Chapter 18
Misunderstandings in Aviation Communication

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Abbreivation

ATCOs	Air Traffic Controllers
ICAO	International Civil Aviation Organisation
IATA	International Air Transport Association

18.1 Introduction

The aviation business is rapidly growing; the International Air Transport Association (IATA) estimates that global traffic will double in the next two decades. In fact, it is predicted that by 2050, nearly 10 billion passengers will travel by air annually (ATAG 2021). The burden on radio communication will naturally increase as global air traffic grows, and operators' total load (work, task, information, communication, and mental) will be unbalanced by excess or underload. If nothing is done, this growth will raise the rate of operator errors and misunderstandings (Kale et al. 2021), resulting in an increase in the number of people killed in communication-related plane crashes around the world. To deal with this expansion, it is critical to provide the greatest degree of communication safety and security.

Misunderstandings and miscommunication between pilots and ATCOs are a common cause of aviation accidents and mishaps (Prinzo and Britton 1993). The rate of errors in radio communications is influenced by a variety of factors (Ragan 2002). According to the European Organisation for the Safety of Air Navigation (Aviation and Agency 2020), technical issues include blocked transmission, frequency congestion, radio equipment malfunction – air/ground, radio interference,

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T. H. Karakoc et al. (eds.), *Advances in Electric Aviation*, Sustainable Aviation,
https://doi.org/10.1007/978-3-031-32639-4_18

and sleeping VHF receivers. In addition to human characteristics and skills, tacit knowledge, such as language level, speech rates, and ambiguous or non-standard phraseology (Papanikou et al. 2021), may play a vital role in aviation communication.

A considerable number of aviation operators, according to Alderson (2009) in a prior study, are not native English speakers, which is the language of international aviation communication. Another key element stated by Parasuraman et al. (2000) is the influence of the conflict between the high automation level and the operators during the flight, particularly when receiving or passing crucial information.

Operators must understand the functionality of flying the aircraft, adhere with standards, rules, and regulations, and manage continual situational awareness and decision-making processes to safely control an aircraft. However, one of the most difficult challenges for operators is maintaining a high level of situational awareness in the changing environment of flight (Kale and Tekbas 2017). There has been a lot of research on operator workload in recent years. Because of the rapid speed of technology change in aviation, operators now get far more, and sometimes contradictory, information from a variety of sources than they did in the early days of the industry.

The current authors define communication load burden as the level of comprehension between operators, which is strongly dependent on language, cultural norms, and social ties, among other factors. Because of the constant evolution of communication technologies, the technological backdrop of the operator's communication requirements should also be enveloped.

Based on a survey issued to operators in various places across the world, this study assesses the communication load of operators in highly automated systems. This research is based on 110 operator replies, 88 pilots (75%), and 17 ATCOs (15%) from multiple nations. In addition, there is a tiny group of five operators that have both an ATCO and a pilot license (4.8%).

18.2 Method

By performing a survey on the descriptive characteristics of the operators from various angles, the research focused on the essential factors in operators' communication load. The purpose of the questionnaire is to quantify the most important issues as seen through the eyes of the operators, based on their experience and knowledge.

The questionnaire was created based on aviation operators (pilots, ATCOs). There were 88 pilots (25 female), 22 of them were native English speakers and five ATCOs. There were 22 ATCOs in total, six of whom were female. The participants' average age was 30 years for females and 34 years for males. Figure 18.1 depicts the gender-based variation in participant age and count.

The experience levels of the participants are shown in Fig. 18.2 for pilots in hours flown and ATCOs in years.

