THE DEVELOPMENT OF A TECHNICAL WORD LIST AND SELF-STUDY MATERIAL FOR AIRCRAFT MAINTENANCE STUDENTS

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THE DEVELOPMENT OF A TECHNICALWORD LIST AND SELF-STUDY MATERIAL FOR AIRCRAFT MAINTENANCE STUDENTS

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Department of Foreign Language Education-English Language Teaching Program

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ABSTRACT

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Department of Foreign Language Education-English Language Teaching Program

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Vocabulary teaching is an important and complex part of ESP research (Coxhead, 2013). Many studies have been carried out focusing on ESP vocabulary ranging from teaching and learning it, the needs of students, academic vocabulary to technical vocabulary (Nation, 2013; Parohinog and Meesri, 2015; Coxhead, 2001). Among various aspects of ESP vocabulary, aviation English holds a significant part dealing with the English for the people in the aviation industry. The importance of aviation English is closely associated with the public safety (Moder,2012), and the role of English is vital for aircraft maintenance technicians alongside with pilots and air traffic controllers. For aircraft maintenance, the relationship between ESP and vocabulary relies on technical vocabulary. Therefore, the aim of this study is to create a technical vocabulary list for aircraft maintenance students, to build a self-study material, and to evaluate the efficiency of this self-study material. So as to construct the technical vocabulary list, a corpus including 93,290 tokens was compiled from aircraft characteristics manuals. The target corpus was analyzed via AntWordProfiler and by experts to create the aircraft maintenance technical vocabulary list with 103 words. The analysis revealed that the words that are not included in the GSL and AWL constitute a large part (31%) of the target corpus. This generated technical vocabulary list was administered to 56 students as a pretest to determine both the level of their vocabulary knowledge and the words to be

incorporated into self-study material. After eliminating the words known by at least 50% of the students, the remaining 80 words constituted the self-study material content. The students studied the self-study material for four weeks. Consequent to their study, a post-test was administered to measure the effect of the four-week study. The results indicated that there was a statistically significant difference between the pre-test and post-test results. This study is an attempt to show the necessity of building a field-specific technical vocabulary list for aircraft maintenance students to help them expand their vocabulary knowledge in their field as these words comprise a large part of what they will encounter.

Keywords: Word list, Technical vocabulary list, Self-study material, ESP vocabulary.

ÖZET

UÇAK-GÖVDE-MOTOR-BAKIM ÖĞRENCİLERİ İÇİN TEKNİK KELİME LİSTESİ VE BİREYSEL ÇALIŞMA MATERYALİ OLUŞTURMA

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Kelime öğretimi, ESP araştırmasının önemli ve karmaşık bir parçasıdır (Coxhead, 2013). Bu alanda ESP sözcük dağarcığına odaklanarak, kelime öğretimi ve öğrenimi, öğrenci ihtiyaçları, akademik kelime dağarcığı ya da teknik kelime dağarcığı gibi birçok konuda çalışmalar yapılmıştır (Nation, 2013; Parohinog ve Meesri, 2015; Coxhead, 2001). ESP kelimelerinin çeşitli alt dalları arasında, havacılık İngilizcesi önemli bir yere sahiptir. Havacılık İngilizcesinin önemi, kamu güvenliğiyle yakından ilişkilidir (Moder, 2012), ve İngilizce, pilotlar ve hava trafik kontrolörleri yanı sıra uçak bakım teknisyenlerinin için de büyük önem taşır. Uçak bakımı için, ESP ve kelime arasındaki ilişki teknik kelime ile ilgilidir. Bu nedenle, bu çalışmanın amacı uçak-gövde-motor-bakım öğrencileri için teknik bir sözlük listesi oluşturmak, bireysel çalışma materyali geliştirmek ve bu bireysel çalışma materyalinin verimliliğini değerlendirmektir. Teknik kelime listesinin oluşturulması için, uçak karakteristikleri kılavuzları kullanılarak 93.290 kelime içeren bir bütünce oluşturuldu. Oluşturulan bütünce, AntWordProfiler programı ve ardından uzmanlar tarafından analiz edilerek 103 kelime içeren bir teknik kelime listesi elde edildi. Analizin sonucu, teknik kelimelerin hedef bütüncenin büyük bir kısmını %31 oluşturduğunu ortaya koydu. Bu kelime listesi hem öğrencilerin kelime bilgisi seviyelerini hem de bireysel çalışma materyalinde kullanılacak kelimeleri belirlemek amacıyla 56 öğrenciye ön test olarak uygulandı. Öğrencilerin en az %50'sinin bildiği

kelimeler elendi ve geriye kalan 80 kelime bireysel çalışma materyalini oluşturdu. Öğrenciler dört hafta boyunca oluşturulan bu materyal üzerinde çalıştı. Çalışmalarının ardından, dört haftalık çalışmanın etkisini ölçmek için bir post-test uygulandı. Sonuçlar, ön test ve son test sonuçları arasında istatistiksel olarak önemli bir fark olduğunu gösterdi. Bu çalışma uçak-gövde-motor-bakım öğrencileri için alana özel bir teknik kelime listesi oluşturmasının gerekliliğine yönelik bir denemedir. Çünkü var olan teknik kelimeler daha sonra alanlarında karşılaşacakları kelimelerin büyük bir bölümünü oluşturmaktadır ve alana özel bir teknik kelime listesinin öğrencilerin kelime bilgilerini artırmalarına yardımcı olabileceğini göstermektedir.

Anahtar Sözcükler: Kelime listesi, Teknik kelime listesi, Bireysel çalışma materyali, Özel amaçlı İngilizce ve kelime

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ETİK İLKE VE KURALLARA UYGUNLUK BEYANNAMESİ

Bu tezin bana ait, özgün bir çalışma olduğunu; çalışmamın hazırlık, veri toplama, analiz ve bilgilerin sunumu olmak üzere tüm aşamalardan bilimsel etik ilke ve kurallara uygun davrandığımı; bu çalışma kapsamında elde edilemeyen tüm veri ve bilgiler için kaynak gösterdiğimi ve bu kaynaklara kaynakçada yer verdiğimi; bu çalışmanın Anadolu Üniversitesi tarafından kullanılan "bilimsel intihal tespit programı"yla tarandığını ve hiçbir şekilde "intihal içermediğini" beyan ederim. Herhangi bir zamanda, çalışmamla ilgili yaptığım bu beyana aykırı bir durumun saptanması durumunda, ortaya çıkacak tüm ahlaki ve hukuki sonuçlara razı olduğumu bildiririm.

Revan SERPİL

TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ESP : English for Specific Purposes

GSL : General Service List

AWL : Academic Word List

ICAO : International Civil Aviation Organization

RT : Radiotelephony

L1 : First Language (Turkish)

L2 : Second Language (English)

ATC : Air Traffic Controller

SPSS : Statistical Package for Social Sciences

RA : Research Article

MAWL : Medical Academic Word List

NAWL : Nursing Academic Word List

SEEC : Student Engineering English Corpus

EC : Engineering Corpus

BEL : Basic Engineering list

IEEC : Information Engineering English Corpus

CAWL : Chemistry Academic Word List

ALC : Applied Linguistics Research Articles Corpus

EAWL : Environmental Academic Word List

AMWL : Aircraft Maintenance Word List

1. INTRODUCTION

"Vocabulary knowledge is a critical component in reading", and reading comprehension is considerably affected by the density of unknown vocabulary in a text (Hu and Nation, 2000). The acceptance of the significant role of vocabulary in reading comprehension has resulted in many researchers' devoting themselves to vocabulary studies to define "important" vocabulary - "vocabulary that is frequently and widely used in English"- (Miller, 2012). One result of these attempts was to create word lists that will help learners and teachers by focusing on the frequently- or densely-used words. Of course, the recent advances in technology and the outcomes of corpus-based research have made the achievement of this target more feasible for academics.

Starting with General Service List (GSL) (West, 1953), a multitude of word lists have been created, among which Coxhead's Academic Word List (2000) is the most recent and well-known one. Conceding the verity of the usefulness of these wordlists, many researchers have continued to construct more discipline-specific word lists like medicine, engineering, and agriculture, believing that "lexical differences that exist across distinct disciplines may be greater than the similarities (Martinez, Beck and Panza, 2009)". Furthermore, keeping in mind that "students need to acquire specialized discourse competencies that will allow them to succeed in their studies and participate as group members (Hyland and Tse, 2007)," and considering the importance and validity of specialized vocabulary, it would be meaningful to study discipline-specific word lists.

