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Plain Language or Anything But?

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Introduction

Air traffic control requires radiotelephony (RTF) communication between controllers and most often pilots, as well as other aviation personnel. The language they use is generally accepted as being composed of International Civil Aviation Organization (ICAO) standard phraseology and plain language. ICAO phraseology is presented in publications that guide global air traffic control organizations in correct language use. Plain language is identified as the language used when standard phraseology is not available for a particular situation. This paper considers contradictions in air traffic controllers' beliefs about the role of standard phraseology and plain language, alongside the corresponding definitions and descriptions of plain language in ICAO publications. While analysing the controllers' interview transcripts in this study, we noted that the controllers held contradictory beliefs about the roles of standard phraseology and plain language. We turned to ICAO documents to determine what beliefs about language use should underpin our training. However, the contradictions in controller beliefs reflected contradictions also found in the ICAO documents, which meant we were unclear about how to approach language training.

This research is important because greater clarity in ICAO documents related to radiotelephony communication is needed to guide language training in aviation, especially in multilingual workplaces. At a local level, differing beliefs about language use are likely to underpin the purpose of training in aviation and perpetuate, rather than address, differences in language use that contribute to miscommunication. The paper begins by presenting the context of this study, then the background, methodology and results, followed by a discussion which centers around a model of the contradictory beliefs and assumptions related to aviation

radiotelephony communication. The limitations, implications and future research conclude the article.

Aviation personnel in the United Arab Emirates (UAE) who hold ICAO Level 4 language proficiency must do language training, which includes radiotelephony, at least once every three years (General Civil Aviation Authority [GCAA], 2016). We wanted to know what language training could or should be incorporated into that training in keeping with the guideline that language learning is integrated into aviation training (ICAO, 2009; ICAO 2010). Further, the training needed to be relevant, effective, and efficient given the limited opportunity for trainees to learn. We also wanted to ensure that training did not inadvertently create new safety problems through a lack of expertise or knowledge on our part. We focused on language training for emergencies for two reasons. First, ICAO (2009) suggests that "the language used in airspace management and interaction with emergency services could be more developed when training controllers" (p. 4). Second, controllers must do emergency training annually to retain their licenses and this would provide an opportunity for language instruction.

Consequently, we needed to know more about the language that controllers use in emergencies, but we found the literature inconsistent. On one hand, there is an assumption that more plain language is used in emergencies (Read & Knoch, 2009). From this perspective, air traffic communication often deviates from standard phraseology in emergency situations towards a more conversational style (Campbell-Laird, 2004; Yan, 2007) or similarly, more plain language is used in emergencies and unusual situations (Bullock, 2017; ICAO, 2010; Moder, 2013; Prado & Tosqui-Lucks, 2019) because standard phraseology is insufficient (Yan, 2007). On the other hand, standard phraseology is regarded as useful for routine and emergency

situations, but not one-off unpredictable (unusual) situations (Mitsutomi & O'Brien, 2003; Varantola, 1989).

One goal of our training was to help reduce miscommunication in the workplace. Causes of miscommunication have been attributed to a range of factors, such as the native English speaker (NES)/ non-native English speaker (NNES) language divide (Bieswanger, 2013; Kim & Elder, 2009); lack of technical knowledge and experience (Kim, 2018; Shin & Kim, 2005); and a lack of fluency in RTF communication (Knoch, 2014). Trippe and Baese-Berk (2019) point out that ICAO's expectation that aviation personnel use plain language in emergencies may be problematic in multilingual workplaces. They predict that miscommunication is more likely in multilingual than monolingual workplaces because aviation personnel from different language backgrounds are less likely to have a shared understanding of the meaning of words. Drayton's (2021) interviews with nine air traffic controllers also raised this issue, with one controller explicitly stating that misunderstandings were more common in his current multilingual workplace than in his former monolingual workplace.

This paper examines four questions that relate to the beliefs of controllers about language use in four multilingual workplaces in the UAE:

1. What definitions or descriptions do ICAO provide for plain language in aviation radiotelephony communication and how do they relate to the beliefs air traffic controllers hold about language use (standard phraseology and plain language) in radiotelephony communication?
2. What impact does language background have on language use?
3. What beliefs do the controllers in this study hold about language use and training for emergencies?

4. What is the impact of the beliefs of these controllers on the purpose of emergency training?

Background and Participants

This study took place at a training centre in the United Arab Emirates (UAE). The research was approved by the Victoria University of Wellington Human Ethics Committee (HEC ID 0000027733) and all participants signed consent forms before taking part. Qualitative data for this study was obtained from interviews with controllers from four workplaces. All the controllers had attained at least Level 4 English language proficiency (GCAA, 2016; ICAO, 2018).