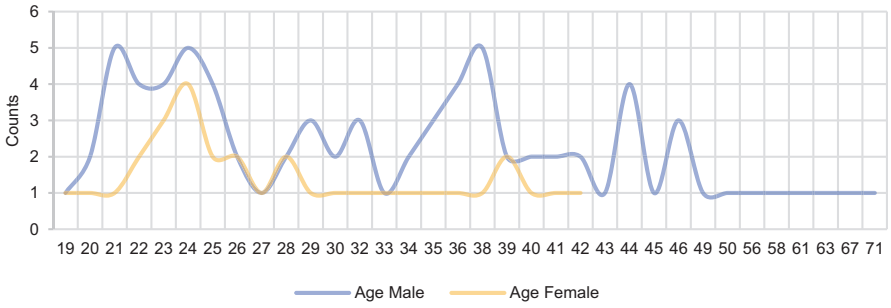

Fig. 18.1 Participants' age and gender variation

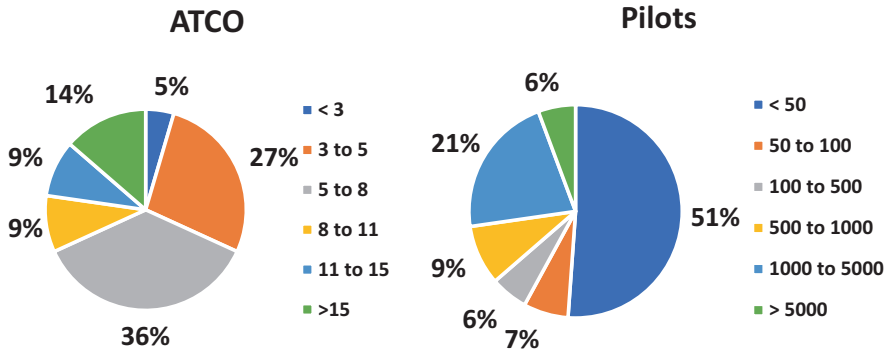

Fig. 18.2 Experience levels for pilot (right) & ATCOs (left)

18.3 Results and Discussion

There was a section at the beginning part of the questionnaire asking the operators to mention the problematic nation in communicating, which is related to both the operators' origin and cultural norms, shown in Fig. 18.3.

Because the majority of airline operators are non-native English speakers, studying their original tongue would have a significant impact on the language barrier (see Fig. 18.4).

The second section of the survey raised several concerns about aviation language competency hurdles between operators, such as cultural influences on language and native language effects. The findings revealed that non-native English speakers of operators have difficulty understanding native English speakers. Two more issues emerge from the findings: the cultural background plays a big impact on misunderstandings in communication, which can lead to accidents; and the responses demonstrated how effective communication affects the burden of the ICAO phraseology as a cornerstone in the communication between operators (see Fig. 18.5).

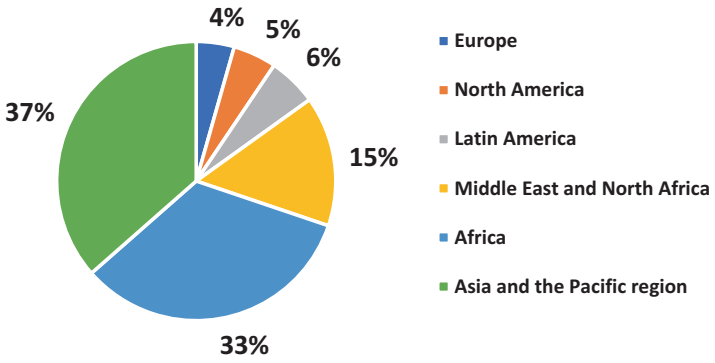

Fig. 18.3 The difficult nation in aviation communication from the participants' point of view

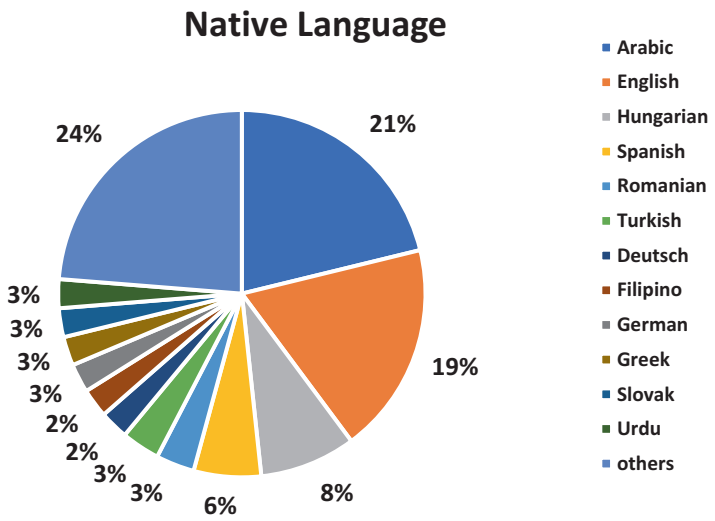

Fig. 18.4 Native language of the operators

The findings reveal that a full focus on radiotelephony communication should be established throughout operator training (pilots and ATCOs). Although the participants agreed that operators do not speak at the ICAO recommended rate, they also agreed that the ICAO standard phraseology should be more adaptable around the world, with more outreach to operators to familiarize them with their background and the applicability of ICAO phraseology.

