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LANGUAGE SWITCHING IN AVIATION

A thesis presented in partial fulfilment of the requirements for the degree of
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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 wanted to fly; You removed the solid ground.

CONTENTS

Chapter One	1
-------------------	---

INTRODUCTION

1.1. Background of the Study	1
1.2. Thesis Outline.....	4

Chapter Two.....	6
------------------	---

THE STUDY CONTEXT

2.1. Bilingualism: Definition and Use.....	6
2.2. Bilingual Air Traffic Environment	7
2.3. Bilingualism as a Contributing Factor in Safety Occurrences.....	8
2.4. Bilingual Air Traffic Conflict.....	10
2.5. English Language Proficiency Regulation in Aviation	12
2.6. Language Issues in Aviation after ICAO LPR Implementation	13

Chapter Three.....	17
--------------------	----

LITERATURE REVIEW

Part I: Defining the Concepts

3.1. Overview	17
3.2. The Importance of SA in Aviation	17
3.3. Bilingualism, SA and Cognition.....	23
3.4. Bilingual IFR Communications Simulation Studies	27
3.5. Language Switching	29
3.6. Contrasting Chinese and English Language.....	34
3.6.1. Pronunciation and Accent.....	36
3.6.2. Number of Instructions in One Transmission.....	37
3.6.3. Grammar Issues	37
3.7. Numerical Processing.....	39

Part II: Methodological Considerations

3.8. Methodological Considerations.....	44
3.9. The Reason for Including Signal Detection Theory	46
3.10. SDT, SA, and Bilingualism	47

3.11. Yes–No Procedure	49
3.12. Response Time: The Challenge	50
3.13. Markers for Language Control.....	53
3.14. Discriminability Index and Decision Criterion	55
3.15. Background Noise and Speech to Noise Ratio	59

Part III: Summary

3.16. Summary of the Literature Review	60
3.17. Identification of the Research Problem.....	62
3.18. Identification of the Research Questions	62

Chapter Four	64
--------------------	----

STUDY 1: Pilot and ATCO Current Language Experiences

4.1. Introduction.....	64
4.2. Method	66
4.2.1. Participants.....	66
4.2.2. Materials	66
4.2.3. Procedure	71
4.3. Results.....	72
4.3.1. General findings.....	72
4.3.2. Bilingual Air Traffic Environment	74
4.3.3. Perceived Effects on SA	76
4.3.4. Experienced Consequences.....	78
4.4. Discussion	81

Chapter Five.....	87
-------------------	----

STUDY 2: Call Sign Recognition

5.1. Introduction.....	87
5.1.1. Call Sign Aviation Regulation and Research.....	87
5.2. Method	89
5.2.1. Overview	89
5.2.2. Participants.....	89
5.2.3. Design	90
5.2.4. Materials	93
5.2.5. Procedure	99

5.3. Results	100
5.3.1. General Findings	100
5.3.2. Performance Speed	104
5.3.3. Performance Accuracy	110
5.3.4. SDT Measures	113
5.4. Discussion	114
Chapter Six.....	120
STUDY 3: Error Identification	
6.1. Introduction	120
6.1.1. Detection of Erroneous Message.....	121
6.2. Method.....	124
6.2.1. Overview	124
6.2.2. Participants	124
6.2.3. Design.....	125
6.2.4. Materials.....	127
6.2.5. Procedure.....	131
6.3. Results	132
6.3.1. General findings	132
6.3.2. Performance Speed.....	133
6.3.3. Performance Accuracy	141
6.3.4. SDT Measures	143
6.4. Discussion	144
Chapter Seven	149
STUDY 4: Prediction	
7.1. Introduction	149
7.1.1. Many Terms, Same Concept? Anticipation, Prediction, Expectation, Projection.....	150
7.1.2. Number Series	152
7.2. Method.....	153
7.2.1. Overview	153
7.2.2. Participants	153
7.2.3. Design.....	154
7.2.4. Materials.....	157

7.2.5. Procedure	161
7.3. Results.....	162
7.3.1. General Findings	162
7.3.2. Performance Speed	165
7.3.3. Performance Accuracy	169
7.3.4. SDT Measures.....	171
7.4. Discussion.....	172