The nine participants were all licensed tower controllers from two military aerodromes (Ghaf and Sandy Aerodromes) and two civil airports which handle military traffic (Desert and Dune Airports). They were chosen by convenience sampling (Friedman, 2012; Rothwell et al., 2016). Eight were air traffic controllers who arrived at the training centre to do emergency training and were asked if they would be willing to take part in the research. The final participant was asked to take part in the research during an unrelated meeting and an interview was scheduled for a later date. The participants' experience on the job ranged from five to thirty-nine years and the participants had worked in the UAE between one and twelve years. Interviews were conducted with controllers from military and civil airport facilities to establish if the experiences in both environments were similar.

Table 1 shows the participants come from a range of language backgrounds. Eight out of nine controllers speak more than one language. Seven of the participants speak English as a second language and one speaks English only. Of those who have worked outside the UAE, two

have worked in English-speaking countries, and all have worked in non-English speaking countries. Pseudonyms have been used for all workplaces and controllers in this study.

Table 1

Research Participants

Name	First language (L1)	Second language(s) (L2)	Places worked
Shaikha Mariam Alia	Arabic	English	UAE
Mansour	Arabic	English	UAE, Turkmenistan, Pakistan, Kazakhstan
Mohamed	Arabic	English Comprehension only: Hindi	UAE
Floyd	English	N/A	USA, Afghanistan, UAE
Nelson	English	Spanish	USA, Korea, Japan, Italy, Honduras, Iraq, Afghanistan, UAE
Axel	Swedish	English, German, French	Sweden, Estonia, Latvia, Lithuania, Nigeria, Namibia, Saudi Arabia, UAE
Oliver [a]	An Eastern European language	English Comprehension only: Russian, Finnish	Eastern Europe, UAE

[a] Many controllers in the UAE come from Eastern Europe, but only a very small number come from some Eastern European countries. For that reason, we have identified Oliver as Eastern European.

Methodology

The ICAO publications are divided into Annexes and Documents. Annexes contain standards and recommended practices (SARPs). Member states are legally bound to meet standards and recommended practices become legal once they are adopted by states (ICAO, 2016a). The following Annexes were included in this study:

1. *Annex 1 Personnel Licensing* (ICAO, 2018) includes language proficiency requirements which were introduced to raise the standard of English of aviation personnel.
2. *Annex 10 Aeronautical Telecommunications Volume II* (ICAO, 2016a) provides standards and recommended practices for radiotelephony communication.

Documents contain procedures which are extensions of the SARPs (ICAO, 2016b) and again, are enforceable once adopted by states. Three documents were examined to find out how standard phraseology and plain language is presented by ICAO:

3. *Document 4444 Procedures for Air Navigation Services: Air Traffic Management* (ICAO, 2016b) provides the standard phraseology for standard operating procedures, excluding callsigns, waypoints and other locally specific items, in different phases of flight, e.g., taking off, cruising or landing.
4. *Document 9432 Manual of Radiotelephony* (ICAO, 2007) provides examples of standard phraseology with dummy callsigns, waypoints and other items which differ from state to state or region to region. The document also gives more written detail about radiotelephony language.

5. *Document 9835 Manual on the Implementation of ICAO Language Proficiency Requirements* (ICAO, 2010) outlines expectations for language training and testing in aviation.

Interview Analysis

Semi-structured interviews (Friedman, 2012) were conducted with all nine controllers. Table 2 identifies the controllers and where they work. The questions were designed to identify the controllers' opinions about language training and help to establish training needs. Ten questions focused on the participants' background, the context of their work, and their opinions about sources of miscommunication and about training (see Appendix A). The interviews were transcribed through many readings and annotations (Révész, 2012). It became clear that the controllers held a range of underlying beliefs about language use and language training needs. Quotes in the results section represent these beliefs.

Table 2

Controllers Interviewed from Each Workplace

Workplace	**Controller Name**
Ghaf Aerodrome (military)	Mohammed, Nelson, Mansour, Alia, Mariam, Shaikha
Sandy Aerodrome (military)	Floyd
Dune Airport (civil)	Axel
Desert Airport (civil)	Oliver

Results

RQ 1: ICAO Publications and Controller Beliefs

This section presents an overview of the findings related to all five ICAO publications. From there, it divides into two further sections. The first is based on findings from *Document 9432 Manual of Radiotelephony* and interview data which identify standard phraseology as a language. The second section is based on *Document 9835 Manual on the Implementation of ICAO Language Proficiency Requirements* and interview data which identify standard phraseology as limited to a set of standard operating procedures. The military or civil background of controllers in this study did not appear to be a source of difference in their opinions.

Annexes 1 and *10* underpin the three documents. Each document acknowledges the requirement in *Annex 10* that states: "Only when standardized phraseology cannot serve an intended transmission, plain language shall be used" (ICAO, 2016a, p. 5.1), for example, in an emergency. *Annex 10* further requires that "Communications shall be concise and unambiguous, using standard phraseology whenever available" (ICAO, 2016a, p. 5.18), and this requirement is also more or less present in all three documents.

