LANGUAGE SWITCHING IN AVIATION

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Eternal rest grant unto the victims of aircraft accidents, O Lord, and let perpetual light shine upon them. For the sake of Your sorrowful passion, may their souls rest in peace. Amen

Abstract

Clear and precise communication between pilots and air traffic controllers is a precondition for safe operations. Communication has long been identified as a major element of the cockpit–controller interface, explaining one third of general aviation incidents (Etem & Patten, 1998). Yet, despite multilingualism with English as the *lingua franca* being a characteristic of aviation communication, little research appears to have investigated the efficiency of operation of bilinguals alternating between their dominant, usually native, language and English in a bilingual air traffic environment.

The studies undertaken for this research sought to rectify this situation by examining the cognitive aspects of situation awareness during language switching in aviation. Quantitatively and qualitatively analysed responses to an online-distributed survey aimed at investigating the current bilingual situation in aviation revealed that while situation awareness for the majority (76%) of native-English speakers was adversely affected by bilingualism, almost 30% of bilinguals also reported their situation awareness being affected. Subsequent experimental analyses using a language switching paradigm investigated how participants recognize a target call sign, identify an error and predict in bilingual compared with monolingual English conditions. The effect of the language condition participants' native Chinese only, English only, or a mix of both, varied across the three tasks. Call sign recognition performance was found to be faster in the English condition than in the bilingual condition, but accuracy did not differ, a finding that was attributed to the effect of call sign similarity. However, when the task was more complicated, the difference between the conditions diminished. No effect on performance was found for simultaneously listening to two speech sources, which is potentially analogous to cockpit communication and radio calls. The error analyses served to test for response bias by calculating sensitivity, d', and decision criterion C in accordance with Stanislaw and Todorov's (1999) Signal Detection Theory calculations.

Several cognitive implications for practice were proposed, for example, in Crew Resource Management (CRM) training and personal airmanship development, exploration of own behavioural biases might be used to adjust the placement of the criterion. The cognitive implications largely focused on affecting attitudes to increase awareness. Attention was focused on performance of bilinguals to identify which language condition facilitated faster and more accurate responses. The findings were unable to support any of the conditions, leaving the question: *Would a universal language for communication on radio frequencies be worth considering, to allow everyone to understand what is said?* Disentangling the effects of language switching on the performance of bilingual pilots and air traffic controllers remains a task for future studies.

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I give thanks to my best friend, Lord Jesus Christ. *Terima kasih*, Lord, my Hero, for the gift of all the people during these years and for everything You do for us, within us, and through us. Pardon me as well, for too often I am not even aware of how much you help me, how much You unceasingly care. Mistakes are mine, the good comes from the Lord Jesus Christ.

I wanted to fly; You removed the solid ground.

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List of Abbreviations

ASRS	Aviation Safety Reporting System
ATC	Air traffic control
ATCO	Air traffic controller
CAA	Civil Aviation Authority
CR	Correct rejection
CRM	Crew Resource Management
ESL	English as a second language
FA	False alarm
FAA	Federal Aviation Authority
ICAO	International Civil Aviation Organization
IELTS	International English Language Testing System
ISI	Inter-stimulus interval
L1	Native language experimental condition
L2	Second language experimental condition
LPRs	Language Proficiency Requirements
Mix	Language switching experimental condition
NES	Native English Speaking
NTSB	National Transportation Safety Board
RPDM	Recognition Primed Decision Making
RT	Response time
SA	Situation awareness
SDT	Signal Detection Theory
SNR	Speech to Noise Ratio