

Improving Radio Communication in General Aviation: A Preliminary Investigation

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Research Aim

Overarching

- Investigate the extent of the problem - miscommunication in general aviation
- Identify cause/s
- Assess the utility of language technologies as a solution

Present research

- To investigate the problem of miscommunication in general aviation – ATC and Pilots



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Miscommunication

- Defined – Failure to effectively exchange information between two or more parties (Tiewtrakul & Fletcher, 2010)
 - Origins
 - Pronunciation
 - Comprehension
 - Word confusion
 - Interference (noise)
- Possibly as a result of standard English opposed to aviation English



The Problem: Miscommunication

Between 1976 and 2000, more than 1,100 passengers and crew lost their lives in accidents in which investigators determined that language had played a contributory role.

(Matthews, 2004)

- Recognised by ICAO →
all new pilots and Air Traffic Control (ATC) personnel must pass an *English Language Proficiency* (ELP) test prior to obtaining their qualifications.
- In Australia, this rule came into effect in March 2009.



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ELP: Some Teething Problems

Possible reason: (Alderson & Horak, 2009)

- Training organisations focus on teaching pilots to use **standard English**, with some aviation specific phraseology and jargon
- Standard conversational English includes using **pauses** in appropriate places, and **intonation** to emphasise important or relevant information
- But these **non-verbal features** are not used as in normal conversation
- In fact, **lack of intonation, rhythm, and pauses** are typical of rapid radio communication in the aviation environment
- Known to be particularly problematic since *no visual clues are present* (McMillan, 1998; Prinzo, 2008; Nevile, 2008).

Example: “Mike India Charlie report final”.



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ELP and Miscommunication

Real example:

- Malay student at YSBK, passed the ELP test.
- But the Control Tower refused to have him solo in the circuit.
- Reasons?

“Unable to understand the student”.

“Student unable to respond”.



ELP and Miscommunication

Real example:

- Aircraft (ABC): BK tower; ABC 2RN inbound with alpha.
- Tower: ABC; BK tower; follow a Cherokee turning downwind.
- ABC: *'looking for traffic' ABC; unable to locate the turkey*
- Tower: 'silence' ABC preceding traffic is in your 2 o'clock and it is a white & blue CHE-RO-KEE; report sighted
- ABC: traffic sighted *'sighted Cherokee'*



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Miscommunication

- Problem a system failure as much as an individual failure
 - Training (skill)
 - Education (ELP or Flight Radio Telephone Operator Licence)
 - [Commercial Operation example](#)
 - “The sad thing is, in my flying around I have heard native English speakers have just as much communication trouble as this guy.”



Communication Challenges in GA

Preliminary study to investigate **potential miscommunication** between Air Traffic Control (ATC) and pilot (native and non-native speakers -EL2 pilots)

e.g. pilots misunderstanding a clearance given to another aircraft as being meant for them.



Method

- Anonymous paper-based survey
- Distributed at flight training organisations in the Sydney basin.
- Designed to elicit *self-reports of radio communication problems* (NOT intended to assess pilots' level of English proficiency)

Six questions:

1-2: information about the pilot's level of English proficiency and flight training;

3-6: pilot's experience with radio communication – both with other pilots and with ATC.



Participants

- 36 general aviation pilots
- Mean flight experience: 342 hrs (Range: 15 - 2,800)
- 13 pilots had passed the General Flying Progress Test (GFPT) or were at the Pre-solo and Solo stages of training;
- 12 pilots held a Private Pilot Licence (PPL);
- 11 pilots held a Commercial Pilot Licence (CPL)



Participants' Language Background

Nine language backgrounds:

- English Native Speakers (NS): 23 pilots
 - Australian English* (22);
 - British English* (1).
- Non-native speakers of English (EL2): 13 pilots
 - Tamil* (4),
 - Cantonese* (3)
 - Malaysian* (2)
 - Malayalam* (1)
 - Telugu* (1)
 - Urdu* (1)
 - Korean* (1)



Participants

Training Level	# of Participants	Mean Flight Hours	EL2
Pre-Solo	2	15*	2
Solo	5	48*	4
GFPT	5	53	2
PPL	12	222*	3
CPL	11	701*	1
Total	35*	342	12*



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Results: Pilots Understanding ATC

Have you ever been in a situation where you did not fully understand what ATC was telling you?