The three documents and *Annex 10* refer to the language proficiency requirements (LPRs) for language testing in aviation which are contained in *Annex 1.* The Annex states that the LPRs are "applicable to [testing] the use of both phraseologies and plain language" (ICAO, 2018, p. App 1.1). Language proficiency testing is mandated to ensure that all aviation personnel reach a minimum acceptable standard of English. That said, "Formal evaluation is not required for applicants who demonstrate expert language proficiency, e.g., native and very proficient non-native speakers with a dialect or accent intelligible to the international aeronautical community"

(ICAO, 2018, p. 1.17). *Document 4444* does not define plain language beyond the requirements in *Annexes 1* and *10*.

Standard phraseology as a language. *Document 9432* provides an "explanation of the role of phraseologies and plain language in radiotelephony communications" and begins with a reiteration of the requirements contained in *Annexes 1* and *10*, then goes on to clarify standard phraseology (paragraph 3.2.2) and plain language (paragraph 3.2.3). The full texts of each paragraph can be found in Appendix B.

Paragraph 3.2.2 pertains to the use of standard phraseology. It states that standard phraseology is not sufficient to cover all circumstances and aviation personnel must have sufficient plain language proficiency for events not covered by standard phraseology. Paragraph 3.2.3 is an explanation for when plain language should be used. The important points here are that plain language is considered as a *subsidiary phraseology* which is used *in addition* to ICAO standard phraseology. It is unclear from this paragraph whether *subsidiary phraseology* means phraseology that is used repetitively in routine situations particular to a region or if *plain language* is used in one-off situations when standard phraseology is insufficient or both. In the foreword, ICAO states "users may find it necessary to *supplement* [emphasis added] standard phraseology with plain language" (ICAO, 2007, p. iii), and this appears to be the premise which underlies the above explanations.

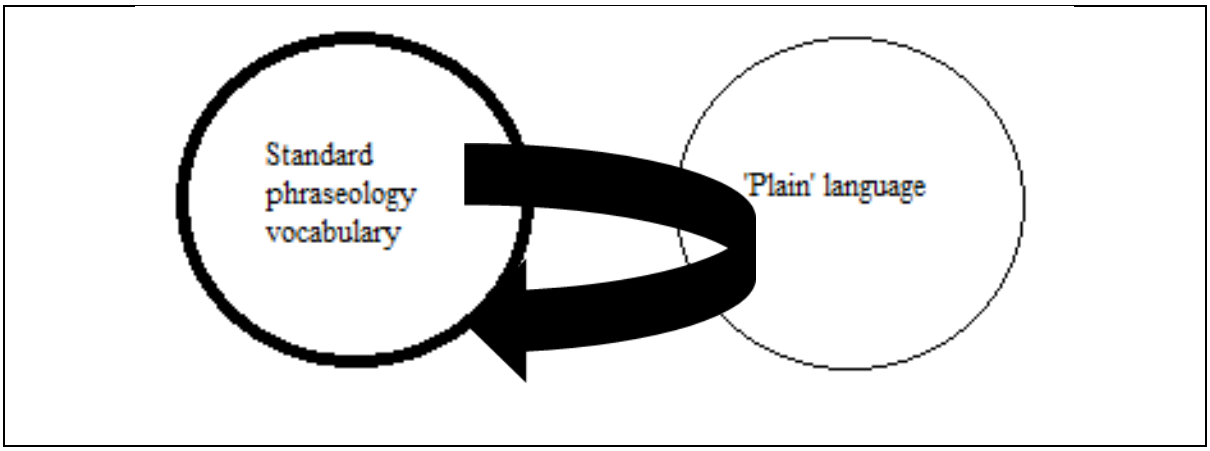
This also suggests that plain language is used with standard phraseology in the way two controllers describe. To them, standard phraseology is adapted to different situations using plain language when required. Oliver explains, "standard RT [radiotelephony] doesn't cover all the situations so there are always some kind of deviations from the standard RT because the situation requires to act a little bit more differently" (Oliver). Mansour says,

> I learned on the job so I become … Like for one year I spend one year just for training this phraseology, how to speak, how to understand, how to get down some of these things, until … I create my own procedure. My own words. I can use it, but within the standard. So I have to start with the standard but using my own words (Mansour).

Figure 1 combines the interview and document data to demonstrate the paradigm where standard phraseology is a language. When standard phraseology "cannot serve an intended transmission" then plain language is used to *supplement* standard phraseology vocabulary. In the diagram, the dominant language use is standard phraseology vocabulary (in the bold circle) and speakers "borrow from" general English or "plain" language as denoted by the arrow.

