Communication Competence in Pilot-Controller Interactions: Repair and Accommodation Strategies

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ABSTRACT

Due to the exponential growth in the aviation industry, the number of non-native speaker pilots and air traffic controllers has significantly increased. Naturally, the interaction has become more challenging since the communication shifted to intercultural communication within a lingua franca setting. This study identifies and discusses the repair and accommodation strategies pilots and air traffic controllers use in their routine in-flight communication. The corpus consists of 30 hours of actual pilot-controller audio communication collected from the Malaysian airspace. Audio data collected from three frequencies (Alpha, Bravo and Charlie) were analysed using the conversation analysis method. The findings extend existing knowledge on miscommunications in pilot-controller discourse. The study found that in most instances, pilots and controllers made conscious efforts to repair the various types of miscommunications that took place. The findings also show that communication errors and misunderstandings are commonly caused by cultural differences and inadequate language competency amongst the pilots and controllers. The paper concludes by suggesting that repair strategies and intercultural communication competence should be integrated within aviation communication training modules to improve pilot and controller communication strategies in intercultural settings.

Keywords: pilot-controller communication; intercultural communication; repair strategies; accommodation theory; aviation English

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INTRODUCTION

Aviation communication between pilots and air traffic controllers (used interchangeably with controllers) has always been regarded as rather delicate and high risk since any communication error compromises safety and may lead to mishaps if left uncorrected or unheeded. English is the language of aviation (Breul, 2013), and aviation English is defined as a comprehensive but specialised subset of English related to aviation (ICAO, 2010). Regardless of the first language of the pilots and air traffic controllers, both parties would have to make requests and convey and receive instructions in English. Pilots and air traffic controllers from different cultural, national, and linguistic backgrounds and with different levels of language competency face challenges in making themselves understood (Borowska, 2018). Although all non-native speaker (NNS) pilots and controllers, as mandated by the International Civil Aviation Organization (ICAO), are required to attain a minimum of Level 4 for the English Language Test Proficiency (ELTP) due to the diversity of the interactants involved, communication errors in aviation communication are inevitable.

The context of aviation communication has also evolved into an intercultural one. NNS pilots and air traffic controllers far outnumber NS (native speaker) pilots and air traffic controllers. In Malaysia, for example, NS or NNS pilot could interact with a local NNS air traffic controller, while in Australia, NS or NNS pilot could interact with a local NS controller. For the pilot and controller to cope in this intercultural communicative setting, an additional set of skills is needed to ensure successful communication between different cultures.

Research in aviation communication tended to focus on accident analysis by using actual tape scripts (e.g., Tajima, 2004; Cookson, 2011) or by using simulation (for example, Cushing, 1995; Prinzo & Morrow, 2002; Tiewtrakul & Fletcher, 2010). Since 2008 (the year ICAO made it mandatory for all pilots and air traffic controllers to be proficient in English), issues related to the testing of aviation English have gained traction with the publication of various studies in the area (e.g., Kim, 2018; Kim & Elder, 2015; Garcia, 2015; Douglas, 2014; Emery, 2014; Alderson, 2011). Later, some studies examined communication errors, such as Bowles (2014), Clark (2017), Molesworth and Estival (2015), and Hamzah & Wong (2018). Earlier studies such as Cushing (1995) and Barshi (1997) used simulated data, while the latter (Molesworth & Estival (2015), Hamzah & Wong (2018)) departed from it and used routine telephony pilot-controller communication. However, in the intercultural setting of English as a lingua franca (ELF), there is a need for more studies that explore communicative issues in specific purpose setting such as the pilot-controller interaction.

THE STUDY

This study presents a facet of a study that explored routine pilot-air traffic controller communication in English as a lingua franca (English as a second language) setting. The study had two main objectives: 1) to identify sources of miscommunication and 2) to examine the repair strategies taken to resolve the communication error. The results of the first objective were reported in the author's previous work. The current paper presents the findings of the second objective. It explores the repair strategies used by the pilot and air traffic controller to resolve instances of miscommunication identified by the author.

INTERCULTURAL COMMUNICATIVE COMPETENCE

According to Zhu (2011), intercultural communication is defined as the communication between two or more individuals from distinct cultures. Intercultural communication includes several dimensions such as negotiation, socialising, identifying communication breakdowns, and avoiding cross-cultural misunderstanding (Kumaravadivelu, 2008). Intercultural communicative competence (ICC) refers to the ability of an individual to overcome differences in language and cultures amongst communities. Based on this definition, the aviation communicative domain is an example of a setting where English is used as the language of contact when two or more speakers who do not speak a common first language interact. To communicate effectively here, individuals must be proficient in English, the lingua franca of the aviation industry, and be familiar with aviation phraseology. They also need to possess intercultural communicative competence to help them overcome the differences in language and cultures in the diverse community (Byram, 1997; Lustig & Koester, 2010) that hinder understanding.