Chapter Eight176

STUDY 5: Listening To Radio Calls Over Background Talk

8.1. Introduction.....	176
8.2. Method.....	180
8.2.1. Overview	180
8.2.2. Participants.....	181
8.2.3. Design	181
8.2.4. Materials	186
8.2.5. Procedure	191
8.3. Results.....	192
8.3.1. General Findings	192
8.3.2. Performance Speed	194
8.3.3. Performance Accuracy	197
8.3.4. SDT Measures.....	201
8.4. Discussion	202

Chapter Nine209

STUDY 6: Sterile Cockpit

9.1. Introduction.....	209
9.2. Method.....	211
9.2.1. Overview	211
9.2.2. Considerations for the Analysis	211
9.2.3. Measures	212
9.3. Results.....	213
9.3.1. Overview	213
9.3.2. Performance Speed	213

9.3.3. Performance Accuracy	216
9.3.4. SDT Measures	217
9.4. Discussion	218
Chapter Ten.....	223
GENERAL DISCUSSION	
10.1. Summary	223
10.2. Discussion	224
10.3. Limitations and Future Research.....	229
10.4. Cognitive Implications for Practice.....	232
CONCLUSION.....	236
REFERENCES	238
Appendix A: Low-Risk Ethics Notification for Study 1	270
Appendix B: Low-Risk Ethics Notification for Study 2.....	271
Appendix C: Stimuli List for Study 2	272
Appendix D: Low-Risk Ethics Notification for Study 3	273
Appendix E: Stimuli List for Study 3	274
Appendix F: Low-Risk Ethics Notification for Study 4	275
Appendix G: Stimuli List for Study 4.....	276
Appendix H: Low-Risk Ethics Notification for Study 5	277
Appendix I: Stimuli List for Study 5	278
Appendix J: Transcript of Background Talks for Study 5.....	279

List of Tables

Table 1	<i>Information–Response Matrix</i>	49
Table 2	<i>Demographic: First Language of Participants by Language Families, and Percentage of Participants Speaking more than Two Languages across Corresponding Language Families</i>	74
Table 3	<i>Survey Participants’ Experiences of Countries Using Bilingual</i>	75
Table 4	<i>Perceived Effects of Language Alternation on Situation Awareness of Native- and Non-Native English-Speaking Participants</i>	76
Table 5	<i>Reported Frequency of Experienced Struggles to Speak English by Non-Native English-Speaking Participants</i>	78
Table 6	<i>The Consequences of Difficulties Related to Bilingual Air Traffic</i>	79
Table 7	<i>ICAO Rating Scale, CEFR, and IELTS Comparison Chart</i>	98
Table 8	<i>Mean Response Times (RT), Mean Durations of Stimuli, and Mean Pure RT in Seconds in First (L1), Second (L2), and Language Switching (Mix) Conditions</i>	103
Table 9	<i>Median (Mdn) Pure Response Times in Seconds across Language Condition and Inter-stimuli Interval (ISI) Factors</i>	107
Table 10	<i>Median (Mdn) Pure Response Times in Seconds across Language Condition and Similarity Factors</i>	107
Table 11	<i>Median (Mdn) Pure Response Times in Seconds on Chinese and English Word Stimuli in Monolingual (L1 and L2) and Language Switching (Mix) Conditions: Mixing Costs and Switch Costs</i>	108
Table 12	<i>Mean Pure Response Times in Seconds across the English Language Proficiency Levels</i>	109
Table 13	<i>Error Types (Miss and False Alarm), Hits and Correct Rejections (CR), and Total Number of Errors across Language Conditions, and Percentage of Errors from 5100 Stimuli (%Error_T)</i>	110
Table 14	<i>Number (n_{errors}) and Percentage of Errors (%Error_E) across ISI Levels and as a Proportion of Total Number of Stimuli ($n_{stimuli}$) in Each ISI Level (%Error_{ISI})</i>	111
Table 15	<i>Number (n_{errors}) and Percentage of Errors (%Error_E) across Levels of Similarity Factor (%Error_S), and as a Proportion of Total Number of Stimuli ($n_{stimuli}$) in Each Level of Similarity Factor ($n_{stimuli}$)</i>	112
Table 16	<i>Frequency of Correct Responses and Errors, and Percentage of Errors (%Errors) across English Language Proficiency Levels</i>	113
Table 17	<i>Sensitivity (d') and Decision Criterion (C) of Call Sign Recognition Task across the Three Language Conditions: Native (Chinese) Language (L1), Second (English) Language (L2), and Language Switching (Mix)</i>	113
Table 18	<i>Mean Response Times (RT), Mean Durations of Stimuli, and Mean Pure RT in Seconds, in First (L1), Second (L2), and Language Switching (Mix) Conditions</i>	133
Table 19	<i>Median (Mdn) Pure Response Times in Seconds across Language Condition and Inter-stimuli Interval (ISI) Factors</i>	136
Table 20	<i>Median (Mdn) Pure Response Times in Seconds on Correct Rejections (CR) and Hits across the Language Condition Factor</i>	137
Table 21	<i>Median (Mdn) Pure Response Times in Seconds on Chinese and English Word Stimuli for Correct Rejections (CR), Hits and Both Combined in Monolingual (L1 and L2) and Language Switching (Mix) Conditions; Mixing Costs and Switch Costs</i>	138
Table 22	<i>Mean Pure Response Times in Seconds across the English Language Proficiency Levels</i>	139