Therefore, the purpose of this corpus-based study is to create a word-list specific to Airframe and Powerplant Maintenance Department by focusing on discipline-specific texts and comparing the words across different word lists. The corpus is a compilation of aircraft characteristics manuals of different plane models in Turkey. Aircraft characteristics manuals are the reading texts that graduates of this department are expected to use in their workplace, and they are the primary source of information for the workers. For the text selection, convenient sampling was used. The chosen texts were analyzed through the AntWord Profiler program and the word list created was compared with the GSL and AWL to eliminate the shared vocabulary to obtain the actual discipline-specific ones. The words in this list was used as a pre-test to measure the students' vocabulary knowledge and to distinguish between the ones they know and those they don't. In this test, the students were required to write the translations of the target words in Turkish (L1). The unknown technical vocabulary was included in a self-study material

whereby the students studied the technical words with their L1 equivalents. After four weeks of implementation, the same vocabulary test was administered as a post-test, and the mean scores of both pre-test and post-test were analyzed via paired-samples t-test.

The following sections of this chapter will present the study background, the current problem, the significance of the study, the purpose, the research questions, and finally the limitations.

1.1. Background to the Study

With the globalization of the world, people from various backgrounds and nations have been communicating through English (Björkman, 2014). As English has gained much importance, functioning in this language has become an important part of ensuring success both in educational world and in business world. One of these fields that require communication in English is Aviation, and as a field with international business potential, English-speaking skills are crucial for the workers employed in this field. There are many studies focusing on flight training (pilots) and air traffic controller (ATC) departments, but the research on the English language needs of students receiving education in the department of aircraft maintenance is scarce.

Regarding aviation English, the strongest focus has been put on the listening and speaking skills of the students in flight training and ATC departments, but reading stands out as the most important language skill for the aircraft maintenance students. As non-native individuals, functioning in English may not be as easy as it is in their first language, and it requires great effort to improve different skills in the target language. One of these skills is reading, and much research has been carried out on the development of reading skill and the contributing factors. One result of these studies was that as "vocabulary knowledge is a critical component in reading," and reading comprehension is considerably affected by the density of unknown vocabulary in a text (Hu and Nation, 2000). According to Laufer and Ravenhorst-Kalovski (2010), the necessary amount for minimal comprehension of a text is 95% coverage, while according to Hu and Nation (2006), this coverage should be 98% for comprehension without help. Hence, a large number of studies have been conducted to examine the words forming a text and creating lists of these words to "help teachers to set teaching goals for their students' vocabulary learning" (Coxhead, 2000, 2011).

For the last half century, several word lists have been formed, which can be basically identified in two broad categories as general service lists and academic word lists. General service lists are mainly focused on the frequently-used words in everyday language (e.g. West, 1953; Browne, 2013), while academic word lists are mostly related to academic words in different fields (e.g. Coxhead, 2000; Gardner and Davies, 2014). In addition to these word lists, in recent years, discipline-specific word lists (e.g. Yang, 2015; Martinez, Back, and Panza, 2009; Vongpumivitch, Huang, and Chang, 2009; Wang, Liang and Ge, 2008) have been developed for the needs of non-natives by criticizing the benefit of academic word lists for all fields (Martinez, Beck and Panza, 2009).

In her research, Yang (2015) focused on establishing a field-specific list of academic words for nursing graduate students, and found that the word families apart from the top 100 word families accounted for 6.89% of the nursing research articles corpus, indicating that Nursing Academic Word List actually made up 13.64% of the text, and similarly, Wang et al. (2008) looked into medical research articles and produced a Medical Academic Word List whose coverage of the text is 12.24%.

In their study, Vongpumivitch, Huang and Chang (2009) compared AWL and their corpus of applied linguistics research papers, reaching the conclusion that AWL plays an important role by covering high proportion of text (11.17%) and discipline-specific words covering 2.8% of the text, which can be seen as an important factor in comprehension of a text, given that 98% of vocabulary knowledge is required for an unassisted reading (Nation, 2006). Martinez, Beck and Panza (2009) focused on agriculture research articles comparing different parts of the articles (e.g. introduction, method), showing that the coverage of AWL is 9.06% in these different parts, and assert that "it is necessary to build frequency lists directly from the target texts of possible users" which will give the learners the opportunity to study the most-encountered words.

1.2. Statement of the Problem

Vocabulary plays a significant role in English for Specific Purposes (ESP) because they are important in terms of classroom practice, and they represent belonging to a particular group (Coxhead, 2013). Although there is no settled agreement on the size of specialized vocabulary (Coxhead, 2013), the amount of those words can vary in different

disciplines in a range between 1,000 to 5,000 words (Nation, 2008), and a lot of research has been carried out to determine the amount of specialized vocabulary in various areas like business, medicine, agriculture, etc. (Li and Qian, 2010; Yang, 2015; Martinez, Beck and Panza, 2009). Among these various fields, studies on aviation English focus especially on pilots and air traffic controllers (ATCs).

Much research has focused on the language of pilots and ATCs, which is radiotelephony (RT). RT has been emphasized greatly because any problems due to insufficient language or miscommunication may result in serious accidents (Cutting, 2012; Tajima, 2004). Hence, recognizing the importance of language proficiency, the International Civil Aviation Organization (ICAO) has also established some language proficiency requirements (2010), particularly for pilots and ATCs.

Despite the abundance of research regarding RT, not so many studies have been carried out related to aircraft maintenance technicians' language needs and proficiency. However, aircraft maintenance also plays an important role in aviation safety (Usanmaz, 2011), and the language proficiency of aircraft maintenance technicians can also be a contributing factor to aviation safety because they are expected to read aircraft maintenance manuals written in English, and lack of written communication due to language proficiency can be problematic especially for the non-native speakers of English (Eckert, 1997).

Therefore, English for aircraft maintenance plays an important role in ESP. Although there have been studies focusing on the technical vocabulary in aviation English for RT (Sullivan and Girginer, 2002; Mell, 2004; Moder and Halleck, 2012), the research on technical vocabulary in aircraft maintenance thorough a corpus-based study and forming a technical vocabulary list hasn't received much attention. However, a particular emphasis should be placed on aircraft maintenance students' technical vocabulary knowledge because, like many other ESP students, they will have specific linguistic needs in their own context both for different types of communication, and with different types of documentation (Peter and Fernandez, 2013).

1.3. Purpose of the Study

The purpose of the present study is to create a discipline-specific word list for Airframe and Powerplant Maintenance Department students by comparing the frequency level of the most frequent words in the study corpus with General Word List (GSL) and Academic Word List (AWL), thus isolating the words used only in the target corpus with high frequency.

This study has three main goals: a) Creating a database by analyzing the aircraft maintenance manuals, and based on the expert opinions, determining the most frequent and important technical vocabulary in these manuals, and on the basis of these identified vocabulary items, creating a technical vocabulary list; b) by using the words in the technical vocabulary list, creating a web-based study material on which students can study individually; c) measuring the effectiveness of the created web-based study material.

The research questions guiding the study based on the main goals are as follows:

1. What are the most frequent words in the aircraft maintenance English database (AMED)?
2. How effective is the self-study material prepared for aircraft maintenance students on their vocabulary scores?

1.4. Significance of the Study

ESP has important educational and professional functions for students and workers. Requiring both knowledge of English for specific purposes and of the specific field of expertise, this type of English is distinct from English for general purposes (Paltridge and Starfield, 2013). For the aircraft maintenance students, who aspire to become aircraft maintenance technicians when they graduate, ESP vocabulary specific to their own fields has a remarkable value.

The students in the Airframe and Powerplant Maintenance Department of the Faculty of Aeronautics and Astronautics of Anadolu University take English preparatory courses for one year (optional), or take general-purpose English courses during their four-

year undergraduate study; however, all these courses have general English objectives rather than objectives specific to their field of study.

In their first year in the department, students encounter technical vocabulary in English specific to their department. Although some researchers (Cowan, 1974) claim that teaching technical vocabulary is not English teachers' concern, Nation (2013) asserts that English teachers can have a contribution to students' technical language. Aiming this contribution, various studies in the aviation field focusing on pilots and ATCs (Sullivan and Girginer, 2002; Parohinog and Meesri, 2015) have been carried out to analyze the features of aviation English. Only a very limited number of these studies have gone beyond the analysis stage, and set out to create classroom materials.

