EXAMINING LANGUAGE COMMUNICATION DIFFICULTIES IN AIRCRAFT MAINTENANCE

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Abstract. The article explores the English language proficiency among aircraft mechanics. The study employs a comprehensive research approach to investigate the amount of difficulties with specific communication activities resulting in the evaluation of the language proficiency of aircraft mechanics. The data for this article were collected by the means of a questionnaire which was distributed to 80 aircraft mechanics in Slovakia. The system of collection of the responses was done in two ways, it was self-adminitered upon the personal visit of five maintenance and repair organizations and it was also sent in its online form to other two companies in Slovakia. The aim of this article is to examine the language difficulties aircraft mechanics encouter during their work.

Keywords: English language, aircraft maintenance, communication activites

1. INTRODUCTION

The English language is the international language of aviation and is the primary language used for communication between pilots, air traffic controllers, and ground personnel. In aircraft maintenance, it is crucial to have a good command of English to communicate effectively with colleagues, superiors, and manufacturers in different countries [1].

The majority of aircraft maintenance documentation, such as manuals, technical reports, and service bulletins, is written in English. It is essential for aircraft maintenance technicians to understand and interpret these documents accurately to perform maintenance tasks safely and correctly. Misunderstandings or misinterpretations of maintenance documentation could lead to serious safety hazards and potential accidents [2]. English proficiency is critical for aircraft maintenance personnel to perform their duties safely and effectively. It enables efficient communication with colleagues, manufacturers or managers. Effective communication is very important because it supports the efficiency, performance and well-being of workers. We distinguish two main types of communication. Synchronous communication in aircraft maintenance is verbal and aircraft mechanics encounter it in the form of conversations or spoken announcements [3], which may be conducted in English. On the other hand, asynchronous communication is usually in written form such as reading aircraft manuals or other technical documentation [4]. Communication is an essential process of exchanging ideas, which is necessary to perform the work of many professions, as well as aircraft maintenance. The international nature of the aviation industry only supports the importance of mastering English, mechanics must easily understand instructions, talk about problems that may arise during their shift, be able to make full use of manuals or discuss problems with colleagues. Aircraft mechanics have to engage in various types of communication during their work [4].

Currently, there are no international standardized guidelines on what kind of knowledge should aircraft mechanics have in English. According to ICAO [5], there are only language requirements for pilots and air traffic controllers and not for other aviation personnel, who use English in their work. The EASA member states do follow Commission Regulation No. 1321/2014 on the continuing airworthiness of aircraft and aeronautical products, parts, and appliances, and on the approval of organizations and personnel involved in these tasks [6], which states that aircraft mechanics need to read, write and communicate effectively in the language of the technical documentation, which is

mostly English. However, there are no guidelines or systems according to which this knowledge could be accessed in a standardized way.

Some countries have adopted additional requirements on the language knowledge of aircraft mechanics in their country. For example, English proficiency is a requirement for aircraft maintenance personnel to obtain certification and licensing from regulatory authorities such as the Federal Aviation Administration (FAA) in the United States. Another country which adopted additional language requirements for aircraft mechanics is Malaysia.

Even though, some countries (Malaysia, USA or Turkey [7]) have adopted a mandatory assessment of the English language level of aircraft mechanics as one of the conditions to be met for the issuance of an aircraft maintenance technician license it is not the case for many other countries. Within the member states of ICAO or EASA, the introduction of such testing is only being discussed, but we can expect that the implementation of a mandatory assessment of the English level of aircraft mechanics will occur. The importance of such assessment was also determined by a study conducted by EASA, which included the view on this issue of important aviation stakeholders [8]. This may cause complications in the future, as currently, Slovakia does not offer sufficient opportunities for education in specialized English for aircraft mechanics.