Figure 1

Standard Phraseology as a Language



Standard Phraseology Limited to a Set of Standard Operating Procedures

In *Document 9835 Manual on the Implementation of ICAO Language Proficiency Requirements*, plain language is defined as "The spontaneous, creative and non-coded use of a given *natural* [emphasis added] language" (ICAO, 2010, p. x), which is qualified as being

"constrained by the functions and topics (aviation and non-aviation) that are required by aeronautical radiotelephony communications, as well as by specific safety-critical requirements for intelligibility, directness, appropriacy, non-ambiguity and concision" (ICAO, 2010, p. 3.5).

The ICAO Document further qualifies the term by saying that *plain* was chosen rather than *general*, *common*, *extended,* or *natural* since *plain* is used in other ICAO documents (ICAO, 2010, p. x). Elsewhere, in the same document, ICAO asserts: "There is simply no more suitable form of speech for human interactions than natural languages" (ICAO, 2010, p. 1.2), suggesting that this premise underlies the definition for plain language.

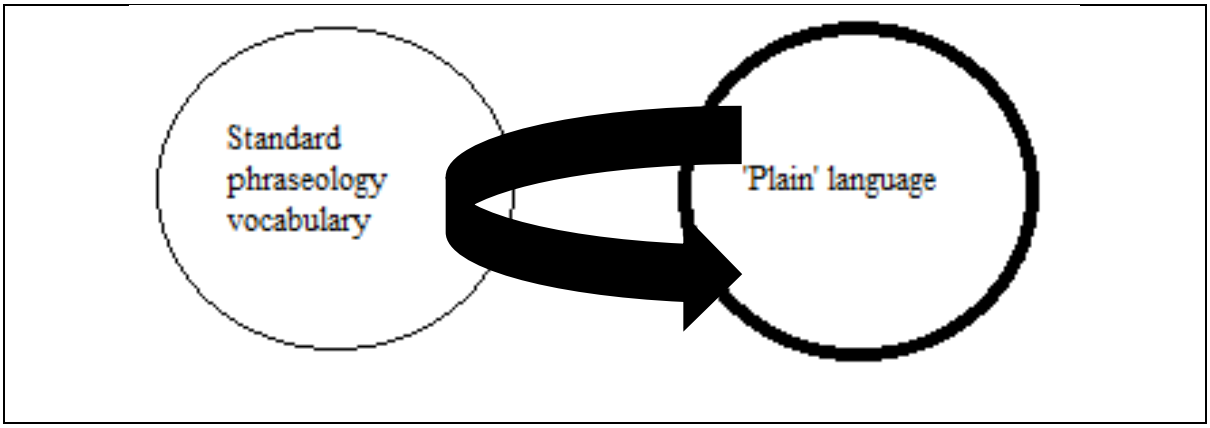
One of the participants, Floyd, reflects this understanding of standard phraseology as phrases to be used for a set of standard operating procedures (beyond which plain language is used). As Floyd says, "There's no phraseology built for hydraulic failure and you know, the pilot needing an odd request … there's no set phraseology" (Floyd), and "in other situations um yeah definitely no phraseology, just get the information you need, talk to the pilot like a human being right" (Floyd).

Floyd reiterated the point that you should '*just talk to the pilot'* four more times in his interview implying that he uses plain or general English when there is no standard phraseology.

Figure 2 shows this second paradigm in which standard phraseology is limited to memorised phrases connected to standard operating procedures. Beyond those circumstances, plain language must be used in the first instance and "borrowing" is from standard phraseology vocabulary. Again, the dominant language use is signified by the circle in bold and the arrow shows borrowing.

Figure 2

Standard Phraseology Limited to Standard Operating Procedures



RQ 2: Impact of Language Background on Language Use

The controllers attributed differences in language use to whether aviation personnel were native English speakers (NES) or non-native English speakers (NNES). Three themes presented themselves in the data. First, the controllers thought that NNES use more standard phraseology. The controllers explain, "non-English speakers tend to stick to specific words and phrases" (Nelson), and "When it comes to the non-native, I would say that … they might be more keener to stick to the standard RT [radiotelephony]" (Oliver). Further, "my experience is that … [if you have] English as second language you speak it better on the radio compared to mother tongues" (Axel).

Second, in contrast to NNES, native English speakers use more general/plain English. Controllers comment on language use: "Um and one of the problems that I see native English speakers having is they tend to fall back on slang and words that are not … phraseology" (Nelson); "so [native English speakers] use their own like aviation English back in Australia, so when they come here, they say the words they use … which … we don't understand" (Mohammed); and "[Native English speakers have] been using more plain language and less of

the standard phraseology" (Oliver). In addition, they say, "that's the danger I think … when a native speaker uses too complex … sentence structures (Oliver); "Some of them [speak faster] yes. Usually because they are flying, they don't have time" (Alia); and "The native speaker, they speak in a … mother tongue with a dialect" (Axel).

Oliver felt that North American controllers used more plain language because they are self-conscious about using standard phraseology. He says,

> I've seen that North American controllers who are really flexible with their phraseology. They've been using more plain language and less of the standard phraseology because for them it's a little bit awkward … this is my personal opinion, to sound a little bit silly maybe (Oliver).