As aviation English is not limited to English for pilots and ATCs (Aiugo, 2007), and as the language needs of aircraft maintenance students can cause problems in aviation safety (Usanmaz, 2011), such needs should also be taken into consideration. Hence, this study is important in terms of its focus on the aircraft maintenance students with an attempt to generate a technical word list by analyzing the aircraft maintenance manuals, and creating a self-study material comprising the most frequent technical vocabulary and their Turkish equivalents for the first-year students.

1.5. Limitations of the Study

The limitations of the current study can be listed as below:

- In this study, only the manuals titled "Aircraft Characteristics" for Airbus 320, 321 and 330 will be used. Therefore, the created vocabulary list will be obtained only from these sources, excluding the other manuals. As such a limited database results in a limited number of tokens, it makes this study a small-scale one.
- The self-study material created as a result of the study targets only the 1st year students. Hence, the results of the self-study material and the vocabulary translation test can only be interpreted for the first-year students.
- The vocabulary test administered as pre-test and post-test at the data collection procedure and the self-study material only aim to help with the receptive

vocabulary knowledge; hence, production is not dealt with in any part of the present study.

- At the final stage of the data collection, as no delayed post-test was administered, the study doesn't analyze the retention of the technical vocabulary focused in the study.

2. REVIEW OF LITERATURE

2.1. Aviation English

Since the 1970's, a more general term *Aviation English* has been used to denote the RT phraseology, along with the English used by airport crew, cabin crew, passenger service agents, administration and civil aviation authorities. Just like other types of English for Specific Purposes, the Aviation English used by the auxiliary and other aviation staff is adapted to the specific field and context, in addition to using the pronunciation, syntax, lexicon, etc. of the conventional English (Cutting, 2012).

Aviation English, which has been used as a medium for quite some time, has different definitions. According to the definition made by Moder (2012), Aviation English is English used by pilots, air traffic controllers and others involved in the aviation industry. While Aviation English occurs in many situations where assistant staff, technicians and airport staff are involved, many studies to date have focused on the specific field named as RT that is used between pilots and air traffic controllers.

According to Aiugo (2007), aviation English is not confined only to the language used between air traffic controllers and pilots. In addition, aviation English is a comprehensive language that relates to any aspect of aviation that comprises the language used by the administrators in aviation industry, and used in pilot briefings, announcements, cockpit talk, maintenance technicians or cabin crew. Although it contains the phraseology specified by the International Civil Aviation Organization (ICAO), Aviation English should not be limited to this, and in some cases, it may necessitate the use of general English (2007).

Despite such far-reaching scope of aviation English, most of the studies conducted in the field of aviation focus on the radiotelephony between pilots and ATCs. Most of these studies aim to determine the grammatical and linguistics structures of these communications. It would be helpful to review some key studies in this field:

The most common verbs occurring in RT communications were researched in the corpus studies conducted by Moder and Halleck (2012), and Mell (2004). The specific stage and form in which the target verbs occur were analyzed, and the results of both of these studies demonstrated that the “bare-imperative” and “bare-participle” structures

were dominant in the data. Although these two researchers did not principally aim to create a word list or a corpus, by conducting a corpus study in the aviation field, they obtained a list based on word frequencies.

In another research conducted by Howard in 2008, 15-hour-long talks of pilots and ATCs were examined, and the occurrence rates of signoffs, greetings and honorifics were identified. The results in this study support the findings of previous research carried out in Europe and Australia, indicating that of the analyzed data, 7% is signoffs, 2% is greetings, and 2% is honorifics.

Furthermore, some other studies have focused on educational material development. By employing discourse analysis, one such study was conducted by Sullivan and Girginer (2002) to design materials at a civil aviation school ESP program in Turkey. Classroom activities aiming to improve the pronunciation of numbers, the practice of readbacks, the repair of miscommunication, and comprehension were designed based on the collected data through control tower voice recordings, workplace observations, interviews and questionnaires.

Another study focusing on needs assessment carried out by Parohinog and Meesri (2015) deals with language proficiency levels of pilots and ATCs. Their study aimed to improve the English skills of the students in aviation school, and the data were collected by using interview, questionnaire, and focus group methods. In the study, where 621 students participated, difficulties in 6 different areas were identified regarding the ICAO English needs of aviation students. Among these, the biggest difficulty was experienced in grammar and syntax. Therefore, it was found that the lack of morphological and lexical knowledge negatively affected students' communication with each other.

Hazrati (2015) asserts that English is the lingua franca for aviation, and it is essential especially for pilots and ATCs. Additionally, Hazrati analyzes English not only linguistically but also culturally, and underscores the fact that in order to be fully functional in a language, cultural points need to be understood as well.

In another study conducted with pilots, Knoch (2014) emphasizes the importance of the role played by the standards defined by the International Civil Aviation Organization (ICAO) and knowledge of English in aviation accidents. In his work with experienced pilots, he tried to find out how pilots assessed their colleagues' English proficiency and how sufficient they thought their English was in their professional life.

In their study, Karimi and Sanavi (2014) aimed to determine the current and future

English needs of students in an Aviation Training Program. According to the results of this study, the students in the aviation program thought they were inadequate in four language skills, and thought that the ESP program they were in was inadequate to meet their expectations. When the program and the course books were considered, it was concluded that a greater emphasis needs to be placed on practice exercises, and the book contents and classroom activities need to better address the important points in professional life.

The difficulty of understanding the communications on radio has increased the importance of the skill of conveying meaning in aviation English (Moder, 2012). Therefore, as in the studies mentioned above, many studies have focused on pilots and ATCs, their language and their specific contexts were analyzed. However, as mentioned in the definition of Aviation English, such English is not limited to RT. Thus, in the next section, some studies conducted on Aviation English excluding RT will be reviewed.

In his study conducted as part of the European Commission Leonardo project, Cutting (2012) aimed to design an English course for those who seek employment as security guards, ground handlers, catering staff, and bus drivers at airports. For this purpose, field observations were utilized to determine the nature of the specific English used at airports. When compared with the other domains of Aviation English, the language use in these four professional groups was found not to have any vital importance. However, especially the research on ground handlers found that having a low language proficiency level contributes to the occurrence of accidents. For instance, Tajima (2004, p. 456) points out that linguistic inadequacy was to blame for the 1972 Paris crash. The cargo-handling ground worker was not able to read English, and failing to understand the caution sign on the defective cabin door, closed the door improperly.

According to his findings, Cutting (2012) states that no international English proficiency competence level is established for aviation ground staff, however, airports need individuals who have English proficiency at basic level, who can carry out effective communication in problematic situations in both daily routines and in ensuring that airport works properly. Furthermore, in order to increase airport profits, they also need to have adequate English proficiency level to be able to communicate with clients and other colleagues in a polite manner.

In 1997, Eckert conducted a study of English used by maintenance technicians. Eckert stresses that 8 of the fatal accidents occurring from 1979 to 1991 were caused by

maintenance factors which is also supported by Goldman, Fielder and King (2002) who report that from 1988 to 1997, at least one aircraft maintenance issue was a cause in accidents. In the United States or in other foreign countries, if an airline company is not authorized to translate the manuals with the approval of Federal Aviation Academy (FAA), the FAA-certified technicians have to follow the English manuals. Although Smith (1996) claims that reading is easier than speaking any language, he recommends that the standard English required for the ATCs must also be a requirement for the maintenance technicians (Smith, 1996, p. 1-2). Underscoring the importance of English used by maintenance technicians, Eckert attempted to measure the extent Mexican maintenance technicians comprehend English by using their task cards with simplified or non-simplified English. Although the results of his study don't yield any statistically significant results between two types cards, he concluded that task cards with simplified English Mexican helped maintenance technicians to understand the aviation material.

2.2. Teaching Vocabulary in ESP

Teaching vocabulary has been a research focus of ESP for many years taking different names like "technical, sub-technical, semi-technical or specialized vocabulary" (Coxhead, 2013). According to Coxhead (2013), two main reasons make vocabulary significant for ESP, which are a) to recognize teachers' and learners' need so that classroom time can be shaped accordingly; and b) such vocabulary provides a disciplinary knowledge thus creating an attachment to a specific group. Given such importance, teaching ESP vocabulary has faced two different opinions. On one side, some researchers believe that teaching technical vocabulary is not a language aspect English teachers are responsible for (Cowen, 1974), while others think English teachers can aid learners cope with technical vocabulary (Nation, 2013).

