven participants, five thought that the statement was urgent. However, two participants were not sure if the statement was urgent or not.

The third statement was, as shown on the right, “*We have a little problem.*” Seven participants out of eight chose to treat the statement with urgency. One of the participants mentioned that any little problem could become a bigger problem if they do not take it seriously. Only one participant thought that the statement is not urgent.

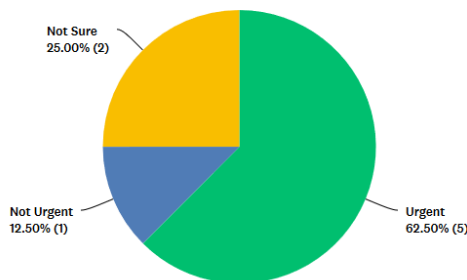
We have a little problem

Answered: 8 Skipped: 0



Is there any possibilities of...we request...is there any airplane that can take off to rescue us?...Any plane that can guide us, an Aero Peru that may be around?

Answered: 8 Skipped: 0

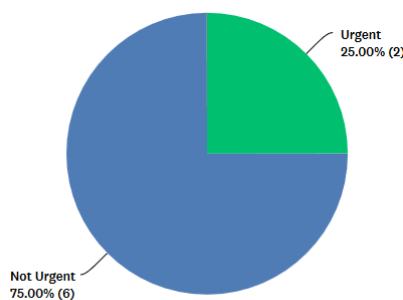


The fourth statement, as shown on the left, was, “*Is there any possibilities of...we request...is there any airplane that can take off to rescue us?...Any plane that can guide us, an Aero Peru that may be around?*” Five participants found that this statement should be treated with urgency. However, two participants were not sure if the situation was urgent or not, and one participant thought it was not

urgent.

It looks like we’re gonna have to return to the field, we’ll need about 8 minutes or so to run some checklists.

Answered: 8 Skipped: 0



The last statement was, as shown on the left, “*It looks like we’re gonna have to return to the field, we’ll need about 8 minutes or so to run some checklists.*” The results here are different from the pattern we have seen in the past four statements where most participants would think the statements were urgent. In this statement, most participants, which was six out of eight, thought that situation was not urgent. Only two participants chose

to treat this situation as urgent, even though the pilot was speaking about returning to airport after takeoff.

4. Discussion

There was individual variation in how the air traffic controllers perceived the statements. Some of them focused on the hedgers, assuming no one would speak indirectly if there was really an emergency, and others focused more on the content of the messages and key words that would indicate danger. For example, one of the participants chose to treat a situation as “urgent” even though the statement mentioned “a little problem.” He commented that any little problem could turn into a

big problem, which is why he would take it seriously before it escalates. This is a wise decision from the air traffic controller, but we cannot assume that all air traffic controllers would make the same decision in that situation.

Some participants did not understand all of the statements. In an interview, one participant who did not understand the phrase, “make the runway” said that in a real situation if he heard something he did not understand, he would ask the pilot to use the standard Aviation English. Reading this statement, one of the participants doubted that a pilot would say a statement like that. However, this statement was said by a pilot in a real situation.

The participants’ responses to the survey showed that hedging, indirectness, and non-standard phrases in aviation emergencies can be problematic. This aligns with the findings of previous research (Howard, 2008). To avoid miscommunication, pilots should not be hesitant to directly declare emergencies when needed and explain dangerous situations to air traffic controllers without mitigation and using standard Aviation English.

5. Conclusion

Not all of the Egyptian air traffic controllers in this study identified all of the quotes taken from emergencies as urgent. Some of the participants expected more direct statements to describe an emergency, but others focused on terms that could indicate potential danger. Flight safety could be improved if pilots avoided hedging when notifying air traffic controllers of emergencies.

5.1 Pedagogical Implications

Teachers of air traffic controllers could help them understand that some native speakers of English hedge their statements even when they express urgency. Instructors could include some statements that include hedging to help students see how hedging is used in authentic context. Teachers of pilots can help them practice speaking directly and make them aware of the danger that hedging could bring. They could refer to studies like this one to make pilots see that other cultures might not take hedging seriously if it is used in emergency.

6. Limitations

The study used a limited sample size of participants. Researchers were only able to find eight participants who were willing to be part of the study. Emergency quotes were manually selected from publicly available aviation transcripts and recordings (BestClips Tube 2016; Cockpit Voice Recorder Transcripts 2018; Last Words 2017) because researchers did not have access to an aviation corpus. Without a corpus, a limited number of hedged quotes expressing emergency was found. Therefore, researchers only had five hedged statements in urgent situations.

7. Future Directions

Other researchers could consider having larger samples in their studies to test if they would get the same findings as this study. More interviews with other air traffic controllers and pilots on the topic of indirect statements in aviation emergencies can be conducted. In this study, pilots were not interviewed nor surveyed. Thus, it would be helpful if future studies could include pilots and examine how often these pilots use hedged statements in urgent situations. In this study, only five hedged statements were collected. More examples of real statements pilots have made expressing emergency indirectly to air traffic controllers could be gathered using an Aviation English corpus. The study focused on examining Egyptian air traffic controllers. However, interviewing air traffic controllers from other cultures can be helpful.

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