2. KNOWLEDGE OF THE ENGLISH LANGUAGE

With the current level of globalization, it is becoming more and more important to have knowledge of the English language as it is the lingua franca. It means that is a primary language that serves people who do not share the same native language for communication [9]. Over the years studies have been emphasizing the connection between the knowledge of English and the employability of an individual [10]. The proper knowledge of English is desired in many professions as it maintains effective communication in international settings. The era of globalization provides the possibility of employment in any part of the world [11]. However, without the knowledge of the English language, this option is severely limited. The candidates for a job position must demonstrate a certain level of English as it is a standard procedure of employers to check their employees' English level during their interview selection process [12]. The importance of English is even more pressing in the aviation industry as it is the language of official communication for aviation personnel.

Due to the nature of the work of aircraft mechanics, they must be able to share information. Communication is crucial when working in a rotating shift, especially when more than one mechanic is needed to do a task. In these situations, it is crucial to be explicit about which tasks or components have already been finished and which still need to be done [13]. Aircraft mechanics work as a team and they cooperate with each other. When one or more participants in the communication speak different native languages and must rely on their understanding of English, maintaining good communication might be difficult [14]. To perform the task correctly, they need to comprehend verbal or written instructions, descriptions, or information [2]. By reporting the progression of a given task it is possible to keep others involved in the maintenance process updated. In terms of efficiency, good work coordination in aircraft maintenance is essential, for example, in the form of getting a spare part for a colleague [15]. It is important to possess the knowledge to express assertiveness and authority, as the views on certain maintenance issues may differ. For the sake of safety, effective communication has to be present, and it has to accompany any task [16]. By checking the work of others, it is possible to minimize maintenance failures. All this communication is crucial, and it is necessary to eliminate any communication barriers that may arise. One of these can be a language barrier [17] [18], which can easily render communication ineffective and thus, possibly dangerous.

When it comes to language skills and which of them is the most important the studies seem to vary. According to a Malaysian study, the listening skill was determined as the most important based on the questionnaires that were collected at an airport. At the same time, this study revealed that the most problematic skill is speaking [19]. If we consider the description of the communication activities given above, it is clear that no single language skill can cover them all, and there is a need for all language skills, namely, reading, writing, listening, and speaking. This is supported by the results of a recent

studies [20] [21] that emphasize the need for all language skills, while determining reading skill as the most used According to a study in Colombia [22], students at aviation schools and aviation professionals similarly highlighted the need for all language skills while mentioning that the most frequently used are reading and the use of technical vocabulary. The issue of terminology and vocabulary also needs to be addressed by the course. By implementing the theory about the mechanism of word-formation of multi-word terms into the training process it would be possible to simplify the daily work of aircraft mechanics and satisfy the needs of rapidly developing aviation technology [23].

The English language can pose considerable difficulties to aircraft mechanics with a different native language. Currently around 80% of aircraft mechanics worldwide are non-native speakers of English [15] . There is a limited number of studies that would address the knowledge of aircraft mechanics. A study conducted by Drury, Ma, and Marin [4] focused on the relationship between English proficiency and maintenance errors. This study determined the reading level of aircraft mechanics on four continents and compared it in relation of the reading difficulty of aircraft manuals. According to the results, the average reading level of non-native English-speaking aircraft mechanics was found to be around 5 on the LEXILE scale, while the level was even lower in the Asian region. By comparison, the reading level of aircraft mechanics working in the United States was at level 14. The flight manuals that aircraft mechanics work with in the United States as well as in other countries are written in a way that requires a higher reading level (around 8 on average) [15]. This level is higher than the average reading level found in continents where English is not the native language, which suggests that the mechanics who participated in this study had difficulty understanding the English-written manual effectively and sufficiently. However, this situation may have changed over time, as this study was conducted in 2005, but a more recent study that would map the English language proficiency of aircraft mechanics worldwide is not available. We can assume that the reading level of aircraft mechanics has improved, due to the worldwide progress in the teaching of the English language, but whether their current knowledge of the language is sufficient for an effective and sufficient understanding of aircraft manuals remains questionable.

3. METHODOLOGY

The aim of this research paper is to determine the difficulties that aircraft mechanics have with the use of the English language at their work. The importance of knowledge of the English language in aircraft maintenance inspired the definition of the current aim, and the authors believe that this research can contribute to similar studies focusing on this issue. The authors believe that aircraft mechanics have the least difficulties with reading skills as it is the most used language skill in this profession.