There are various ICC models. The ICC model developed by Byram (1997), widely used amongst ICC practitioners, identifies three factors that influence intercultural communication: attitude, knowledge, and skills. Bennett's (1986) empirical model of intercultural communication demonstrates how a person experiences cultural differences in six stages: denial, defence, minimisation, acceptance, adaptation, and integration. Kramsch (1993), on the other hand, believes the skills of 'third space' enable a person to develop the skills as an intercultural speaker by incorporating both the native culture and the new culture introduced to him or her, which is suitable for aviation context.

MISUNDERSTANDING IN INTERCULTURAL COMMUNICATION SETTING

Misunderstanding or non-understanding in intercultural communication is inevitable. A misunderstanding is seen as a potential point of interruption in conversation or a communicative confusion in which the listener fails to make sense of what has been communicated by the speaker (Mauranen, 2006; Hamzah &Wong, 2018). Bremer (1996) believes that misunderstanding is caused not only by the participants' backgrounds but also by the misinterpretation of propositional meaning or mishearing words that are generic, which can happen in any context of communication. However, due to the nature of ICC, which often involves second language speakers or lingua franca users of the language, pragmatic mismatch (Gumperz, 1992) and inadequate linguistic proficiency (Bremer, 1996) are likely to occur. A summary of the reasons for misunderstanding in ICC (Table1) is provided by Zhu (2011).

TABLE 1. Sources of misunderstanding in ICC

Misunderstanding	Inadequate linguistic proficiency (i) Lexical comprehension problem (ii) Mishearing a lexical element (iii) Syntactic complexity	Bremer 1996
	Pragmatic mismatch Clash of styles	Bremer 1996; Thomas 1983 Gumperz 1992
	Mismatch in schemes and cultural stereotypes Mismatch in contextualisation and framing	Bailey 1997 Nishida 2005

Source: Zhu (2011)

Zhu (2011) stresses that although misunderstanding in ICC occurs because of its intercultural nature, not all misunderstandings are caused by the interactants' cultural backgrounds. In an intercultural communication context, the interlocutors have different L1 and culture, different levels of English proficiency and different accents (hence, differences in intonation and pronunciation). Due to pragmatic mismatch and inadequate English proficiency, misunderstandings occur more commonly in ICC as the interaction frequently involves non-native speakers or lingua franca users.

In a study of routine pilot-air controllers' communication, Hamzah & Wong (2018) found that procedural deviation and giving unclear instructions (usually by the controllers) and making unclear requests (usually from the pilots) are the leading causes of communication errors. These errors were mainly due to plain English (General English) instead of standard aviation phraseology. Further, errors were found to occur more in situations where longer or more complex structures were used during heavy traffic and bad weather conditions. During the former, pilots and controllers tended to use non-standard forms of English that were often influenced by their first language; during the latter, there is a tendency to backslide to plain English (Cookson, 2009).

REPAIR STRATEGIES AND ACCOMMODATION THEORY

Repair strategies are referred to as mechanisms to repair when a communication failure occurs to gain proper understanding (Dingemense et al., 2015; Schegloff et al., 1977). Repair strategies are not only required in intercultural communication but are also applied in any naturally occurring communication.

Schegloff et al. (1977) differentiate between initiating a repair and solving the trouble. Schegloff believes there is a situation where one speaker commences a repair and completes it. There is also a situation where one speaker commences a repair, but another completes the repair. Cho and Larke (2010) suggest that there are nine types of repair strategies used by language learners, and these repair strategies are used to rectify communication breakdowns in natural conversational communication.

Since Schegloff's empirical work on repair strategies, more development has taken place. Egbert (1998) adds one request for repetition in which the recipient can ask for a repetition of the problematic message. Liebscher and O'Cain (2003) study includes requests for definition, translation, or explanations initiated by the recipient of the trouble message. Dingenmanse et al. (2015) explore the 'other-initiated repair' system where the recipient of a message can signal communication trouble in which the sender can repair the original message. The study postulates three basic types of repairs:

a. <u>Open request</u> trouble sources are signals, but where or what was never specified.
b. <u>Restricted requests</u> trouble sources are signals and specific and clarified requests.
c. <u>Restricted offer</u> offers a candidate for what was just said and asks for confirmation.

Table 2 summarises the repair strategies identified by previous studies on conversation analysis.