Table 23	<i>Error Types (Miss and False Alarm), Hits and Correct Rejections (CR), Total Number of Errors and “Say Again” Requests across Language Conditions, and Percentage of Errors from 5200 stimuli (%Error_T)</i>	141
Table 24	<i>Number (n_{errors}) and Percentage of Errors (%Error_E) across ISI Levels and as a Proportion of Total Number of Stimuli ($n_{stimuli}$) in Each ISI Level (%Error_{ISI})</i>	142
Table 25	<i>Number of Participants (n), Correct Responses and Errors, and Percentage of Errors (%Errors) across English Language Proficiency Levels</i>	143
Table 26	<i>Sensitivity (d') and Decision Criterion (C) of Error Identification Task across the Three Language Conditions: Native (Chinese) Language (L1), Second (English) Language (L2), and Language Switching (Mix)</i>	144
Table 27	<i>Mean Response Times (RT), Mean Durations of Stimuli, and Mean Pure RT in Seconds in First (L1), Second (L2), and Language Switching (Mix) Conditions</i>	164
Table 28	<i>Mean Pure Response Times in Seconds and Standard Deviations (SD) across Language Condition and Position Factors</i>	167
Table 29	<i>Mean Pure Response Times in Seconds and Standard Deviations (SD) across Language Condition and Pattern Factors</i>	167
Table 30	<i>Mean Pure Response Times in Seconds across the English Language Proficiency Levels</i>	168
Table 31	<i>Error Types (Miss and False Alarm), Hits and Correct Rejections (CR), and Total Number of Errors across Language Conditions, and Percentage of Errors from 1920 Stimuli (%Error_T)</i>	169
Table 32	<i>Number (n_{errors}) and Percentage of Errors (%Error_E) across Levels of Position Factor and as a Proportion of Total Number of Stimuli in Each Position Factor Level (%Error_P)</i>	170
Table 33	<i>Number (n_{errors}) and Percentage of Errors (%Error_E) across Pattern Factor Levels and as a Proportion of Total Number of Stimuli in Each Pattern Factor Level (%Error_P)</i>	170
Table 34	<i>Number of Participants (n), Correct Responses and Errors, and Percentage of Errors (%Errors) across English Language Proficiency Levels</i>	171
Table 35	<i>Sensitivity (d') and Decision Criterion (C) of Prediction Task across the Three Language Conditions: Native (Chinese) Language (L1), Second (English) Language (L2), and Language Switching (Mix)</i>	171
Table 36	<i>Mean Response Times (RT), Mean Durations of Stimuli, and Mean Pure RT in Seconds in Second (L2) and Language Switching (Mix) Conditions across the Three Tasks with Background Talk (Call Sign Recognition, Error Identification, and Prediction)</i>	193
Table 37	<i>Mean Pure Response Times in Seconds across Language Condition and Background Talk Factors</i>	194
Table 38	<i>Median (Mdn) Pure Response Times in Seconds on Chinese and English Word Stimuli in Monolingual (L2) and Language Switching (Mix) Conditions; Mixing Costs and Switch Costs</i>	195
Table 39	<i>Mean Pure Response Times in Seconds and Standard Deviations (SD) across Language Condition and Background Talk Factors</i>	196
Table 40	<i>Median (Mdn) Pure Response Times in Seconds on Chinese and English Word Stimuli in Monolingual (L2) and Language Switching (Mix) Conditions; Mixing Costs and Switch Costs</i>	196
Table 41	<i>Mean Pure Response Times in Seconds and Standard Deviations (SD) across Language Condition and Background Talk Factors</i>	197