Another important component is the operators' level of experience, and switching from active control to passive monitoring could help reduce communication demands.

The participants' opinion on whether they are satisfied with ICAO phraseology applicability is shown in Fig. 18.6.

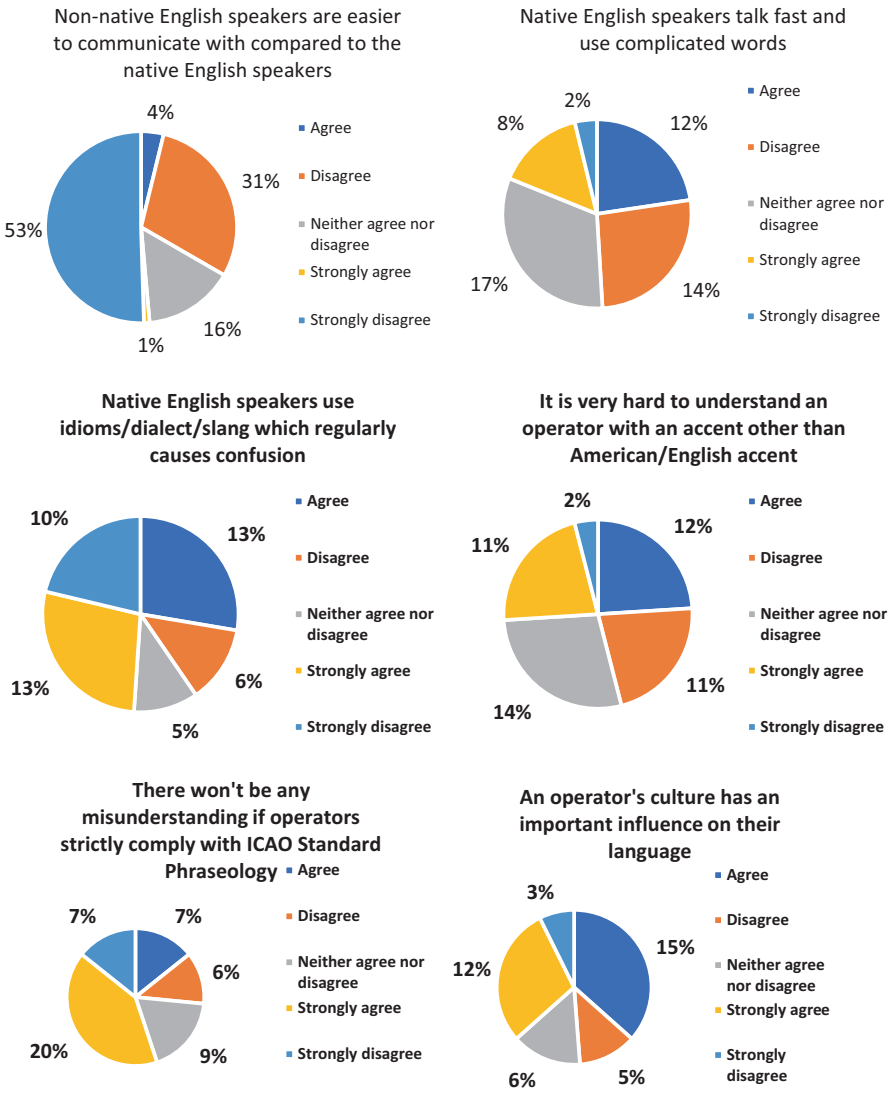

Fig. 18.5 Examples of language and culture-related questions and rate of response

An important factor in investigating the crucial issue in miscommunication between operators is to scale whether the language barrier or the operators' total load is the critical issue in miscommunication, participant opinions were more focused on the language barrier as the crucial factor.