TABLE 2. Summary of Repair Strategy

	Strategy types
Schegloff et al. (1977)	Unspecified, interrogatives, (partial) repeat, partial repeat plus question, and understanding check
Egbert (1998)	One-request for repetition
Liebsher and Daily-O'Cain (2003)	Request for a definition, translation, or explanation
Cho (2008)	Correction and non-verbal strategies
Cho & Larke (2010)	Unspecified repair Interrogatives repair Partial repeat plus a question word repair Partial repeat repair Understanding check repair Request for repetition repair Request for definition repair Non-verbal resource repair Correction repair
Dingenmanse et al. (2015)	Other-initiated repair (open request, restricted request, restricted offer)

In aviation communication, all errors or misunderstandings should be signalled, addressed, and rectified immediately by the speaker or hearer; ignoring them could contribute to undesired incidences. Despite its importance, repair strategies have not gained much interest among researchers. The idea of having communicative competence by utilising accommodative strategies in communication among pilots and controllers is still disregarded.

Accommodation theories by Giles (1973), Giles and Coupland (1991), provide an understanding of how speakers adapt to their interlocutors' speech patterns. It provides a means of explaining adjustments speakers made, either converging toward or diverging away from the interlocutor in their communicative behaviour or simply maintaining unchanged their habitual patterns. It is believed that a need to be understood plays a significant role in accommodative behaviour. The message will be more readily understood when the sender reflects the receiver's manner of communication, such as similar vocabulary (Giles & Powesland, 1975).

Studies by Gumperz (1982) and Prodromou (2008) posit that English as lingua franca (ELF) speakers cultivate particular approaches in communication that enable them to achieve understanding and negotiate non-understanding, for example, contextualisation cues, formulaic language, and discourse segment analysis. They further suggest that speakers and listeners are responsible for constructing an understanding in conversation and all participants' contributions need to be considered. Bremer (1996) found that ELF speakers initiate negotiation strategies to overcome non-understanding in a situation when one speaker realises that there is a mismatch between what is intended by the speaker and what the interlocutor interprets from the conversation. Participants work through structuring a common ground or collective knowledge instead of ignoring these elements.

Cogo (2009) suggests that accommodation theory is one of the key pragmatic strategies for successful communication in a lingua franca setting. At the same time, Gasiorek (2016) stresses that communication adjustment could improve communication in intercultural circumstances.

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INTERCULTURAL COMMUNICATION CHALLENGES IN AVIATION COMMUNICATION

The majority of NNS pilots and controllers learned English specifically to participate in communication rather than to attain proficiency in the language (Hamzah & Wong, 2018). This practice undoubtedly creates barriers between NNS and NS regarding language competency.

Cultural differences and language competency widens the gap in understanding each other for NS and NNS. Meritt and Maurino (2004) agree that cultural issues in aviation communication can be improved by NS and NNS working together to overcome challenges. Four possible ways and the descriptions in the cultural interface, adapting Meritt and Maurino are shown in Figure 1.

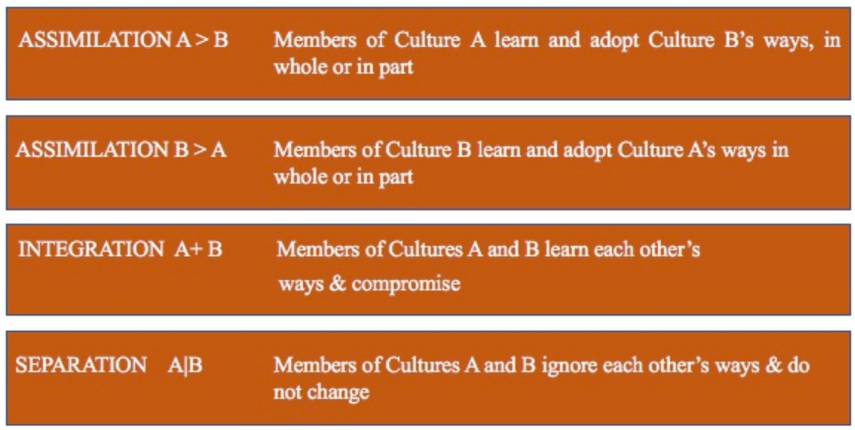

FIGURE 1. Four possible cultural interfaces adapted from Meritt & Maurino (2004)

Hazrati (2014) explores the necessity of focusing more on intercultural communicative competence in teaching aviation English. She believes that aviation English teachers or trainers should recognise the sensitivity and significance of language and its culture to achieve safety in aviation communication. Although it is common practice amongst pilots and controllers to adopt assimilation by adjusting to the language competency of another party, integration could be established by incorporating intercultural communication learning in the classroom.

For pilots and controllers to communicate successfully, they need to understand the necessity of becoming interculturally competent speakers. This is because the interaction between pilots and controllers predominantly happens in an intercultural setting.