Thence, when the vocabulary teaching is seen as a part of ESP teaching, then the primary question of "What vocabulary do ESP learners need?" arises (Coxhead, 2013). This is a question that encapsulates many others like the kind of ESP course or learners, their language proficiency, needs, time etc. (Coxhead, 2013). Moreover, there are other problems teachers face concerning technical vocabulary. Chung and Nation (2003) describe two main problems as follows:

- The target technical vocabulary items are often not a specialization of language teacher.
- Technical vocabulary and the related field are integrated, and the technical vocabulary in that field is learnt while advancing in the field.

In spite of its difficulties, Hyland and Tse (2007) values the role of specialized vocabulary as it helps "students to acquire specialized discourse competencies that will allow them to succeed in their studies and participate as group members (p.248)". Seeing its significance, there are a couple of studies carried out regarding vocabulary teaching in ESP.

One of the studies was conducted by Rusanganwa (2013) to provide technical vocabulary needed by first-year physics students in their academic field. He tried to find out the effect of multimedia in teaching technical vocabulary in physics, and found out that the students taught through multimedia had higher scores than the control group in their final test.

Another study focusing on technical vocabulary teaching was carried out by Memory (1990), who analyzed the time of vocabulary teaching in a reading activity. He questioned whether teaching vocabulary before, during, or after reading task would have any influence on the reading performance. The outcome of his study showed that the time of technical vocabulary teaching doesn't have any effect of the students' reading; yet, he concludes that teaching the required or difficult technical vocabulary before the reading can enhance the learning of the meanings of the new terms.

Despite the promising value of research on ESP vocabulary, the need for further research still continues, and many researchers still carry on studying various aspects of technical vocabulary teaching. One of these aspects recently gaining attention is specialized word-lists, which will be elaborated on in the following part.

2.3. Corpus-Based Studies on Word Lists

Vocabulary teaching and learning is a crucial component of ELT pedagogy and tests. Word lists are widely accepted to facilitate vocabulary learning. Over time, increasingly specific word lists have been developed, from the General Service List (GSL) (West, 1953) which contains 2000 widely used English word families, to the

University Word List (Xue and Nation, 1984) which was a synthesis of several previous academic lists, to the Academic Word List (Coxhead, 2000), the first to create a word list systematically on the basis of a computerized academic corpus, and more recently, to corpus-based discipline-specific word lists, e.g., medicine (Wang, Liang and Ge, 2008), engineering (Mudraya, 2006), and applied linguistics (Vongpumivitch, Huang and Chang, 2009).

Since AWL items vary widely across disciplines, and the same word can show remarkable variation in frequency, range, preferred meanings and forms, and the collocational patterns, Hyland and Tse (2007) argue that "a single inventory" cannot represent the vocabulary of academic discourse, and support using a more restricted, discipline-based lexical repertoire for English learners. Specialized academic word lists and technical word lists have been separately developed, but the length and specificity of an academic word list in a particular subject area need to be referred to the frequent technical vocabulary used in the same field.

One research focusing on the field-specific wordlists is about medicine. Based on a corpus of 50 medical research articles (RAs) in English with 190,425 running words, Chen and Ge (2007) conducted a study on the word frequency and the text coverage of the 570 word families from Coxhead's Academic Word List (AWL) in medical RAs. They found that the text coverage of the AWL words accounted for around 10.07% in English medical RAs, that 292 (51.2%) out of the 570 AWL word families were frequently used in English medical RAs, and that the academic words used in English medical RAs made up around 10% of the text coverage. From these findings, they concluded that: (a) academic vocabulary, with a high text coverage and dispersion, is an important set of word items in medical RAs; (b) the AWL underrepresents the academic words frequently used in medical RAs; and (c) academic words serve some rhetorical functions in academic texts. They found that some high-frequency academic words in Coxhead's corpus were not as frequent in medical RAs. Wang (2008) also developed a Medical Academic Word List (MAWL) of the most frequently used medical academic vocabulary from various medical sub-disciplines, to serve as a guide for medical English instructors in curriculum design. MAWL was compiled from a corpus containing 1,093,011 running words of medical RAs from online resources. The established MAWL contains 623 word families, which accounts for 12.24% of the tokens in the medical RAs. Wang suggests that the MAWL can help instructors focus on crucial medical academic

words, and facilitate their setting clear goals for vocabulary teaching. For learners, the MAWL can provide a more specific guide in learning medical academic vocabulary, and also help them study EMP academic vocabulary in a more conscious, explicit and manageable way, consolidating their MAWL vocabulary knowledge with further exposure to medical texts. In another study related to medicine, Yang (2015) aimed to establish a Nursing Academic Word List (NAWL) of the most frequently-used nursing academic vocabulary covering various nursing sub-disciplines. He used a Nursing Research Articles Corpus (NRAC), a collection of journal articles in the field of nursing (containing 1,006,934 running words from 252 nursing research articles), to identify the AWL word-forms and the MAWL (Wang et al., 2008) word-forms in the NAWL corpus and to find out the frequent lexical items in all nursing sub-disciplines that are not among the first 2,000 words of English as given in the GSL (West, 1953). The 676-word NAWL is the only list of academic words exclusive to the nursing field, aiming to improve nursing students' reading comprehension of academic texts and their academic writing skills. The NAWL provides 3% more nursing text coverage than the MAWL. Yang suggests that the NAWL can serve as a reference for developing EAP materials, and can help EFL English learners interested in studying nursing to enlarge their vocabulary size faster.

Besides medicine, business is another field that word lists are formed for. Li and Qian's (2010) study of a Financial Services Corpus aimed to find out the presence of the AWL items in their corpus of financial texts, and the ways to effectively teach the AWL items in the corpus. Li and Qian found the AWL had a coverage of 10.46% in the corpus, and that high-frequency AWL items had an impressive presence in the corpus, with a cumulative coverage of 22.03%; and yet, the high variation in terms of the most frequent AWL items across the text types clearly indicated the specificity of the different text types used in the financial services industry. They also found that the concordance provides valuable access to the important collocational dimension of the AWL items.

Engineering is another field word lists have been generated for different aims. In one the studies in the engineering field, Mudraya (2006) tried to synthesize the lexical approach with a corpus-based methodology in teaching Engineering English so as to improve ESP instruction. He used examples from the Student Engineering English Corpus (SEEC) with about 2,000,000 running words (Moudraia, 2004), aiming to create a representative corpus of Student Engineering English with words from compulsory

engineering textbooks. Mudraya recommends the integration of the lexical approach with a data-driven corpus-based methodology in ESP teaching because corpora can inform ESP instruction by enabling students to learn about language via a corpus and to learn how to extract material from corpus. Since general language ability and specialized language ability complement each other, ESP teaching needs to bridge the gap between them (Dlaska, 1999).

In his research, Ward (2009) focuses on the teaching of English to engineering students who are expected to do at least part of their studying through textbooks written in English. Such students often find themselves very poorly prepared by their secondary education for reading engineering material in English. Covering 2000-word families, (Mudraya) (2006) and Ward's (1999) foundation engineering lists are too long for learners who may know only half this number. Ward aimed to create a word list, which is useful for engineers in all sub-disciplines in terms of text coverage and general frequency, and easy enough, in terms of length and technicality, for learners who don't have mastery of the GSL or the AWL. Ward claims that engineering corpus (EC) is representative (representing a range of topics in chemical, civil, electrical, industrial and mechanical engineering fields), balanced (giving equal importance to each field), genre-specific (only textbooks are represented) and relevant to student needs (textbooks for later years of undergraduate study), while other larger corpora do not address the specific needs of students. Coxhead's academic corpus contains no engineering section. Including a wide variety of genres, Hyland and Tse's (2007) 569,000-word engineering corpus is restricted to mechanical and electronic engineering. This was the reason for the creation and use of EC – to identify the vocabulary frequent in a wider representation of engineering sub-disciplines, in a specific genre. EC contains 10,290 word types among its 271,000 tokens. Basic engineering list (BEL) is a 299-word short and non-technical list for foundation engineering students which represents a relatively easy target for learners. By concentrating on word types rather than lemmas or families, it encourages learning not only of individual words, but also of their lexico-grammatical environments and gives excellent coverage of a wide variety of engineering textbook material.

Zhang (2013) attempted to find an optimal balance between the length of word lists and their coverage to facilitate language teachers' vocabulary instruction planning and priority setting for EAP/ESP programs. Covering 1,024,882 running words and 15,000 word types, the Information Engineering English Corpus (IEEC) was based on English-

language university-level textbook materials selected from ten compulsory courses in the discipline of information engineering, including Programming Principle, Operating System, Information System, Computer Network, Computer Security, Data Structure and Algorithm, MySQL Database, Java, Artificial Intelligence and Cryptography. 10.39% token coverage and 564 word families of Coxhead's AWL are represented in the IEEC. The words beyond the GSL and the AWL constitute 8.81% of the total tokens of the IEEC. Although the coverage of frequent academic words (9.16%) almost doubled that of frequent technical words (4.95%), the average number of family members these headwords have in the IEEC showed a reverse trend. There are 12 technical headwords in the IEEC with more than 10-word family members, while none of the academic headwords use the same criteria.