Third, the greater use of plain language causes miscomprehension. For example, Nelson and Oliver say, "… if I'm using a slang word … and English is their second language they may not understand it or they may take it as something … totally different because in English the same word could have two different meanings" (Nelson), and "when the native speaker he uses really complex language ah the comprehension might be off" (Oliver).

RQ 3: Beliefs about Language Use and Training for Emergencies

The controllers held differing beliefs about language training for, and language use in, emergencies. Two controllers shared similar beliefs about language use. They stated that controllers should be silent during emergencies since the pilot is busy in the cockpit and should not be disturbed. They also felt that language could not be practiced since there is no standard phraseology and plain language is used. For example, Axel and Floyd say, "during emergencies, more plain language [is] used. There's no standard" (Axel), and "anything that's non-standard, can't teach that" (Floyd).

In an emergency, Axel and Floyd thought that a controller who had achieved ICAO English language proficiency Level 4 would know what to say. While the remaining seven controllers agreed that English language proficiency is necessary, they had a different opinion about training in that they believed that language training for emergencies would be useful. Shaikha sums up this view when she says, "[Training] will help us in our realistic work so we can understand pilots from different nationalities" (Shaikha).

Language training for emergencies gives trainees a chance to consider the language they might need. As Mansour puts it, "Um sometimes in the simulator they create something like an abnormal, then you have to create your language, you know, you have to like digging inside your mind to put the words" (Mansour).

RQ 4: Impact of Beliefs on the Purpose of Training

This section presents the differences in the purpose of training in Ghaf and Sandy aerodromes. Controllers in both aerodromes stated that the overall purpose of training was to reduce panic, but they used different ways to achieve that common aim. For Ghaf controllers, the simulator training was designed to reduce communication problems during emergencies by standardising the language and procedures. The controllers used a written script with the checklists in the simulator, and practiced reading the script to ask pilots for information and pass it on to emergency services, as Mohammed and Nelson explain,

> [The] emergency situations … today, we tried to do as … standard as much as we can, like asking for questions, POB [persons on board], fuel endurance, type of emergency. …. We have a checklist, but a lot of people don't follow it, so you will do it your way, I'll do it my way (Mohammed).

> What we found is, we have a checklist with information that's required to be passed but it doesn't tell you how to say it. So we're finding that controllers are basically passing the information as they deem necessary so I may pass it different from the next controller which causes confusion on the receiving end because they're getting different calls every day in a different format (Nelson).
>
> We came up with creating a script so that's what we're teaching, that's what we're practicing now is the script. And the script is word for word so the only thing the controller has to do is copy the information down. They write it in the empty block and then they just read it verbatim (Nelson).

In contrast, the Sandy simulator session focused on logistics. This means that the controller practiced what to do in an emergency including where to send emergency vehicles. Floyd explains, "I think the [simulator emergency training] we did today and the one we send everybody through is geared, you know, obviously more for less panic and just knowing what you need to do in a certain situation" (Floyd).