METHODOLOGY

SAMPLE POPULATION

The pilot-controller communication sample is from air traffic controllers operating at Kuala Lumpur International Airport (KLIA). They are NNS of English and have attained at least a minimum level 4 (operational level) in the ICAO Aviation English Test (ELPT). They also hold an air traffic controller license endorsed by Civil Aviation Authority Malaysia (CAAM). On the other hand, the pilots were from airlines/freighters operating in the Malaysian airspace. They are of various nationalities and could either be NS or NNS.

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CORPUS OF THE STUDY

The research data consists of 30 hours of recorded audio interaction between pilots and controllers in the Malaysian airspace obtained from CAAM. Three different frequencies, Alpha, Bravo, and Charlie, were chosen to represent the different phases of flight progression (Ground, Aerodrome and Approach) for departure and landing at Kuala Lumpur International Airport (KLIA). KLIA was chosen due to the mix of local and foreign pilots flying in the airspace with high-density traffic, which enabled the researchers to explore a more multinational aviation discourse.

All the audio recordings used had been approved by the Department of Civil Aviation Malaysia (now Civil Aviation Authority of Malaysia). They were transcribed manually since aviation language consists of specific information, such as bearing, waypoint, standard instrument departure (SID) for departure, standard instrument arrival (STAR) for arrival and other abbreviations that transcription software (Atlas.ti., QDA Miner) available then was unable to decipher correctly. The data were transcribed verbatim using the transcription conventions in Table 3.

TABLE 3. Transcription Convention adapted from Sacks, Schegloff, & Jefferson, G. (1978)

(.)	A micro pause of less than one second.
(2.0)	Pause indicated length in seconds.
[ ]	Across two or several overlapping turns by different speakers. The bracket indicates the beginning and end points of overlap.
] [	Across two turns by different speakers, indicating 2nd turn latched onto the 1st turn without perceptible pause.
:	Lengthened sound.
Stress	Underlining indicates emphasised syllables or words.
?	Question or rising intonation.
(( ))	Unclear utterance, transcriber's best guess.
…..	Section of transcript omitted.

Table 4 shows a sample excerpt of a transcript for this study. For each error identified in the transcripts, the alphabetical letter in the left column represents the frequency (Alpha, Bravo, and Charlie), and the number following the letter represents the line in the interactions. The second column identifies the speakers' turn (i.e., the pilot or the controller). The time of the audio data is not included since it is irrelevant to this study.

TABLE 4. Sample of transcript data

A(40)	Controller	Cathay 708(.) descend flight level 270(.) and for sequencing fly on heading 300
A(41)	Pilot	turn left heading 300 and descend level 260? Say again cleared level?
A(42)	Controller	descend flight level 270
A(43)	pilot	descend flight level 270(.) heading 300(.)Cathay 708

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DATA ANALYSIS

First, the instances of miscommunication were identified to analyse the repair strategies used. Then, the repair strategies taken by the pilot and controller to rectify the miscommunication were categorised based on the findings of Schegloff et al. (1977), Egbert (1998), Liebsher and Daily-O'Cain (2003), Cho and Larke (2010) and Dingenmanse et al. (2015). Types of repair strategies used by pilots and air traffic controllers in the non-native speakers setting were identified with reference from Cho and Larke's (2010) findings (see Table 2).

Each repair strategy taken by the pilot or controller was categorised and tabulated. The percentage was also calculated accordingly. All data were approved by CAAM officer. Figure 2 illustrated an analysis of repair strategies in routine pilot-controller communication when miscommunication or misunderstanding occurs.

FIGURE 2. Repair strategies analysis in pilot-controller communication

FINDINGS AND DISCUSSION

The repairs that both pilot and controller made to rectify problematic situations were analysed. Since this study used randomly selected audio recording, not all of the strategies mentioned will occur in the interactions. However, there might be unprecedented situations that happen out of routine communication. The negotiation and accommodation strategies were also observed as part of repair strategies in pilot-controller communication, including speakers from various Englishes and different levels of competency. The frequency distributions of repair strategies are presented according to the repair type, and the types of repair strategies are discussed collectively.

Figure 3 shows the total number and frequency of repairs made by pilots and controllers in each frequency. A total of 71 repairs were recorded; total repairs in Alpha is 45% (n = 32), Bravo is 42.3% (n = 30) and Charlie at 12.7% (n = 9) frequencies. Alpha frequency has the highest repairs done by pilots and controllers, while Charlie frequency has the lowest repairs. Alpha frequency has the highest repair due to the high frequency of miscommunication errors in the Alpha frequency. Bravo frequency has a slightly lower communication error compared to Alpha as the procedure during this phase is quite similar to Alpha. Charlie frequency has the lowest communication errors. Repairs were made to correct miscommunication or to change instructions/requests by the pilots or controllers.