Based on our previous study [20], reading skills are the most commonly used in aircraft mechanics, and therefore, the authors suppose that aircraft mechanics are the most proficient in this skill and have the least difficulties with it. The methodology of this research followed a systematic process. The first step was determining the issue, which is the importance of the English language in aircraft maintenance and the absence of legal obligations for aircraft mechanics to show an adequate level of knowledge of this language. Further, literary research took place, which was necessary for the understanding of the theoretical framework, which focused on needed knowledge of the English language in aircraft maintenance. Based on the findings from the theoretical framework it was possible to denote the aims and further methodology for the present research.

The authors decided to determine the difficulties of aircraft mechanics by the means of a questionnaire. Questionnaire provides an effective collection of large amount of data in a relatively short time. It is beneficial for the respondents as it does not require an extensive amount of their time, which was a factor that had to be considered since the respondents were asked to fill out the questionnaire during their working hours of right after the end of their shift. This approach permits to determine what difficulties do aircraft mechanics encounter based on the self-evaluation of their skills. Even self-evaluation poses multiple benefits in the form of time efficiency, its limitation lies in the degree of objectiveness. A greater objectiveness could be achieved by a comprehension test with an

interview, however, this method was not deemed appropriate for the purposes of our study as it considerably affected the size of our sample which therefore would not be representative. The self-evaluation in the form of a questionnaire shows the perceived difficulties the aircraft mechanics encounter which provides an insight also into the mechanics' perception of the importance of English. The preparation of the questionnaire took the theoretical framework into consideration and resulted in a questionnaire composed of two parts. The first was focused on the demographic information about the respondents, the second part dealt with the difficulties that the aircraft mechanics encounter when it comes to working with the English language. The aim of the questionnaire was to obtain relevant information in a valid manner through various types of questions, which were open and close-ended and also in the form of a Likert scale. The questionnaire was prepared by means of an online platform Quatrics and it was also distributed in paper form at the maintenance and repair organizations. Those companies that were not visited personally were provided the link to the online form of the questionnaire. The data collection period was from 7 October to 7 November 2022.

The gathered data from this questionnaire are viewed as important insight into the issue of the English language in aircraft maintenance. In order to attain the aims of this research a questionnaire was distributed at five maintenance and repair organizations in a physical form and was sent to two other in its online form in the Slovak Republic. The research evaluated the responses of 80 respondents, which is viewed as a sufficient representative sample with regard to the limited number of working aircraft mechanics in the Slovak Republic. The results from this research can point out the most common language difficulties of aircraft mechanics and also provide a closer look at the attitudes of aircraft mechanics.

4. RESULTS

The sample of the research consisted of 80 male respondents, whose demographic information is available in Table 1. The average age of the respondents is 31 years, which shows that the younger generation is interested to work in the field of aircraft maintenance. The respondents' years of experience varied from less than a year to 47 years, which permitted us to divide the respondents into three main groups based on years of experience, namely: less experienced, experienced, and very experienced. The sample can be also divided into three groups based on their years of studying English, these groups are: short-term learners, mid-term learners, and long-term learners.

This section presents the results of the research, and the data collected from the questionnaire that was performed at aircraft maintenance organizations in Slovakia. The second section of the questionnaire was devoted to determining which aspects of languages pose the most difficulties to aircraft mechanics. The difficulties of aircraft mechanics with the English language are subjective and were assessed based on their perceived difficulty with specific aspects of language, specific tasks under the general, listening, writing, reading, and speaking skills. The respondents had to evaluate how often does a certain language task pose a difficulty to them on the scale from 1 (never) to 5 (always). Based on their answers it was possible to create three categories of difficulties, namely, high, medium, and small number of difficulties.

