Investigating the Effectiveness of Standard Aviation Phraseology Design: A Combination of Corpus Analysis and Psycholinguistic Experimentation

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This study focuses on the language form used in the context of pilot-air traffic controller radiotelephony communication: standard aviation phraseology (SAP). The SAP is an example of controlled operative languages, developed through lexico-semantic and syntactic-pragmatic restrictions of English. Conventional expressions, each with a clear and precise meaning, are selected to form SAP. The syntactic structure of SAP is characterized by the incorporation of a performative verb, enabling the execution of a specific speech act (Wyss-Bühlmann, 2005). The design of SAP is intended to ensure clear, effective, and unambiguous air-ground verbal exchanges. Non-compliance with these standardized practices in real-life radiotelephony communications may result in misunderstandings (Morrow *et al.*, 1994; Jones, 2003; Howard, 2008; Estival *et al.*, 2023). Nevertheless, the implementation of SAP remains a complex task, as pilots and air traffic controllers tend to be influenced by the regularities of English (Lopez, 2013). With the assistance of an expert air traffic controller, we identify instances of non-standard use of SAP in real air-ground communications. Three types of variation are highlighted: syntactic, lexical, and semantic, and we examine the potential comprehension issues posed by these variations. To assess the impact of non-standard use on pilots' comprehension, 40 French-speaking pilots are presented with standard and non-standard Air Traffic Control (ATC) messages, delivered in audio format using the Psychology Software PsychoPy. Once the instructions are understood, participants press the space bar and either read back or respond to the transmitted instructions. The participants then perform the actions according to the instructions on the Microsoft Flight Simulator game by manipulating the virtual flight controls. Reaction times to the ATC messages, as well as each participant's readback or response, are systematically recorded. The results demonstrate that deviations from SAP hinder pilots' comprehension by increasing significantly their reaction times and lead to multiple interpretations of the intended message($p = 0.04973$). The effectiveness of SAP is grounded in its semantic dimension, which involves avoiding ambiguous constructions, and its pragmatic dimension, which emphasizes the direct and explicit transmission of communicative intent. The findings underscore the importance for users of ATC communications to strictly adhere to SAP and develop accommodation skills for effective communication in non-routine or unexpected situations not covered by SAP.

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