Valipouri and Nassaji (2013) examined a 4 million-word corpus of research articles in the field of chemistry to identify frequently used words in chemistry research articles and developed a word list for chemistry graduate students in an EFL context. They established a corpus of 4 million words from 1185 written texts of chemistry RAs in analytical, organic, inorganic, and physical/theoretical chemistry. They found that 1400 word families are frequently used in the chemistry corpus. These words are classified as Chemistry Academic Word List (CAWL). Compared with the CAWL words, a high number of the AWL words were not used frequently in chemistry, and the high-frequency AWL words had different frequency order than those in Coxhead's AWL, showing that academic words are not used similarly across disciplines. Also, many non-AWL content word families occurred with high frequency in the CAWL corpus, lending further support to the idea that field-specific vocabulary lists derived from the target academic texts need to be developed (Hyland and Tse, 2007; Martinez, Beck and Panza, 2009; Wang, Liang and Ge, 2008).

In the field of agriculture, Martinez, Beck and Panza's (2009) 826,416-word corpus-based study focuses on frequency, coverage, distribution, and meaning of the words from the AWL in agriculture research articles. They found that the list of frequent words from the AWL in the corpus was more limited than Hyland and Tse's (2007) and Chen and Ge's (2007) lists, which may help agriculture ESP learners' specific needs to be met. The results obtained provide focused, specific information on aspects of the academic vocabulary of agriculture RAs, representing a highly-restricted vocabulary list from the AWL. In line with Hyland and Tse's suggestion, this reduced list of frequent

AWL families shows that it is necessary to build frequency lists directly from the target texts. Such specific lists better meet the aim of offering learners a list of words that will be encountered often (Nation and Waring, 1997). Another corpus study in the field of agriculture comes from Munoz (2015). He studied the vocabulary of agriculture semi-popularization articles (an intermediate genre between the research articles published in specialized journals and the popularization articles published in the media) in English. The corpus comprised of 455,366 tokens and 12,246 types. First, he focused on a general lexical description of the corpus, particularly on vocabulary size, standardized type/token ratio, and word range, as well as the coverage of grammar words, general words, and academic words. Secondly, he analyzed the high-frequency words in the corpus. Munoz found a high lexical variation in the corpus. The calculation done via WordSmith Tools revealed a 57.71% ratio between types and tokens, indicating an average number of 57 new types for every 100 tokens in the corpus. The 6% coverage of GSL and the AWL academic words in this study is less than the 9.06% found by Martinez, Beck and Panza (2009) in research articles, but the 77% coverage of general words in semi-popularization articles is about 10% higher than found in research articles by Martinez, Beck and Panza (2009). According to the results, regardless of their initial categorization as general words and academic words, many of the high-frequency words had specialized meanings. Thus, supporting earlier studies (Hyland and Tse, 2007; Martinez, Beck and Panza 2009; Neufeld, Hancioglu, and Eldridge, 2011), the findings in this study indicate that the GSL and the AWL are limited in their lexical description of semi-popularization articles due to the multiple meanings lexical items have in various contexts due to polysemy, homonymy, and pragmatic factors. The semantic and pragmatic features denote technical meanings in the corpus (e.g. general words, such as ‘seed’ and ‘disease’, and academic words, such as ‘emergence’ and ‘response’, are technical words because semantically they signify field-specific concepts and pragmatically they are used in the context of semi-popularization articles). She reached the conclusion that the specialized meanings hinge upon the semantic relations of words in the conceptual system of a discipline as well as the specialized communicative situations in which they are used. Thus, frequency criteria may fail to reveal the specialization of the words used in scientific texts, such as the semi-popularization articles in this study. The findings also demonstrate that identifying the vocabulary of scientific genres, as was done in Ward’s (2009) engineering wordlist, is more useful than selecting specialized vocabulary on the basis of the GSL and

the AWL. The general words and academic words in the semi-popularization articles acquired technical meanings that clearly reflected concepts of the agriculture discipline. The study underscores the value of compiling small specialized corpora to build genre and discipline-based wordlists specifically designed to address the needs of learners in certain areas of specialization, rather than building general, non-discipline-specific vocabulary lists. Integration of both frequency criteria as well as meaning criteria in wordlist compilation emerges as particularly important. Using frequency helps target the specific vocabulary that needs to be taught; using meaning helps capture the aspects related to the word usage, such as the technical meanings, common collocation patterns, and the fixed multiple-word units used as terminological phrases. Developing more specialized wordlists will allow ESP teachers to set vocabulary goals by addressing both the question of how many words need to be taught and how words are used in specific genres and disciplines.

In the field of Applied Linguistics, Vongpumivitch, Huang and Chang (2009) conducted a corpus-based lexical study aiming to explore the use of words in Coxhead's (2000) Academic Word List (AWL) in applied linguistics journal articles, drawing on the Applied Linguistics Research Articles Corpus (ALC) comprising 200 research articles published in five international journals. This study established a list of 475 AWL word forms and a list of 128 non-AWL content word forms that are frequently used in applied linguistics. The results of this study reveal that the coverage of the AWL in applied linguistics (11.17%) is higher than in the art discipline (9.3%) investigated in Coxhead (2000), and in medical research (10.07%) as found in Chen and Ge (2007). Therefore, the AWL words were found to play a key role in the field of applied linguistics as in other previously researched fields.

In the field of environmental sciences, Liu and Han (2015) established the first environmental academic word list (EAWL) in an effort to help learners acquire a good command of specialized English. Analyzing the AWL coverage of the environmental science corpus, they found that the AWL varies across different subject areas within the environmental science discipline because the number of technical words differs among subject areas. For example, the AWL word coverage is not the same in various types of research essays (Li and Qian, 2010), and it covers only 6.27% of the medical text corpus (Cobb and Horst 2004), suggesting a high density of technical medical terms in these texts. Social sciences tend to focus on expressing ideas, while natural sciences are more

likely to emphasize the description of results, so the ideas are reflected in different ways in different disciplines. The AWL words are usually used to express viewpoints rather than to describe phenomena (Cobb and Horst, 2002; Coxhead and Nation, 2001). For instance, Chen and Ge (2007) and Martinez, Beck and Panza (2009) claim that whereas a higher number of AWL word families come up in the discussion sections of research articles, the result sections contain fewer AWL word families. Environmental science includes both natural science and social science subject areas. While the natural science subject areas comprise fewer AWL word families with low AWL coverage, the social science subject areas have more AWL word families with high AWL coverage.

Based on their finding that the AWL covers 12.82% of the corpus in the field of environmental science, but EAWL provides better coverage, Liu and Han also concluded that a field-specific academic word list can enable learners to study more effectively than is afforded by general academic word lists. Thus, covering more subject areas and being more appropriately distributed in the environmental science corpus than the AWL, the EAWL appears to be more helpful for academic study in this specific field.

Table 2.1. *Empirical Studies on Word Lists*

Author	Year	Aim	Focus	Corpus Text	Corpus Size
Liu & Han	2015	A field-specific word list and testing its validity	Academic Vocabulary	Environmental Science RAs	862,242 words
Yang, M.	2015	A word list for nursing department	Academic Vocabulary	Nursing RAs	1,006,934 words
Li & Qian	2015	Academic words in financial services corpus	Academic Vocabulary	Annual reports, brochure, fund description, ordinances, speeches	6,3 million words
Munoz, V. L.	2015	High frequency words in agriculture semi-polarization articles		Semi-Polarization articles	455,366 words
Zhang, M.	2013	Comparative study of Semi-Technical and Technical Vocabulary	Field-Specific Vocabulary	University Level textbooks	1,024,882 words
Valipouri & Nassaji	2013	Academic vocabulary in chemistry RAs	Academic Vocabulary	RAs	4 million words
Martinez et. al.	2009	Academic Vocabulary in agriculture research articles	Academic Vocabulary	Agriculture RAs	826,416 words
Vongpumivitch et. al.	2009	AWL and Non-AWL content words in applied linguistics RAs	Academic Vocabulary	Applied Linguistics RAs	1.5 million-words