Table 1. Demographical information

	n	**%**
Age		
19 - 30	27	33%
31 - 45	36	45%
46 - 60	15	19%
61 +	2	3%
Years of experience		
Less experienced (0 – 4 years)	22	28%

Experienced (5 – 10 years)	25	31%
Very experienced (11 and more years)	33	41%
Years of studying English		
Short-term learners (0 - 4 years)	32	40%
Mid-term learners (5 – 10 years)	34	43%
Long-term learners (11 and more years)	14	17%

Based on the responses of the aircraft mechanics (Figure 1 and 2), we can see that the distribution of the aircraft mechanics related to the frequency of difficulties in the individual communication activites is similar. From this we can deduce that the years of experience and the years of studying English of aircraft mechanics do not influence the amount of perceived difficulties that aircraft mechanics experience.

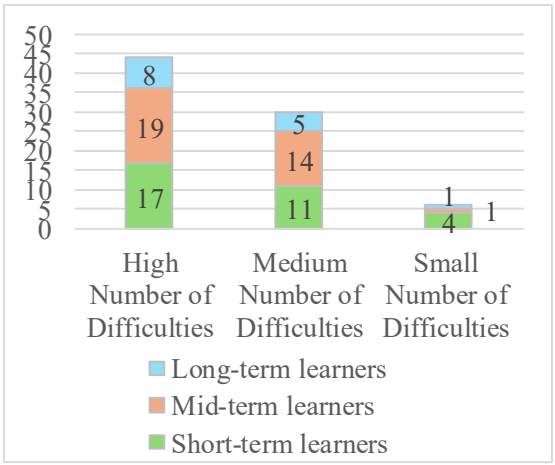

Figure 1 Frequency of difficulties based on the years of studying English

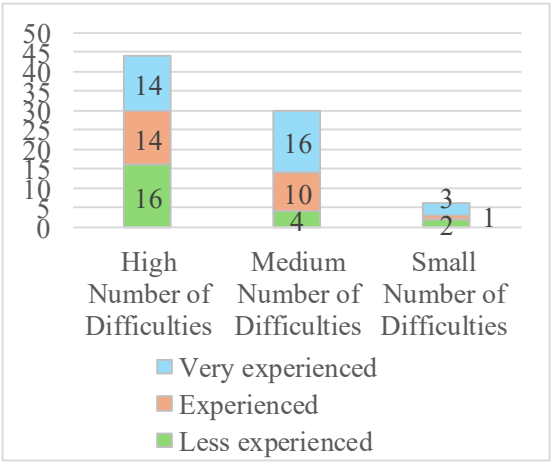

Figure 2 Frequency of difficulties based on the years of working experience

Firstly, the aircraft mechanics had to express their view on the amount of difficulties they experience at work in relation to specific aspects of language which are needed in the production of the language and are used also in writing and speaking skills. This category has the highest average of difficulties (2.89), since it is focused on the active use of the language, which tends to cause most of the difficulties for foreign speakers. Even though these aspects are all needed in performance of other skills, they received higher average of difficulties than specific situations within individual skills. The

reason may be that respondents could better mentally picture their difficulties when formulated as a separate aspect of language production. The least perceived difficulties are seen in the use of correct vocabulary, which reaches 2.65. Other aspects of language were regarded as posing similar moderate level of difficulties ranging from 2.81 to 3.01. This is showed in Table 2 below.

Table 2. Difficulties in production of language

No.	Production of language	Mean
1	using correct word-order	3.01
2	fast formulation of ideas	2.98
3	using correct pronunciation	2.97
4	using correct grammar	2.96
5	clear formulation of ideas	2.86
6	using correct spelling	2.81
7	using correct vocabulary	2.65

The difficulties were seared into five categories: general skill (G), listening skill (L), writing skill (W), reading skill (R) and speaking skill (S), see Table 3. General skill was created with the goal to group communication activities that aircraft mechanics participate in, but they cannot be placed under any other language skill exclusively as it uses the combination of these skills. Listening skill received the overall average of 2.51, which makes it the skill which poses the second most difficulties according to the subjective view of the respondents. The speaking skill received a slightly lower average than the general skill. These skills are closely related, which could also explain the similarity in these averages. Writing and reading skills collected the same overall average of 1.97.