- 21 Pilots answered 'Yes'

English	(14)
<i>Tamil</i>	(2)
<i>Cantonese</i>	(2)
<i>Malaysian</i>	(2)
<i>Korean</i>	(1)
- 20* Pilots asked ATC to repeat (1 x instructor explained)

Clearance	(4)
Runway direction	(4)
Aircraft call sign	(1)
Navigation	(1)
Breach of control airspace	(1)
Radio interference	(1)

* Could not recall



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Results: ATC Understanding Pilots

Have you ever been in a situation where ATC asked you to repeat what you said?

- 26 Pilots answered 'Yes'

English (17)

Tamil (2)

Cantonese (3)

Malaysian (2)

Malayalam (1)

Korean (1)

- 25* Pilots understood the message the 2nd time

Aircraft call sign (10)

Clearance information (7)

Upwind (1)

Flight information (1)

* Could not recall



Results: Rank in Order of Difficulty

All pilots were asked to Rank in order of difficulty (1 = most difficult):

*Remembering what you have to say,
Saying what you have to say,
Understanding ATC,
Understanding other pilots,
Reading back.*

- | | | |
|----|---|-----------------------|
| 1. | <i>Understanding other pilots²</i> | (Mdn = 1.97, Range 3) |
| 2. | <i>Remembering what you have to say^{1,3}</i> | (Mdn = 2.57, Range 4) |
| 3. | <i>Reading back</i> | (Mdn = 3.14, Range 4) |
| 4. | <i>Saying what you have to say³</i> | (Mdn = 3.62, Range 4) |
| 5. | <i>Understanding ATC^{1, 2}</i> | (Mdn = 3.71, Range 4) |

Results: Native Language and Task Difficulty

Determine if differences observed with task difficulty could be explained by native language.

Kruskal-Wallis non-parametric test failed to reveal any differences $X^2(5,21) = 3.77, p = .58$

Suggests native language not an influencing factor in what pilots found difficult with radio communication

*Note small sample sizes



Results: Licence Type and Task Difficulty

Determine if differences observed with task difficulty could be explained by qualifications (licence type).

Kruskal-Wallis non-parametric test failed to reveal any differences $X^2 (3,20) = 5.77, p = .12$

Suggests qualifications as measured by licence type not an influencing factor in what pilots found difficult with radio communication

*Note small sample sizes



Results: Free Text

Pilots were asked to suggest other areas of difficulty with radio communication

- 3 Pilots responded

p1 “pilots whose first language is not English”

p20 “it’s very hard when pilot is mumbling/broken English”

p36 “Bloody Indians”



Results So Far

- a. Communication problems do pose a **threat to general aviation safety**.
- b. Most challenging communication problem for pilots is not with ATC, but **with other pilots**.
- c. Pilots, **irrespective** of native language or qualifications find communicating with other pilots difficult



Conclusions

- Communicating with other pilots – challenging
 - Quality of transmission between two aircraft negatively affects effective communication (Shimizu et al., 2002).
- Communicating with ATC - least challenging task.
 - May be explained in part by the intensive training provided to ATC, and to the standardized phraseology now regularly employed (Cushing, 1994; Hutchins & Klausen, 1996).
- Finally, there is some evidence to suggest that the standard of English employed by EL2 pilots contributes to the challenges of radio communication in GA.



Future Research

- Directed towards investigating the underlying problems associated with radio communication, such as comprehension, phraseology, intonation, speech irregularities (i.e., utterances) and the use (or misuse) of pauses.
- Directed towards quantifying the frequency of communication problems within GA and whether ATC experiences are similar to that of their flying counterparts.



Planned Experiments

1. Actual (frequency) impact of *English Language Proficiency* on effective radio communication?
2. Causes of misunderstandings between EL2 pilots and ATC?

Subjects: EL2 pilots of different proficiency levels
4 conditions: *external* (low traffic and high traffic)
internal (low workload and high workload)

Variables: (1) accuracy of interpretation (*comprehension*)
(2) ability to repeat phrases (*repetition*).

Four possible outcomes:

- Hear but not understand
- Hear what you expect
- Not hear
- Partial hear



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Proposed Solutions

1. better communication strategies:

- educate both ATC and Pilots about typical areas of miscommunication
- teach more effective communication strategies to ATC and pilots
- develop a computer based training tool to maintain communication skills

2. technologies:

- to identify potentially unclear or confusing messages
- to alert ATC and pilots

D. Estival & B. Molesworth (2009). "A study of EL2 pilots' radio communication in the General Aviation environment". *Australian Review of Applied Linguistics*. Vol.32, No.3.



Thank You

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