Tables 18.1 and 18.2 below summarize the investigated descriptive characteristics of Likert-based questions in the questionnaire and the percentage of each statement, which provide a strong indication that language-based issues and how they

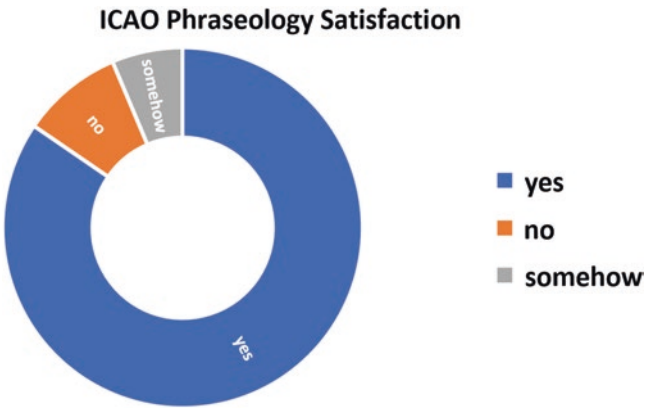

Fig. 18.6 ICAO satisfaction rate

are critical between operator's communication in the current system are strongly related to cultural background and the lack of standard phraseology.

The participants were given the freedom to describe the most important factor affecting aviation communication in the final section of the questionnaire. The majority of the participants agreed with the factors mentioned in the questionnaire and mentioned some non-human based factors such as weather conditions. Although the participants mentioned language as a major issue affecting aviation communications, other important factors such as teamwork skills, operator's workload, and better operating ergonomics were also introduced in this section.

18.4 Conclusion

Based on a distributed questionnaire that gave an overview of the operators' opinions from experienced events and based on the current situation of aviation communication, the questionnaire focused on main aspects such as language-based issues which showed a crucial effect on aviation communication from the participant's point of view. The study highlighted the most critical aspects in aviation communication and reflected the real issues in communication between operators.

Another critical issue raised by the questionnaire is the ICAO standard phraseology and its adaptability and applicability around the world, and how it would be affected if the optimal rate or exact phraseology were not maintained, which would significantly increase the rate of misunderstanding – one of the leading causes of aviation accidents and incidents.

The current authors of the study are going to conduct comprehensive research on automation effects on operators' total loads including the communication load of pilots and ATCOs.

Table 18.1 Descriptive characteristics of the first part of the survey responses

How much do you agree or disagree with the following statements regarding radio communication?	Agree	Disagree	Neither agree nor disagree	Strongly agree	Strongly disagree	Total
Non-native English speakers are easier to communicate with compared to the native English speakers	14%	36%	18%	4%	28%	100%
Native English speakers talk fast and use complicated words	42%	16%	20%	21%	1%	100%
Native English speakers use idioms/dialect/slang which regularly causes confusion	46%	7%	6%	34%	5%	100%
It is very hard to understand an operator with an accent other than American/English accent	41%	13%	16%	29%	1%	100%
There won't be any misunderstanding if operators strictly comply with ICAO standard phraseology	25%	7%	11%	53%	4%	100%
An operator's culture has an important influence on their language	52%	6%	7%	33%	2%	100%
Familiarity with the cultural background among the operators makes communication easier	29%	24%	22%	18%	7%	100%
Cultural misunderstandings in communication could lead to an accident	58%	5%	11%	23%	3%	100%
Good communication has a notable influence on teamwork effectiveness, workload, and safety	42%	3%	5%	49%	2%	100%

Table 18.2 Descriptive characteristics of the second part of the survey responses

How much do you agree or disagree with the following statements regarding radio communication?	High	Low	Middle	Very high	Very low	Total
Poor language skills	24%	16%	30%	20%	10%	100%
Strong foreign accents	41%	5%	15%	37%	2%	100%
Failure to use ICAO standard phraseology	21%	23%	28%	25%	4%	100%
Too high or too low workload for controllers or pilots	25%	11%	29%	27%	8%	100%
Pilot performance issues (e.g., failure to notice and/or react to prolonged lack of R/T activity on the frequency selected, lack of situational awareness)	29%	16%	32%	16%	6%	100%

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