Table 42	<i>Number and Percentage of Errors across the Tasks and Background Talks</i>	198
Table 43	<i>Number and Percentage of Errors across the Tasks and Language Conditions, Total Number of Errors (Totals), Total Number of Stimuli within Tasks (N), and Percentage of Total Number of Errors (%Error_T) within Tasks</i>	199
Table 44	<i>Distribution of Errors (Miss and False Alarm), Hits and Correct Rejections (CR) in Call Sign Recognition Task, Total Number of Errors across Language Conditions, and Percentage of Errors from 1350 Stimuli (%Error_T)</i>	200
Table 45	<i>Distribution of Errors (Miss and False Alarm), Hits and Correct Rejections (CR) in Error Identification Task, Total Number of Errors across Language Conditions, and Percentage of Errors from 1080 Stimuli (%Error_T)</i>	200
Table 46	<i>Distribution of Errors (Miss and False Alarm), Hits and Correct Rejections (CR) in Prediction Task, Total Number of Errors across Language Conditions, and Percentage of Errors from 720 Stimuli (%Error_T)</i>	201
Table 47	<i>Sensitivity (d') and Decision Criterion (C) across the Three Tasks (Call Sign Recognition, Error Identification, and Prediction), and Two Language Conditions, Second (English) Language (L2), and Language Switching (Mix)</i>	202
Table 48	<i>Mean Pure Response Times in Seconds (M), Standard Deviations (SD), Error Counts and Percentage of Errors within Conditions (%Error) of Call Sign Recognition (Task 1), Error Identification (Task 2), and Prediction (Task 3) Tasks with and without Background Talk</i>	214
Table 49	<i>Comparison of Sensitivity (D') and Decision Criterion (C) of the Three Tasks Conducted with and without Background Talk in Second (English) Language (L2), and Language Switching (Mix) Conditions</i>	217

List of Figures

<i>Figure 1.</i> Formulas for calculating the switch costs.....	54
<i>Figure 2.</i> Formula for calculating the mixing costs.	55
<i>Figure 3.</i> Normal Q-Q plot for the outlier data point (L2, ISI 1, Similarity 2).	101
<i>Figure 4.</i> Normal Q-Q plot for the outlier data point (L2, ISI 3, Target).....	102
<i>Figure 5.</i> Interaction plots for Language condition, ISI, and Similarity factors.	105
<i>Figure 6.</i> Profile plots for English language proficiency groups in the L2 and Mix conditions..	109
<i>Figure 7.</i> Interaction plot for Language condition and ISI factors.	134
<i>Figure 8.</i> Profile plots for the English language proficiency groups in the L2 and Mix conditions.	140
<i>Figure 9.</i> Interaction plots for Language condition, Position, and Pattern factors.....	166
<i>Figure 10.</i> Profile plots for the English language proficiency groups in the L2 and the Mix conditions.	168
<i>Figure 11.</i> Study 5 flow diagram with three consecutive tasks performed under background talk; the Call sign recognition, Error identification, and Prediction tasks.	180
<i>Figure 16.</i> Profile plots for Background talk factor across the three tasks (Call sign recognition, Error identification, Prediction), and two language conditions (L2, Mix).	216

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