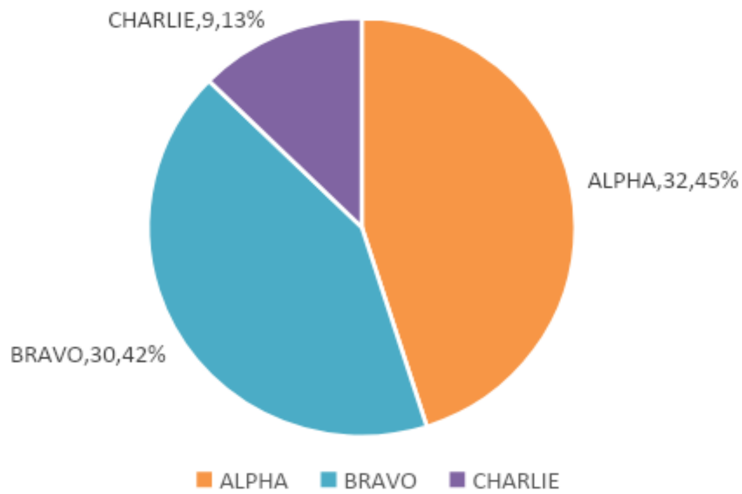

FIGURE 3. Total repair strategies by frequency

Table 5 shows repair strategies according to types of repairs. A total of 30% of the strategies fall under correction repair, which pilots and controllers rectify immediately after the mistake was made in transmissions. The data also show 20% interrogative repair, where the pilot or controller inquires as to the intention of the other party. Request for repetition repair is 12%, partial repeat plus a question word repair is 11%, and partial repeat repair when the message received was unclear, ambiguous, incomplete or incorrect is 6%. Understanding check repair is 10%. This type of repair occurs when the pilot and controller need to confirm that their message meanings match each other to avoid misinterpretation of the message. Unspecified repair is 10%. Controllers commonly use this to change instruction to accommodate traffic changes. The non-verbal resource repair is 3%. This was when the pilot or controller resolved the miscommunication or misunderstanding without verbal communication. The non-existent definition of repair (0%) suggests that pilots and controllers are well-versed with aviation terms and procedures.

TABLE 5. Repair strategies according to a type of repair

No.	Type of repair	Number	%
1.	Understanding check repair	7	10
2.	Correction repair	21	30
3.	Partial repeat repair	4	6
4.	Partial repeat plus a question word repair	8	11
5.	Interrogative repair	14	20
6.	Unspecified repair	6	8
7.	Request for repetition repair	9	12
8.	Non-verbal resource repair	2	3
9.	Request for definition repair	0	0
	Total	**71**	**100**

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TYPES OF REPAIRS IN PILOT-CONTROLLER COMMUNICATION

This section further elaborates on the range of repair strategies that have been identified in pilot-controller communication. For this study, the frequency labels (Alpha, Bravo, Charlie) are insignificant since the focus is on the type of repair strategies in interactions:

(1) Understanding check repair

a. The controller overlooked the pertinent information in the instructions issued to the pilot.

(1)	Error	Controller	approve (.) approve
(2)	Repair	Pilot	confirm approve heading 240 Malaysian 705?
(3)		Controller	Malaysian 705(.) affirm, approve

The pilot carried out the understanding check repair in line (2), who requested the missing information (heading) in the instruction given by the controller in line (1).

However, the controller did not acknowledge the repair since the instruction still does not have the missing heading information (refer to line 3).

b. The controller gave an instruction in line (4) and pilot respond with incomplete readback in line (5).

(4)	Error	Controller	Malaysian 367(.) continue descend 9,000 feet QNH1007(.) expedite through flight level 130
(5)		Pilot	9,000 feet(.) expedite Malaysian 367
(6)	Repair		affirm(.) expedite through fl130(.) thanks
(7)		Pilot	expedite flight level 130(.) wildo Malaysian 367

The controller used understanding check repair to confirm that the pilot has received the specific requirement in line (6) when the pilot gives an incomplete readback in line (5). The pilot readback a specific level to expedite through in line (7).

c. The controller used hedges (may) in instruction that created uncertainty for the pilot in line (8)

(8)	Error	Controller	Red Cap 102 Yankee: 2 may vacate runway via Yankee 2
(9)	Repair	Pilot	Err confirm Yankee 2 approved? Red Cap 102

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The pilot carried out an understanding check repair to confirm if the controller had approved the request to avoid miscommunication in line (9).

(2) Correction repair

a. The controller repeatedly requested the same information from the pilot.