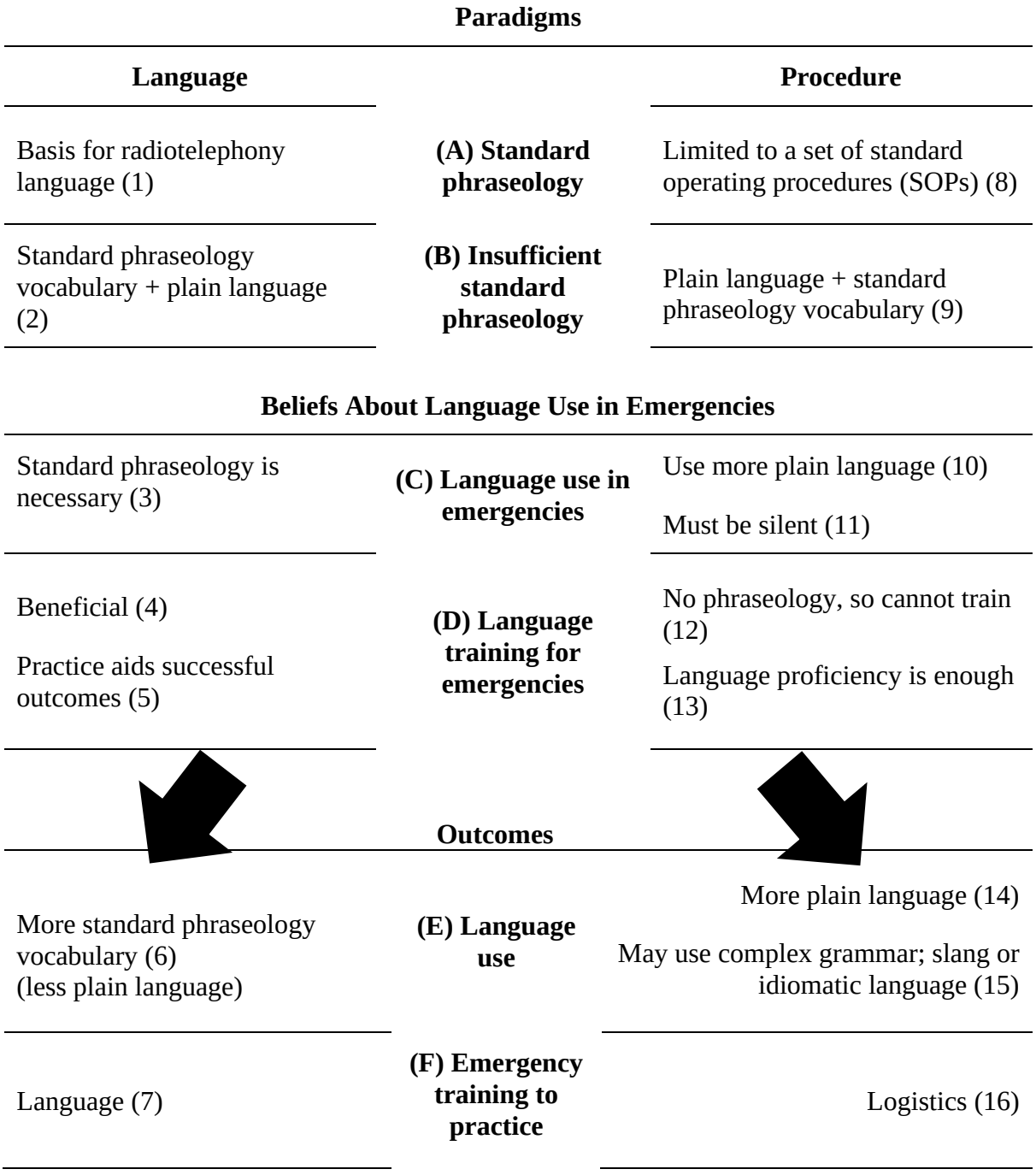
Discussion: Controller Beliefs, Language Use and Training for Emergencies

In this section we present a model of the contradictions identified in the results, and how they relate to language use and training outcomes. The model in Figure 3 presents the two paradigms of language use found in the ICAO publications and interview data. The two sides of the model present the two underpinning paradigms titled *Language* and *Procedure*, based on the contrasting approaches to standard phraseology. The language paradigm holds that standard phraseology is the basis of a language for all radiotelephony communication and it is extended, where necessary, with plain language. The procedure paradigm holds that the standard operating procedures are coupled with memorized standard phrases that are the basis for communication in

routine situations only, beyond which plain language is used. The model is divided into three parts. The top part summarises the ICAO publications and controllers' beliefs about the role of standard phraseology (A) and the use of plain language when standard phraseology is insufficient based on Figures 1 and 2 in the results (B). The middle part summarises the controllers' beliefs about language use in emergencies and is centred around two categories identified in interviews: what constitutes the language used during emergencies (C); and the benefit or otherwise of language training for emergencies (D). The bottom part of the model summarises the outcomes of controller beliefs. They are organised around two key outcomes. The first outcome is language use (E) in which the composition of the language identified by the controllers is summarised. Note that this language use is not limited to emergencies. The second outcome is the purpose of emergency training (F) for each of the aerodromes in this study.

Figure 3

Language Use and Outcomes in Aviation Radiotelephony Communication



Let's now talk through the relationship between the model, controller beliefs and ICAO publications. Controllers on the language (left) side of the model view standard phraseology as a

language which forms the basis of radiotelephony communication (1). These controllers think that standard phraseology is frequently adapted, using plain language, to circumstances as they arise (2). A similar finding was made by Rees (2013) who showed pilots and controllers frequently need to adapt their language, or use plain language, in routine situations. Both (1) and (2) are supported in *Document 9432*; i.e., plain language is supplementary to standard phraseology which forms the basis of communication. The next belief about language use in emergencies is that standard phraseology is necessary (3) and should be used as much as possible. The final beliefs relate to language training for emergencies. From this point of view, language training for emergencies is beneficial (4) because it allows controllers to practice (5) what they will say before an emergency happens and helps to reduce panic in a real emergency. The outcomes of these five beliefs are that controllers are more likely to use more standard phraseology vocabulary (6) (and less plain language), and one purpose of emergency training can be to practice the language required to deal with an emergency (7).