Table 2.1. *Empirical Studies on Word Lists (Continued)*

Ward, J.	2009	A basic engineering English word list	Field-Specific Vocabulary	Engineering textbooks	271,000 words
Wang, et. al.	2008	A medical academic word list	Academic Vocabulary	Medical RAs	1,093,011 words
Hayland & Tse	2007	Distribution of AWL in different academic discipline	Academic Vocabulary	RAs, textbooks, book review, scientific letter, MA thesis, doctoral dissertations, final year project thesis	3,3 million words
Chen & Ge	2007	Distribution of AWL word families in medical RAs	Academic Vocabulary	Medical RAs	1.093.011 words
Mudraya	2006	Frequency-based corpus of student engineering lexis	Field-Specific Vocabulary	English language textbooks in engineering departments	1,986,595 words

2.4. What is a Technical Vocabulary?

For the purposes of this study, what technical vocabulary means needs to be explained; yet, the first point that needs to be addressed here is what "word" means in this study. In previous research, words are divided into four different categories as high frequency words, academic vocabulary, technical vocabulary, and low-frequency vocabulary (Nation, 2001; Chung and Nation, 2003). In this categorization, Chung and Nation (2003) state that:

> "Research on technical vocabulary has shown a significant underestimation of the role played by technical vocabulary in specialized texts and a lack of information about how technical vocabulary relates to other types of vocabulary…. While there is considerable research evidence about the nature and coverage of high frequency and academic words, there has been little investigation of technical vocabulary and low-frequency words. One of the reasons for this is that there has been little agreement about what technical vocabulary is and about how to count it reliably."

As mentioned, drawing the line between technical vocabulary and low-frequency vocabulary is not easy, which explains why the research carried out about them has so far been so limited. Although the difficulty still continues, in his latest book, Nation (2013) provides a different categorization for vocabulary. Vocabulary is divided into two basic categories as frequency-based words and specialized vocabulary. And based on this categorization, frequency-based word lists include three types of vocabulary on the basis of how much they occur in a text.

Table 2.2. *Frequency-based Vocabulary*

Word Level	Feature
High-Frequency Words	• Includes functions words and many content words • The classic list of high-frequency words is General Service List of English (West, 1953) • Almost 80% of running words in an academic text or newspaper are high frequency words, and around 90% of conversation and novels
Mid-Frequency Words	• Largely general purpose vocabulary • Consists of 7,000 word families from the third to ninth 1,000 • The boundary between high-frequency and mid-frequency vocabulary is arbitrary • In most type of texts, around 9% of the tokens are mid-frequency words
Low-Frequency Words	• Beyond the first 9,000 words of English • These are a very large group of words but cover very small proportions in any text • These words consist of technical terms from different subjects • They are words that are seldom met in language use

Reference: *Nation, 2013.*

Apart from this frequency-based word lists, the second category mentioned by Nation is "specialized vocabulary". In this category, Nation divides specialized vocabulary into two sub-levels as academic vocabulary and technical vocabulary, and explains what the features of words are in each sub-level.

Table 2.3. *Specialized Vocabulary*

Word Level	Features
Academic	• Given different names by different researchers like academic vocabulary, sub-technical vocabulary, or semi-technical vocabulary, • The most well-known one is Academic Word List (AWL) by Avril Coxhead (2000), • AWL has 570 word families in it can includes academic words from four different subject areas; law, science, humanities and commerce • In an academic text, combined with high-frequency vocabulary, their coverage reaches to 86,1%, • More specifically, AWL covers around 8.5% of academic text, 4% of newspapers and less than 2% of the running words of novels, • Academic vocabulary can be found in a wide range of academic fields, yet they are not necessarily recognized as high-frequency vocabulary, and they are not technical words because they are not related to just one field.
Technical	• Technical words are closely related to particular discipline, • They can come from different word levels (high, mid, low frequency), • They vary in different subject areas, • In technical texts, they cover a large proportion of the text.

Reference: *Nation, 2013.*

When all the categories mentioned above are taken into consideration; for the purposes of this study, the category of technical vocabulary has been studied. However, while studying technical vocabulary, one thing should be kept in mind:

> "Technical vocabulary can come from any of the three vocabulary levels. Some high-frequency words can be technical vocabulary in certain disciplines. For example, arm, leg and neck are technical words in the field of anatomy. Language, word, and comprehend are technical words in applied linguistics. Some mid-frequency academic words can take on technical meanings in certain disciplines, and what may be low-frequency words in one discipline may be technical words in another (Nation, 2013, p. 304)."

Therefore, in this research, words excluded from first 2000 words in GSL and AWL are identified as target vocabulary, and to differentiate between technical vocabulary and

low-frequency words, after computer-based analysis, all the words found in low-frequency were cross checked with two experts, one of whom is a professional in the field of teaching technical vocabulary, and the other one an aircraft maintenance technician working in the field.

In addition to this, among the 93,290 tokens, for the purposes of analysis, instead of word families, word types are used as the unit of counting because, as Nation (2003) also states, it was found that just because one or two members of a family were technical words, not all of them were (e.g., frequency and frequent). By word family and word type, it is meant that a single word form, like *agree* or *agrees*, is a word type. When word types are counted, each word is counted as different types (like *agree* and *agrees*), and are seen as two separate words. On the other hand, a word family is treated as a collection of formally-related and semantically-related word types. Hence, the *agree* family could include *agree*, *agrees, agreed, agreeing, agreement, disagree,* and *disagreement* (Bauer and Nation, 1993). In studies dealing with technical vocabulary, not all members of a word family are seen as terms in a field while one of them might be used.

3. METHODOLOGY

3.1. Introduction

This chapter describes the compilation of the database, what types of data collection instruments were used, and how the database was compiled and analyzed. Then, it is followed up by an explanation of the vocabulary test formation and application, and how the specific vocabulary test was formed based on the research purposes. Finally, the participants are introduced, and the setting in which the vocabulary test was applied is described in detail.

3.2. Data Collection Instruments

3.2.1. Research data

The data of the study consists of aircraft characteristics manuals of three different planes used in Turkey. Aircraft characteristics manuals of Airbus320, Airbus321 and Airbus330 were used for this study because, based on the statistics of Turkish Statistical Institute, the number of these planes owned by various airlines is overwhelmingly higher than the case for the other types of planes. Due to such high proportion of ownership compared to other types of planes, and the higher probability for the maintenance students to come across with one of these planes during their undergraduate studies, it would be more appropriate to take these manuals into consideration as well. In addition, the aircraft characteristics manuals of these planes are publicly accessible and published for free on the website of the company, which renders them ideal research materials for convenient sampling. The numbers are shown in Table 1 below.

Tiplerine göre uçak sayısı, 2008-2015

Number of aircraft by type, 2008-2015

Yıl	Toplam	Yolcu uçağı - Passenger aircraft						Kargo uçağı- Cargo aircraft						Diğer
Year	Total	Air Bus Industrie(A)	B-757	B-737	B-777	MD-8x	Diğer	A-300	A-310	A-330	F27-500	B-737	B-747	Other
2008	**262**	102	7	106	-	9	9	19	6	-	4	-	-	-
2009	**299**	110	7	103	-	8	20	19	9	-	2	21	-	-
2010	**332**	128	7	151	-	5	15	17	7	-	-	1	-	1
2011	**349**	152	3	155	12	-	1	15	7	2	-	1	1	-
2012	**370**	139	-	160	12	-	6	14	8	17	-	14	-	-
2013	**385**	170	-	177	12	-	1	12	3	6	-	1	3	-
2014	**422**	181	-	196	16	-	8	6	5	6	-	-	4	-
2015	**489**	214	-	213	23	-	14	6	5	7	-	-	7	-

Kaynak: Sivil Havacılık Genel Müdürlüğü

Source: Directorate General of Civil Aviation

Figure 3.1. *Number of Aircrafts by type based on Turkish Statistical Institute*

After the target texts were determined, by following the steps of previous research on creating word lists (Chung and Nation, 2003; Liu and Hun, 2005; Martinez, Beck and Panza, 2009; Wang, 2008), all the pictures and graphs were removed from the content section, and the remaining text with 93,290 tokens constituted the research database to be run through the corpus analysis tool, AntWord Profiler. The resulting list was first reduced to a shorter one, and the first 250 words were chosen by the researcher. Then, these words were checked on three different dictionaries, namely, Aviation Terminology Dictionary by General Directorate of State Airports Authority, Aviation Dictionary by Ayhan Tığrak (1973), and Airbus online glossary on http://www.airbus.com/tools/glossary/ (Accessed on March 3, 2017), and the words that are not in any of the dictionaries were excluded. The word list obtained through this analysis was cross checked with one professional and one technician to create the final word list.