(10)	Error	Controller	your heading to bobag sir
(11)		Controller	Singapore 319(.)request your heading to bobag?
(12)		Controller	Singapore 319(.)request your heading to bobag?
(13)	Repair	Controller	Singapore 319(.) request heading to bobag?
(14)		Pilot	Heading 200(.)Singapore 319

The controller finally initiated a correction repair to resolve the error by removing "your" in the request in line (13), which earlier resulted in confusion for the pilot.

(3) Partial repeat repair

b. The pilot's pronunciation was unintelligible to the controller in line (15).

(15)	Error	Pilot:	Go Cat 2482(.) request direct ((infar))
(16)	Repair	Controller	Go Cat 2482(.) say again direct?
(17)		Pilot	echo mike sierra alpha romeo

The controller requested a repeat for the unclear word "infar" in line (16). The pilot spells out the word "EMSAR" in line (17) to avoid prolonged misunderstanding due to his/her pronunciation of the word.

(4) Partial repeat plus a question word repair

a. The pilot requested a repeat of the specific information about the instruction issues from the controller in line (19).

(18)	Error	Controller	Cathay 708(.)descend flight level 270(.) and for sequencing fly on heading 300
(19)	Repair	Pilot	turn left heading 300 and descend level 260? Say again cleared level?

This error was due to the long instruction with four different information in one lengthy transmission in line (18), call sign (Cathay 708), altitude (flight level 270), justification of action (sequencing) and heading (300). The pilot initiated the repair as he/she was unsure of the altitude instructed in the message in line (19).

b. The pilot had mistaken the waypoint given by the controller in line (20)

(20)	Error	Pilot	confirm direct to dando? Thai Asia 394?
(21)	Repair	Controller	Thai Asia 394(.) negative direct rigto

The pilot had carried out partial repeat plus a question word check repair in line (20), and the controller immediately corrects the instruction in line (21).

(5) Interrogative repair

a. A Callsign confusion by the controller in line (23) as he/she mistakenly heard different callsign in pilot transmission in line (22)

(22)	Error	Pilot	Lumpur(.) good evening Malaysian 183(.) descending level 270 squawk 0606
(23)		Controller	Malaysian 103(.) good evening, descend fl310
(24)	Repair	Pilot	confirm for Malaysian 183?

The pilot carried out an interrogative repair in line (24) as the controller had not taken any action to resolve the situation in line (23).

b. The controller used non-standard phraseology that caused non-understanding for the pilot.

(25)	Error	Pilot	Malaysian 711(.) request orbit, right hand orbit present position
(26)		Controller	are you not trying
(27)	Repair	Pilot	say again?

The pilot initiated a request for repetition repair in line (27) since he/she could not comprehend the controller's request or question in line (26).

c. The controller issued a taxi instruction for a wrong runway in line (28).

(28)	Error	Controller	((Red Cap 6112)) taxi holding point runway 33 via Uniform 3(.) Quebec hold short Quebec 5
(29)	Repair	Pilot	confirm 33?
(30)		Controller	runway 32R (.)correction holding point runway 32R Papa 1 via Quebec 3(.)Quebec hold short Quebec 5

The pilot carried out interrogative repair in line (29), and the controller initiated correction repair to resolve the error in line (30).

d. The pilot pronunciation was heavily accented due to L1 interference in line (31)

(31)	Error	Pilot	Lumpur ground, Thai Asia 316
(32)	Repair	Controller	Thai Asia: (2.0) station calling can you say again call sign?

The controller requested a repetition of the pilot callsign in line (32)

(6) Unspecified repair

a. The controller made a presupposition in line (34) that led to misunderstanding in communication.

(33)	Error	Pilot	Silk Air 940(.)Quebec 15. ((confirm))?
(34)		Controller	Silk Air 940 (.) you missed your stand Quebec 15(.) Is it?
(35)		Pilot	negative(.) Quebec 15 right now(.) we are waiting for auto dock to start
(36)		Controller	Silk Air 940 (2.0) stand by
(37)	Repair	Pilot	Silk Air 940(.) docking now

The pilot used unspecified repair in line (37) as he felt it was unnecessary for him to wait for the controller's response as the aircraft had completed all the procedures.

(7) Request for repetition repair

a. The controller failed to hear the pilot's request in line (38).

(38)	Error	Pilot	Fireflies 3556 request to maintain heading due weather
(39)	Repair	Controller	Fireflies 3556 say again?
(40)		Pilot	request to maintain heading 290 to avoid weather

The controller requested for repetition in line (39) from the pilot, indicating that he/she either did not hear the previous turn or only heard it partially.

(8) Non-verbal resource repair

a. In this case, the pilot was ready to taxi and requested a taxi instruction, but the controller claimed the taxi instruction had been issued earlier. The pilot either failed to copy the taxi instructions or was never given. However, the problem was resolved without any repair by both parties.