The beliefs on the procedure (right) side of the model contrast with those on the left. The first belief is that standard phraseology is a series of phrases for a finite set of standard operating procedures (8). In circumstances where there is no standard phraseology, plain language is used in the first instance and supplemented with vocabulary from standard phraseology (9). This view is supported in *Document 9835* which bases a definition of plain language on natural English and suggests that plain language replaces standard phraseology when it is insufficient for communication (Intemann, 2008; Lopez et al., 2013). In terms of emergencies, these controllers believe that more plain language is used (10). The next belief is that controllers need to be silent since the pilot is busy in the cockpit (11). The expectation for silence is also contained in *Document 9432 Manual of Radiotelephony* (ICAO, 2007) and may well be held by controllers in

both paradigms, but was only mentioned by two controllers, so the model reflects the interview data on this point. Further, language training for emergencies is not possible since there is no phraseology for use in emergencies (12). Also, every emergency is different, so if controllers have sufficient English language proficiency, then they can successfully deal with one (13). There are three outcomes related to beliefs (10) – (13): that more plain language is used (14), that language use may include complex grammar and slang (15), and that the purpose of emergency training is to practice the logistical arrangements needed to resolve an emergency (16).

Mansour, Oliver and Floyd's beliefs and outcomes matched the left or right side of Figure 3. Interview data about the "impact of language background on language use" suggests that NNES are more likely to demonstrate the language use (E) shown on the left side (6) and NES are more likely to display outcomes (14) – (15) on the right. Mansour and Oliver, (both NNES), stated language and training outcomes (6) and (7). During interviews they expressed beliefs (1) - (5) on the left side. In other words, their beliefs and outcomes matched the language paradigm in Figure 3. Floyd's beliefs were in stark contrast. Floyd (a NES) expressed the beliefs on the right side of the model, i.e., (8) - (13) with language and training outcomes (14) - (16). For example, in terms of language use, Floyd used the idiomatic phrase *that's your call,* in response to a vehicle driver in a simulator emergency exercise. The ICAO phraseology is *at own discretion.* Floyd's beliefs and outcomes matched the procedure paradigm on the right side of the model.

However, the beliefs held by controllers could not always be predicted from language background and did not simply follow the language or procedure paradigm. For these controllers, there were differences in their observations of the workplace and their personal beliefs about language use. For example, NES Nelson believes in (1) – (5) with training at (7), and (6) for

language use. He advocated for greater standardization of language use in emergencies. Further, he felt that standard phraseology needed to be emphasised and tested in ab initio training. Non-native English speaker Axel believes in (1) and (2) on the left side. The outcomes for him were (16) for training on the right side, and (6) for language use. Axel observed greater use of plain language by NES and believed this was a problem. However, he also felt that more plain language is used in emergencies (10) and language training for emergencies is not possible (12), which was at odds with his NNES peers in this study.

This variation in beliefs can help explain variations in language. ICAO (2010) gives the example: "Can we keep high speed?" and explains that "there is no ICAO phraseology for this pilot's request for permission" (p. 3.6), suggesting that no phraseology means plain language must be used instead. Controllers or pilots who, instead, see standard phraseology as the basis of radiotelephony language might say, "**Request maintain speed,**" which applies (adapts) the principles and vocabulary of standard phraseology to circumstances for which there is no phraseology (1). The bolded words *request, maintain* and *speed* are technical words in standard phraseology (Drayton, 2021). Conversely, "Can we keep high **speed**?" matches language use in (14) and follows from the assumption that plain language is used when there is no standard phraseology (8) – (9). This short phrase results in very different language use depending on the beliefs of a controller. In terms of the reasons for variation in language that lead to miscommunication, this study adds underlying beliefs or assumptions about language use, that are contained in ICAO Documents and held by controllers, as possible causes.

Limitations of this Study

A major limitation of this study is its very small size. With only nine controllers, the results are not generalizable beyond these UAE workplaces. However, the existence of similar

contradictions in ICAO Documents and controller beliefs suggests that the findings are worthy of further investigation in a larger study.

It would be valuable to test the understanding of communication which uses standard and non-standard language (e.g., “request maintain” vs “can we keep”). This work would then provide a measure of comprehension which is outside the scope of the present study.

Implications

The findings in this study have implications for policy, training, and language testing in aviation. The definition of plain language in ICAO Documents needs clarification. It is likely that plain language as a supplement to standard phraseology is too narrow to describe actual language use and that plain language as *natural* English is too broad. It is possible that a better definition, specific to radiotelephony communication, lies somewhere between the two.

The lack of clarity around plain language definitions may contribute to differences in training and to language variation. Training for radiotelephony communication is needed for all users regardless of language background. This paper highlights the need for training to use the language contained in standard phraseology as a starting point for communication (Clark, 2017; Moder & Halleck, 2009), which could contribute to greater standardization of language use between speakers from diverse backgrounds.

Language testing in aviation also requires examination. First, the assumption that adequate language proficiency is enough to deal with emergencies was not supported in this study. The Ghaf controllers’ training was because they had different approaches to dealing with emergencies despite having achieved ICAO Level 4 language proficiency. Trippe (2018) found that language proficiency did not equate to successful comprehension of radiotelephony communication. Further, the language proficiency requirements do not address the standard

phraseology vocabulary identified in Figures 1 – 3 but are focused on 'plain' language (Elder et al., 2017; Farris, 2016; Kim, 2018; Moder & Halleck, 2009). Finally, the requirement in *Annex 1* that only non-native English speakers (NNES) are to be tested assumes that improvement in language ability of NNES will result in more successful communication (Read cited in Hirch, 2020). Given that variation in language can occur regardless of language background, this research suggests that the technical vocabulary of standard phraseology (Drayton, 2021) should be tested and that such testing should include native English speakers.