3.2.2. Vocabulary test

Drawing on this specific database, the Aircraft Maintenance English Database (AMED) was created including 196 most frequent words (See App.1). This word list was shared with a professional and a technician working in the field, and they were asked to determine which words were more important and frequently met in the field. Each person examined the list on their own and chose some words to be eliminated. After this, the

researcher compared the two lists, and the words chosen by both experts were included and the rest were eliminated. The final word list included 103 words (See App.9).

This word list with 103 words in it constituted the vocabulary test. The test was a mere translation test, in which the participants were expected to write the translation of the target technical word in their own language. The aim of applying this test was twofold: The first was to decide which words were known by the participants so that these words wouldn't be included in the self-study material to be prepared, and second, to test the vocabulary retention of the participants after studying on self-study material. Figure 1 below shows an excerpt from the vocabulary translation test applied at the beginning of the study. The second vocabulary test (See App.10) applied at the end of the data collection process included only 80 words that the participants studied via online study-material. In Table 3.1., the bold words are the ones that are not included in the second application of the vocabulary translation test. These exemplify just the first 38 words and the ones excluded.

Table 3.1. *An excerpt from the vocabulary test*

Lütfen aşağıdaki İngilizce kelimelerin karşılarına Türkçelerini yazınız.	
1. a/c	20.layout
2. center of gravity	21.fuselage
3. jacking	22. nlg (nose landing gear)
4. aft	23.crew
5. exhaust	24.thrust
6. fwd (forward)	25.nacelle
7. fr (frame)	**26.emergency**
8. clearance	27.connector
9. centerline	28.airflow
10. mlg (main landing gear)	**29.cockpit**
11. lh (left-hand)	30.cowl
12. rh (right-hand)	31.refuel
13.flap	32.probe
14.take-off	33.pax
15.compartment	34.pneumatic
16.velocity	**35.turbine**
17. apu (auxiliary power unit)	**36.cabin**
18.tank	37.rib
19.drain	38.exterior

3.2.3. Self-study material

In creating the self-study material, the results of the implemented vocabulary test and the online self-study app, Quizlet program, were used. First, the applied vocabulary-translation test was analyzed, and according to the results of this analysis, the words known by 50% or more participants were not included in the self-study material. The remaining 80 words obtained through this elimination constituted the basis of the self-study material.

With these words, the self-study material was created by using the Quizlet online web-tool. Quizlet program is a tool allowing individuals to work on vocabulary selected by themselves or by others. It can be used both in the teacher and student mode. If used in the student mode, it only allows creating and studying vocabulary sets, but in the teacher mode, it further enables teachers to track student progress. This web tool allows the creation of an unlimited number of vocabulary lists. When the vocabulary lists are created, an explanation, picture, example sentence, etc. can also be added to each of the words, depending on the preferences of the user. A sample page is shown below in Figure 3.2.

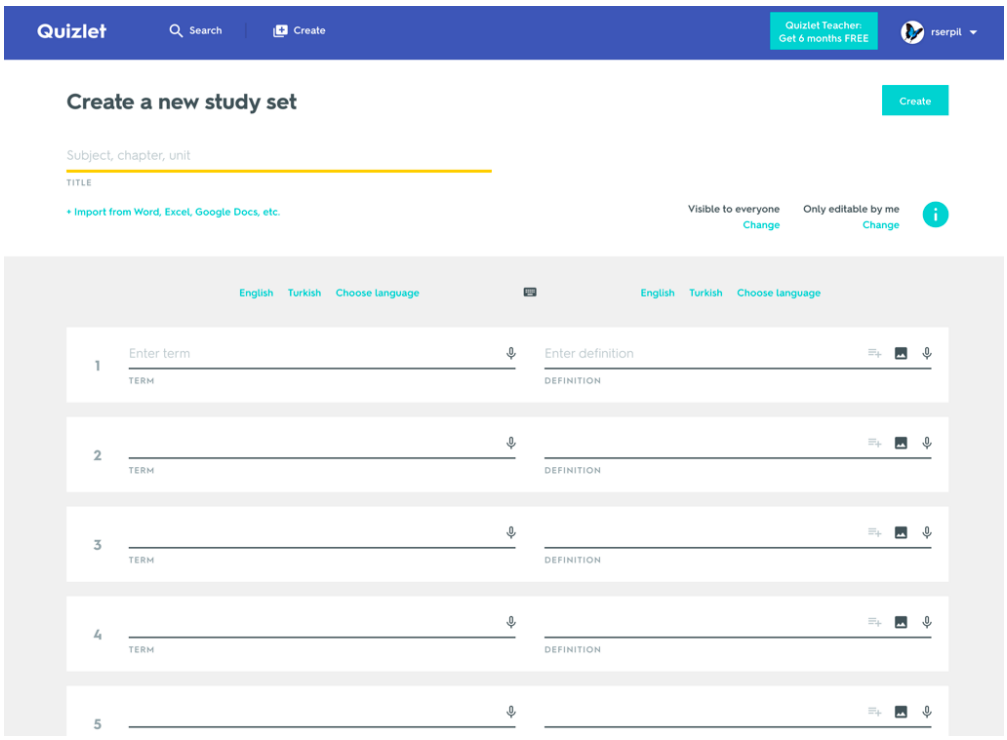

Figure 3.2. *How to create a study set in Quizlet*

For the purposes of this study, four different study-sets were formed in Quizlet, each including 20 words. The definitions of the words in these sets were the translation of the English technical words. A sample set can be seen in the Figure 3.3. below.

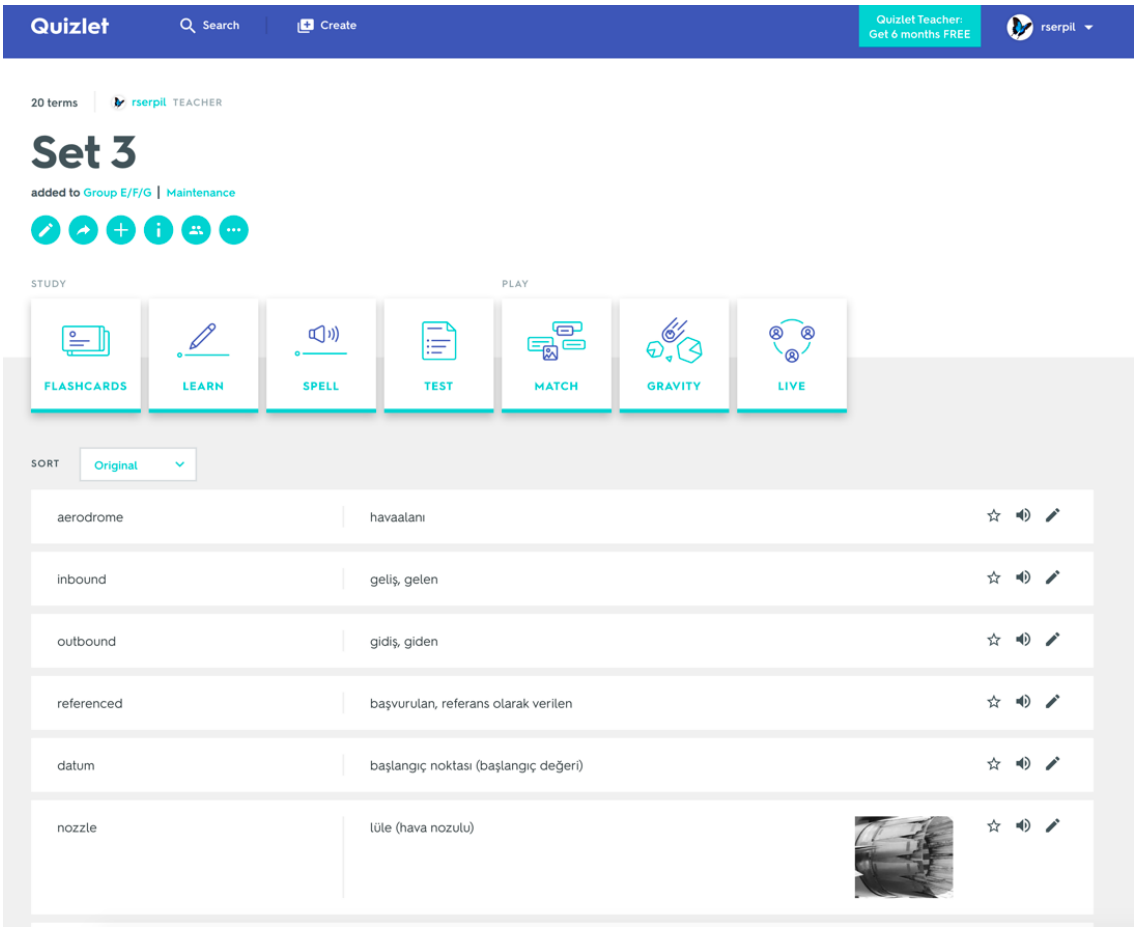

Figure 3.3. *A Sample from a vocabulary set on Quizlet*

While creating these sets, if two separate words had the same definition, aiding photos were used for better explanation. For example; only one Turkish translation, "kanatçık," is used for the words "flap" and "slat," although they refer to different parts of a plane. Therefore, to demonstrate the difference between these two terms, pictures were used to show the students where a flap or slat is located on a plane. Figure 3.4 below shows these words taken from the self-study material.