Table 3. Difficulties – average per language skill

No.	Language skills	Mean
1	Listening skill	2.51
2	General skill	2.19
3	Speaking skill	2.15
4	Writing skill Reading skill	1.97

The difficulties in specific communication activites is shown in Table 4. Collaboration with foreign colleagues at a Slovak maintenance organization received 2.31, which is the highest in this category. Participating in training, and conferences in English collected the average 2.21. The respondents considered traveling to foreign maintenance organizations where all communication is in English as the least difficult in this category as it received 2.05. Listening and understanding of foreign accents acquired the highest average of difficulty equal to 2.86. Followed by listening and understanding lengthy descriptions received 2.55 and listening and understanding informal language 2.48. The last in this category is listening and understanding of spoken instructions.

All communication activities within the writing skills received the average close to 2, while writing task cards was considered to pose the most difficulties (1.83) and the writing emails (2.08) the most. Reading and understanding of emails received a similar average of 2.04. Communication activities within the reading skill also vary closely ranging from 1.88 to 2.15. The one posing the difficulties the most frequently was denoted as reading and understanding detailed descriptions (2.15). Reading and

understanding aircraft manuals and written instructions received the same average of 1.9. On the other hand, the one posing difficulties the least was reading and understanding task cards (1.88).

According to the overall average the third skill that poses difficulties the most often is the speaking skill. The average responses for these communication activities ranged from 1.99 to 2.28. The most difficulties are posed by communication activities: talking about out-off-work and work related topics. The other two skills are describing the work done which has a similar average to the last communication skill talking with foreign aircraft mechanics.

Table 4. Difficulties based on specific communication activity

No.	Type	Communication activity	Mean
1	L	Listening and understanding accents	2.86
2	W	Writing emails	2.80
3	L	Listening and understanding lengthy descriptions	2.55
4	G	Traveling to foreign maintenance organizations where all communication is in English	2.50
5	L	Listening and understanding informal language	2.48
6	R	Reading and understanding emails	2.40
7	G	Collaboration with foreign colleagues at a Slovak maintenance organization	2.31
8	S	Talking about out-off-work related topics	2.28
9	S	Talking about work-related topics	2.26
10	G	Participating in training, and conferences in English	2.21
11	L	Listening and understanding spoken instructions	2.18
12	R	Reading and understanding of detailed descriptions	2.15
13	S	Describing work done	2.11
14	W	Writing reports	2.10
15	S	Taking with foreign aircraft mechanics	2.10

5. DISCUSSION

The results of this research are going to be compared to the results from our previous research [20], which focused on the relevance of these communication activities in aircraft maintenance. According to the results from the previous study a list of most commonly used communication activities was assembled. When determining the content of a language course for aircraft maintenance it is imperative to take into consideration the results of both of these research.

Fast and clear formulation of ideas is key in every effective communication. To decrease these difficulties a complex effort needs to be made and it can be achieved by practice in speaking and writing. Some of these aspects relate only to the speaking skill (correct pronunciation), only to the writing skill (correct spelling), while others relate to both of them. Correct pronunciation is crucial in speaking as the influence of the native language pronunciation can cause difficulties in understanding. The incorrect spelling of the words in writing can cause confusion and slower the understanding of the written text. The use of correct grammar and word-order are necessary for comprehensible production of language and can considerably enhance resolution of any problem that may arise. The use of correct vocabulary and thus, terminology seems to pose the least difficulty in the first category. Terminology is essential and is used throughout the technical documentation that aircraft mechanics work with, meaning they are accustomed to it. However, an issue can arise when terminology is not used consistently throughout the documentation [20].