(41)	Error	Controller:	confirm you are not ready for taxi?
(42)		Controller:	Malindo 223(.)are you ready for taxi out?
(43)		Pilot:	that is affirmative(.) Malindo 223
(44)	Repair	Controller:	Malindo 223 taxi holding point runway 33 and taxi clearance has been issued earlier (.)continue
(45)		Pilot:	via ((Zulu)) (.)standard route Malindo 223

The repair was not initiated verbally by the pilot. However, in line (44), the controller insisted that the taxi clearance had been issued in previous interactions. The problem was resolved as a result of a commonly shared context between the pilot and controller in line (45)

STRATEGIES IN PILOT-CONTROLLER COMMUNICATION

This study breaks down the repair strategies taken by pilots and controllers based on their respective categories. The findings show that the repair and accommodation strategies of English as a Second Language exist in pilot-controller communication. Some of the repairs are done by initiating more than one repair strategy. This section discussed the type of repair and accommodation strategies and in which situation pilots or controllers normally initiate the repair.

CORRECTION REPAIR

The findings revealed that correction repair made immediately by the controller or pilot to avoid imminent dangerous situations was the most commonly used repair strategy in pilot-controller communication. The changes in altitude, speed, heading, and taxi instruction are inevitable for an aircraft during a flight; hence aviation routine messages are not fixed or predictable.

INTERROGATIVE REPAIR

Another repair strategy used by controllers and pilots in this study was interrogative repair, commonly used to overcome communication misunderstandings. Interrogative repairs are customarily used to increase understanding of non-standard procedures or instructions unfamiliar to the hearer and in the events where instruction or requests are distorted (see 5 (b) for interrogative repairs)

REQUEST FOR REPETITION REPAIR / PARTIAL REPEAT REPAIR/ PARTIAL REPEAT PLUS A QUESTION WORD REPAIR

Repetition repairs are common in any communication; however, repetition repair is crucial in pilot-controller communication. The data suggest that pilots and controllers often used partial repeat repair in one transmission instead of requesting repetition repair, whereby the controller or pilot had to repeat the whole instructions to reduce transmission time. Repetition by the pilot or controller normally only consists of the critical elements such as changes in altitude, heading, speed restriction, runway in use, significant changes in weather conditions, and immediate traffic information.

UNDERSTANDING CHECK REPAIR / REQUEST FOR DEFINITION REPAIR

The 30 hours of pilot-controller communication findings suggest that no pilot or controller required the use of a request for definition repair strategy, which indicates that they had a complete understanding of the procedures and terms used in aviation. However, the pilot occasionally requested for understanding check repair to ensure their understanding of the instruction matched what the controller expected. The controller used understanding check repair to understand the pilot's intention during deviation and emergencies to prepare them for the necessary continuous action.

UNSPECIFIED REPAIR

The data revealed that controllers often initiated unspecified repairs when they realised an error has been made in their instructions or information. The repair was done immediately after the first transmission without waiting for the pilot to reply to their previous transmission.

NON-VERBAL RESOURCE REPAIR

In aviation discourse, non-verbal communication elements such as body language and facial expression are non-existent. However, there were small amounts of repairs done in communication without involving verbal communication. Mutual understanding, experience, and situation awareness often make verbal repairs unnecessary.

ACCOMMODATION STRATEGIES

Accommodative strategies often occur naturally in communication. This strategy aligns with accommodation theory, which posits that speakers will adjust their speech patterns to achieve successful communication in interactions. The study found that pilots and controllers adjusted their speech rates to accommodate each other as they were aware of and understood the language competency level of the speaker they were speaking to. This instance agrees with Jenkins (2000) suggestion that the intelligibility between speaker and listener in communication is dynamically negotiable rather than statically integral in a speaker's linguistic forms. Speakers can adjust and accommodate each other to improve understanding.

NEGOTIATION STRATEGIES

Speakers initiate negotiation strategies to overcome non-understanding in a situation where one speaker realises there is a mismatch between what the speaker has intended in the conversations. The findings suggest that pilots or controllers occasionally left the miscommunication without any repair because they were unsure of the situation and/or felt they lacked the linguistic competence to convey the message or resolve the issue (see unspecified repair).

This study suggests that, within the English as a lingua franca setting, the lack of awareness by pilots and controllers in signalling the problem is due to language insufficiency, which leads to unresolved situations. Negotiation strategy in aviation discourse, especially involving NNS pilots and controllers, is more crucial since most speakers come from countries where English is spoken either as a second, third, or foreign language. Gumperz (1992) suggest that speakers and listeners are responsible for constructing an understanding in conversation and all participants' contribution needs to be considered. Hamzah (2021) also suggests that minimal English in intercultural communication could benefit pilots and controllers by minimising lexical options in interactions.

