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A prosodic profile of American Aviation English

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ABSTRACT

Aviation English is a codified register of English used by international pilots and controllers, derived from postwar American radiotelephony. Although regulations require proficiency in Aviation English, little has been done to describe it. The current study seeks to add to theis literature by describing the prosodic profile, or rhythm and intonation, of American Aviation English as compared to Standard American English. Specifically, we examine corpora of air traffic controller speech and professional radio broadcasters' speeching. Two corpora of naturally produced speech, this study demonstrates that Aviation English has a more restricted pitch range, is faster, and exhibits less variable vowel durations and more variable consonant durations than Standard English. These prosodic differences from Standard English may create difficulties for Aviation English users, and indicate inaccuracy in the assumption that attaining proficiency in conversational English is sufficient for proficiency in Aviation English.

1. Introduction

Aviation English Standard Phraseology is not a conversational style, but a distinct register of English: a codified, abbreviated, jargon-filled register using numbers paired with descriptors to convey crucial information succinctly. As a form of radiotelephony, Aviation English Standard Phraseology is designed to be decipherable without face-to-face contact, in a time-critical environment that includes radio static and multiple speakers sharing a single radio frequency (International Civil Aviation Organization, 2004; Philps, 1991; Melnichenko & Melnichenko, 2008). Aviation English messages must be conveyed quickly and concisely via clear, emotionless delivery (Prinzo, Lieberman, & Pickett, 1998). Aviation English radiotelephony also requires speakers to audibly occupy the radio frequency or risk being interrupted. This specialized register of English has been adopted as a lingua franca by aviation professionals around the world (Estival, Farris, & Molesworth, 2016; Hazrati, 2015; Kim & Elder, 2009). From the content of these transmissions flight crews in a given area are privy to each other's communications (similar to a party-line phone exchange) and develop an awareness of each other's positions and intentions (Prinzo & Campbell, 2008). If crews are not able to understand each other, situational awareness is diminished and can lead to accidents (Borowska, 2018; Dennis, 2015; Tallantyre, 2014). Indeed, aviation English communications affect the safety of some three and a half million passengers daily (ICAO Annual Reports, 2017), underlining the need for description and standardization of this register of English. The present study intends to provide a description of the rhythmic properties of Aviation English, a feature of the language that we believe plays a critical role in communication and miscommunication.

Beginning in 1951, the International Civil Aviation Organization (ICAO) has required that air traffic controllers (ATCOs) and pilots who do not share another language speak Aviation English with one another. Regardless of the ICAO Aviation English

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requirement, Aviation English communication problems continued to contribute to accidents. Accordingly, ICAO implemented a requirement that international pilots and ATCOs undergo Aviation English proficiency testing starting in 2011 (ICAO, 2004). Even though proficiency in Aviation English is mandated for international pilots and ATCOs, little is known about how to evaluate or train Aviation English users. Currently, the majority of pilots trained in the US learn Aviation English Standard Phraseology in the aircraft while they are learning to fly, regardless of their native language. This is problematic because the high cognitive load required to control an aircraft detracts from available cognitive resources for absorbing and responding to language input (Robertson & Johnson, 1988). This burden is particularly onerous for non-native English speakers, who may have the added cognitive load of translation (Farris, 2007). Difficulty describing Aviation English stems from the fact that the Standard Phraseology described in regulatory publications (Federal Aviation Administration, 2017; International Civil Aviation Organisation, 2010), is not the only sanctioned form of Aviation English radiotelephony. This Standard Phraseology may be circumvented in non-routine situations and in…

> … cases, where phraseology provides no ready-made form of communication, pilots and [air traffic] controllers must resort to *plain language* (ICAO, 2010: 3.3.13.) (emphasis mine).

Therefore, proficiency in "plain English", has become mandatory in addition to proficiency in Aviation English Standard Phraseology (ICAO, 2010) Since plain English is not sufficiently defined, this stipulation amounts to a Standard English conversational proficiency requirement for pilots and ATCOs working internationally, regardless of the fact that the vast majority of Aviation English communication is in Standard Phraseology.

Similarly, although proficiency in Aviation English Standard Phraseology and plain (i.e. Standard) English are required by the ICAO, how these varieties of English interact in language learning and use remains understudied. One study analyzing different usage characteristics of Aviation English Standard Phraseology and Standard English used in radiotelephony concludes that they are actually separate specialized registers of English for which the ICAO specifically outlines conditions of use (Bieswanger, 2016). However, ICAO requirements support Aviation English training conventions rooted in the assumption that Standard English proficiency aids in Aviation English proficiency. In fact, requiring proficiency in both these varieties of English (Standard Phraseology and Standard English) may be an unnecessary burden on Aviation English users and increase miscommunication.

As mentioned above, unlike Aviation English Standard Phraseology, "plain English" is relatively undefined. However, the intent of the regulation allowing for use of plain language is clear. The ICAO stipulates that…

> Plain [English] in aeronautical radiotelephony communications means the spontaneous, creative and non-coded use of a given natural language, although 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 [sic], non-ambiguity and concision. (ICAO 2010: 3.3.14)

Because of this vague description, individual pilots and ATCOs must determine the construction of plain English utterances. Underlying the plain English exception is the assumption that this form of English will lead to more reliable communication than Aviation English Standard Phraseology in non-routine circumstances. In cases where pilots and ATCOs share a first language, this assumption may be accurate and the use of a shared conversational register of English (whether English is their first or second language) could clarify communication. However, Aviation English is mandated for all pilots and ATCOs in international airspace who do not share a first language. Therefore, the assumption that Standard English will be a reliable form of communication may be inaccurate. Additionally, even fluent speakers of Aviation English Standard Phraseology may have less facility in the more complex and nuanced register of Standard English. Standard English itself may be quite different regionally and in different contexts. For the purposes of this study, we have chosen to represent Standard English with Standard American English, or the form of English commonly used in writing and speaking in the US. This study seeks to clarify the relationship between Aviation English Standard Phraseology and Standard English by assessing phonological aspects, or the sound, of each register.

1.1. Aviation English Standard Phraseology

Aviation English Standard Phraseology word order and terminology are fixed, and marked by infrequent use of articles, auxiliary verbs, prepositions and pronouns (Hinrich, 2008; Moder, 2012; Philps, 1991). Aviation English transmissions often consist of commands issued by an ATCO and acknowledged by a pilot. Indeed, these command/response communications are described as the "core role of pilot-controller communication" (ICAO, 2010, 3.4.7). Command topics include flight path parameters (altitude, heading, airspeed), weather phenomena (wind, visibility, turbulence), location of other aircraft in the vicinity, and permission to perform particular tasks. Each transmission may contain several topics. For example, here is a Standard Phraseology transmission from an ATCO to Delta flight 1019:

> Delta ten nineteen, twelve miles south of the marker heading three two zero, maintain four thousand till established, one nine zero knots to the outer marker, cleared I-L-S approach runway three five right (Godfrey, 1994).

In this example, proper Standard Phraseology is reflected in topic order as well as lexical topic identifiers (e.g. *heading, maintain,* etc.) and number expressions for each topic addressed. The aircraft is identified by a call sign made up of the carrier name and flight number read as a group, rather than as separate digits (i.e. *Delta ten nineteen*). Although Aviation English