The general skill is considered the fourth most difficult according to the descriptive statistics. This skill encompasses various skills which can be useful for the aircraft mechanics. During the situations within this category, they can help themselves with extralinguistic prompts (such as body language, gestures or facial expressions) in order to better understand. During the participation in training, and conferences in English, aircraft mechanics mostly need to use the complex set of skills related to the

listening and speaking skills. Collaboration with foreign colleagues at a Slovak maintenance organization is an important part of maintenance operations as it was denoted as the seventh most frequent communication acitivity [20]. An appropriate level of English is needed for adequate communication which is necessary during collaborations in international teams of mechanics. Traveling to foreign maintenance organizations where all communication is in English may have received the lowest perceived difficulty since traveling to a foreign country is a common experience for most people.

Listening skill is considered as the second skill that poses difficulties the most. According to the previous study [20], listening skill is the second most commonly used. Generally, listening skill is a hard one to master, one of the reasons is the unavailability of the information after it has been uttered, which leaves limited time to think about what was being said. Further, many different accents in English can complicate the understanding when an individual is not familiar with it, this was also the situation which was denoted as the one posing difficulties the most frequently. However, based on the study of relevance of these communication activities, other listening communication activities are used more often and therefore during the preparation of the language course more attention should be paid to them. For instance, listening and understanding of spoken instructions and informal language are used the most frequently from the listening skill. The difficulties posed by unformal language can be caused by the prevalence of academic English which is taught at schools. Aircraft mechanics seem to have the least difficulties with listening to spoken instructions, which may be caused by the generally shorter and imperative sentences that are used in instructions that are easier to understand. Lengthy descriptions can be complicated to understand also for native speakers as they can contain a lot of information.

Both of writing and reading skills were denoted as the most commonly used by aircraft mechanics in our previous study [20], which can explain the least number of difficulties in these communication activities. Writing task cards together with reading and understanding task cards were viewed as a communication activities that pose the least difficulties from all of the activities. The reason for this may be that this activity was denoted as the sixth most common in a previous study [20], therefore, aircraft mechanics are in constant contact with it. Writing emails together with reading and understanding of emails are considered to pose difficulties similarly. However, according to the previous study reading and understanding of emails was denoted as the fifth most common and writing emails only as thirteenth.

One of the possibilities of how to cope with these difficulties is to address them during the specialized course. The high amount of difficulties causing various accidents encouraged some countries such as Turkey or Malaysia to adopt minimal language requirements for aircraft mechanics. Even though, these countries require a certain language certificate, the system of specialized language education for aircraft mechanics is not well developed. These initiatives should be supported by an education system that would address the needs of future aircraft mechanics. Such course development would be easier with appropriate and accessible guidelines from the international organizations which are now missing.

5. CONCLUSION

In conclusion, this research highlights the crucial role of effective communication skills in aircraft maintenance, building on insights from our previous study [21]. The information gained from the questionnaires provides and insight into the perceived difficulties that aircraft mechanics encounter during their work. Overall, the results indicate that the difficulties are not as frequent, while clear articulation is essential, with a focus on pronunciation, spelling, grammar, and consistent technical terminology usage. While speaking and listening skills present challenges, specialized attention to frequent communication activities like informal language and spoken instructions is necessary. Additionally, while aircraft mechanics demonstrate proficiency in writing and reading, misunderstandings in tasks like email correspondence require targeted training.

By comparing these findings with the results of our previous study [21] it was possible to put into perspective how important or common are the individual communication activites in relation to the perceived amount of difficulty they pose. This combination of information can build a more solid picture about the relevance of such difficulties. The determination of these difficulties can be beneficial for course developpers as they can address these difficulties in their curriculum. Current students aspiring to work in aircraft maintenance and aircraft mechanics themselves who are interested in improving their language competence can take inspiration for self-studying.

Future research will focus on the preparation of course curriculum proposal based on the results of the present and previous studies. In order to create such a proposal it is necessary to perform additional analyses that would focus on the present situation analysis in the form of determining the current language knowledge of potential students of such course by the means of a specialized test for aircraft maintenance, further by analysis of the deficiencies between the target communication competencies required for aircraft mechanics and the current level of language of the potential students. These steps together with means analysis form the whole needs analysis, which is used for creating a course of English for specific purposes. By integrating findings from these studies, specialized language courses can address communication needs, enhancing operational efficiency and safety in aviation maintenance.

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