The findings demonstrated that pilots or controllers resolved miscommunication or misunderstanding immediately to avoid any undesirable incident from occurring. The findings show that pilots or controllers commonly combined two or more repair strategies to resolve communication errors in pilot-controller communication. The study provides evidence that pilots and controllers adapted accommodation and negotiation strategies embedded in repairs which enabled them to overcome communication complications. The absence of definition repair in the data is perhaps due to shared experience and the standard operating procedure used in aviation discourse.

Most of the miscommunication or misunderstanding in pilot-controller communication is easily resolved due to both pilot's and controller's shared context and experience. However, there are implications of miscommunication or misunderstanding that occurred due to cultural differences and inadequate language competency amongst the pilots and controllers involved.

Intercultural differences often lead to misunderstandings in communication. Controllers and pilots should be prepared and guided by qualified trainers to negotiate meaning effectively to avoid ambiguous situations. English for specific purpose courses, such as aviation language courses, must be designed and practised together with intercultural competency, which is part of the workplace demand. The aviation training module should include repair strategies and intercultural communication competence. Figure 4 illustrates a plausible paradigm of intercultural communication competence in pilot-controller communication.

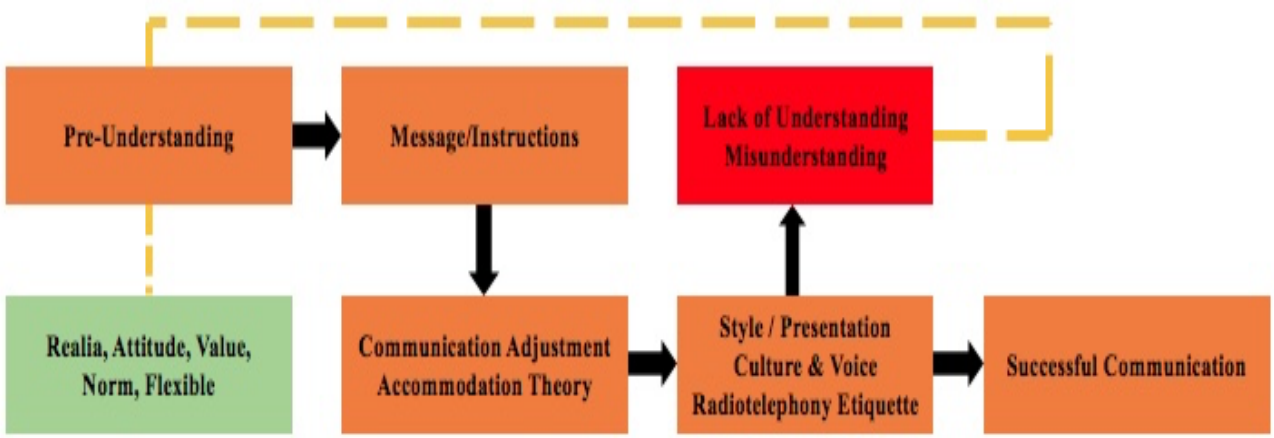

FIGURE 4. Intercultural communication competence paradigm in pilot-controller communication

CONCLUSION

This study highlights the most crucial part of interaction in pilot-controller communication; repairs must be done immediately after communication errors occur. Miscommunication or communication errors can occur even during non-complex messages; the skills and comprehension of the pilots and controllers involved are imperative to rectify problematic communications.

The findings show that both pilots and controllers used plain English and shorter transmission with few aviation topics for a better understanding of each other, consistent with suggestions by Breul (2013), Hinrich (2008), and Morrow and Prinzo (1999). The findings showed that NNS pilots and controllers consciously or subconsciously include these strategies to ensure successful communication. This research suggests that pilots and controllers should be trained in communicating within intercultural communication settings to familiarise themselves with various levels of English competency, pronunciations, and different cultures.

This research explored routine pilot-controller communication in NNS settings and observed repair strategies and cultural influence in aviation discourse. For further research, it is recommended to include communication adjustments made by pilots and controllers to rectify communication errors between different cultures. Furthermore, a good mix of NS and NNS pilots could benefit the study for better comparison. Also, it is recommended for researchers in aviation discourse to explore the theory of "third space and symbolic competence" by Kramsch (1993) that created intercultural speakers through intercultural encounter and communication, or Deardorff's (2006, 2009) process model of intercultural competence. Deardorff's beliefs, attitudes, knowledge, comprehension, and skill to acquire knowledge of others (culture) should be incorporated into the probability of successful communication since cultural diversity is inevitable. The benefits of being intercultural speakers extend beyond the distinctions between particular cultures and focus on various cultural contexts.

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