Future Research

Further research into the radiotelephony language that controllers use every day is needed. Little is known about the combination of standard phraseology and plain language in routine communication. One way to address this issue would be to use corpus analysis to develop a list of technical vocabulary contained in ICAO standard phraseology. The list could be used to establish the nature of technical vocabulary (Nation at al., 2016) and its coverage (Coxhead, 2017; Coxhead et al., 2020; Nation et al., 2016) in different situations ranging from routine communication to emergencies or unusual situations. An examination of technical vocabulary could also shed light on the nature of plain language used with it and within it. Not only are standard phrases used with plain language, but they also contain plain language; e.g., *are you ready* in 'G-CD ARE YOU READY FOR IMMEDIATE DEPARTURE' (ICAO, 2007, p. 4.6, capitals in original). Examining vocabulary usage from the Human Factors perspective of Threat and Error Management (TEM) (ICAO, 2005) may also highlight events where standard phraseology and plain language are likely to be combined. It is important to note that this is not a suggestion that standard phraseology be developed for every situation that could arise in aviation. Rather, a better understanding of how technical vocabulary is used (or not) and how

this affects communication is required. Further, a better understanding of technical vocabulary and plain language may enable development of tests that better reflect the tasks undertaken in the aviation environment (Farris, 2016; Kim, 2018; Knoch, 2014).

Corpus analysis can also be used to identify differences in technical vocabulary coverage of controllers with different beliefs about language use. Establishing individual language differences can be done using the keyword analysis method used by Culpeper (2002) to identify keywords of individual characters in a Shakespeare play. Research of this nature could establish the veracity of the model presented in Figure 3 on a larger scale. The results of future research identified here would help establish future training and testing needs in aviation radiotelephony language.

The research presented in this paper is about tower air traffic control, but it would be useful to extend this research to include approach and area air traffic control. Another future direction for research could be to investigate apps for aviation in terms of both the language they include and how they are used. Finally, another direction for research might be to investigate checklists for emergencies, but only after more is understood about how language is used in the aviation context.

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Appendix A

Interview Questions

1. What languages do you speak and how often do you use them?
2. How many years have you worked as an air traffic controller?
3. How many years have you worked in the UAE?
4. Where have you worked before?
5. You speak to pilots every day in your job. How does this part of your job compare to when you speak to pilots in the simulator?
6. Would it help trainee air traffic controllers to learn phraseology as a separate subject (outside of the simulator)? Why/Why not?
7. Did you receive training (outside the simulator) in phraseology or English language when you trained to be an air traffic controller? Was it helpful?
8. Would you say that the language used on the radio by native English speakers and non-native English speakers is the same or different? If different: In what ways?
9. Do you think it would be useful to give communication or language training to all air traffic controllers? Why/Why not?
10. Would language training help in emergency situations? What kinds of language training would you suggest?

Appendix B

Extracts from ICAO Document 9432

Document 9432 Manual of Radiotelephony – Paragraphs relating to standard phraseology and plain language

3.2.2 Phraseologies have evolved over time with periodic initiatives by bodies responsible for codifying and standardizing their use. ICAO phraseologies are developed to provide maximum clarity, brevity, and unambiguity in communications. Phraseologies are applicable to most routine situations; however, they are not intended to cover every conceivable situation which may arise. The success and widespread adoption of the ICAO phraseologies has given rise, to some degree, to an expectation on the part of some users that phraseologies *alone* could suffice for all the communicative needs of radiotelephony communications. ICAO provisions related to the use of language adopted by the ICAO Council in 2003 better clarify that, while ICAO phraseologies should always be used whenever they are applicable, there also exists an inherent requirement that users also have sufficient "plain" language proficiency. ICAO documents make this clear in a number of instances (ICAO, 2007, p. 3.2, emphasis in original).

3.2.3 ATS personnel and other ground personnel will be expected to use *appropriate subsidiary phraseologies* which should be as clear and concise as possible and designed to avoid possible confusion by those persons using a language other than one of their national languages. "Appropriate subsidiary phraseologies" can either refer to the use of plain language, or the use of regionally or locally adopted phraseologies. Either should be used in the same manner in which phraseologies are used: clearly, concisely, and unambiguously. Additionally, such *appropriate subsidiary phraseologies* should not be used *instead of* ICAO phraseologies, but in addition to ICAO phraseologies when required, and users should keep in mind that many speakers/listeners will be using English as a second or foreign language (ICAO, 2007, p. 3.2, emphasis in original).