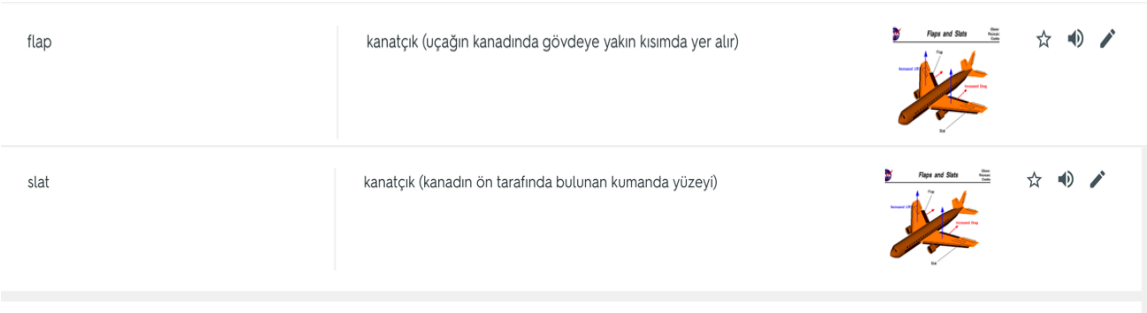

Figure 3.4. *Words with pictures*

After the study sets were created, they could be studied in seven different parts which include *flashcards, learn, spell, test, match*, *gravity* and *live*. If these parts are followed in the order mentioned, the study builds up on each other. The flashcard section is the introduction of the words. On one side of the card, the English version is written while the Turkish translation is written on the other side. Figure 5 illustrates two sides of a flashcard.

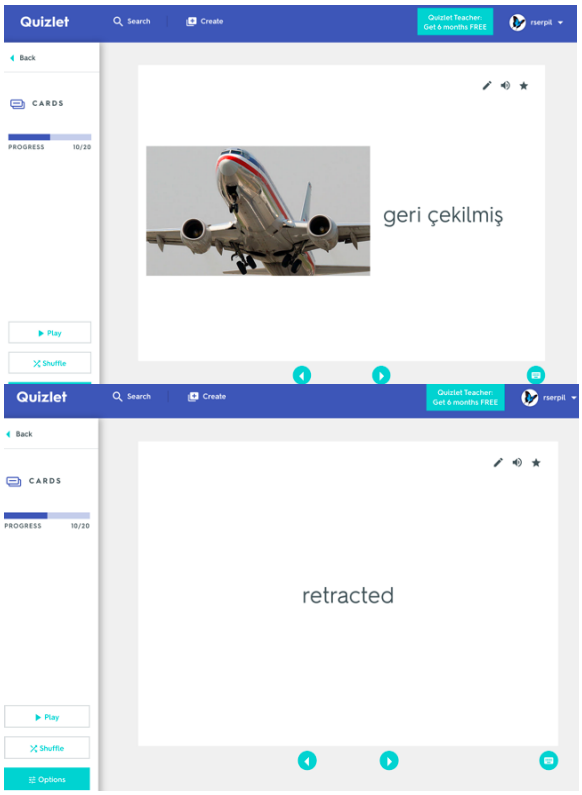

Figure 3.5. *Flashcard Section*

The second and third sections require typing. The second section is "*learn,"* in which the learners need to type the words in either Turkish or English. A prompt is given above it, and the answer is written below it as in Figure 3.6. The learner can choose the language for the prompt and the answer using the options button. The third section, *"spell,"* requires learning to type the word they hear. Along with hearing it, the translation of the word is also seen. In this section, the language can be switched through an option button like the previous section. Figure 3.7 shows an example of this section.

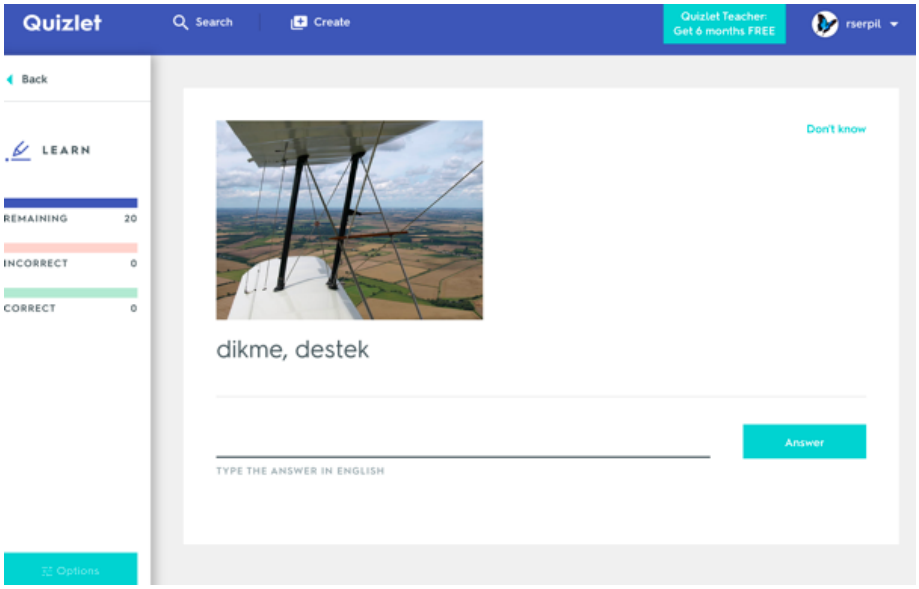

Figure 3.6. *Learn Section*

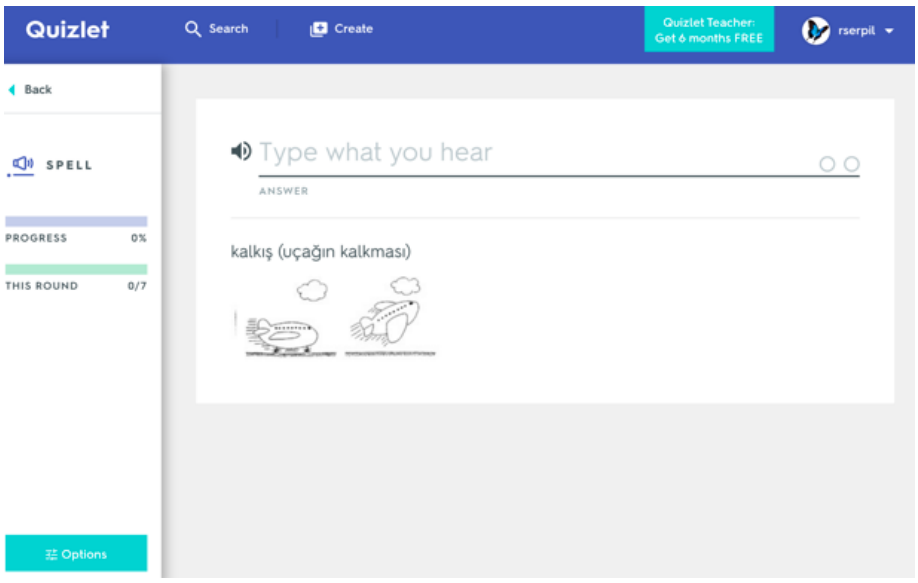

Figure 3.7. *Spell Section*

The fourth section is the "test," which includes four types of questions: matching, true-false, written, and multiple choice. The type of questions can be arranged as the learners can choose all four types or just one type, and all the questions are generated by the tool itself. The language can also be changed, and the options section enables learners to create as many sets as they want. Figure 3.8 shows different question types for Set 1 in the study.

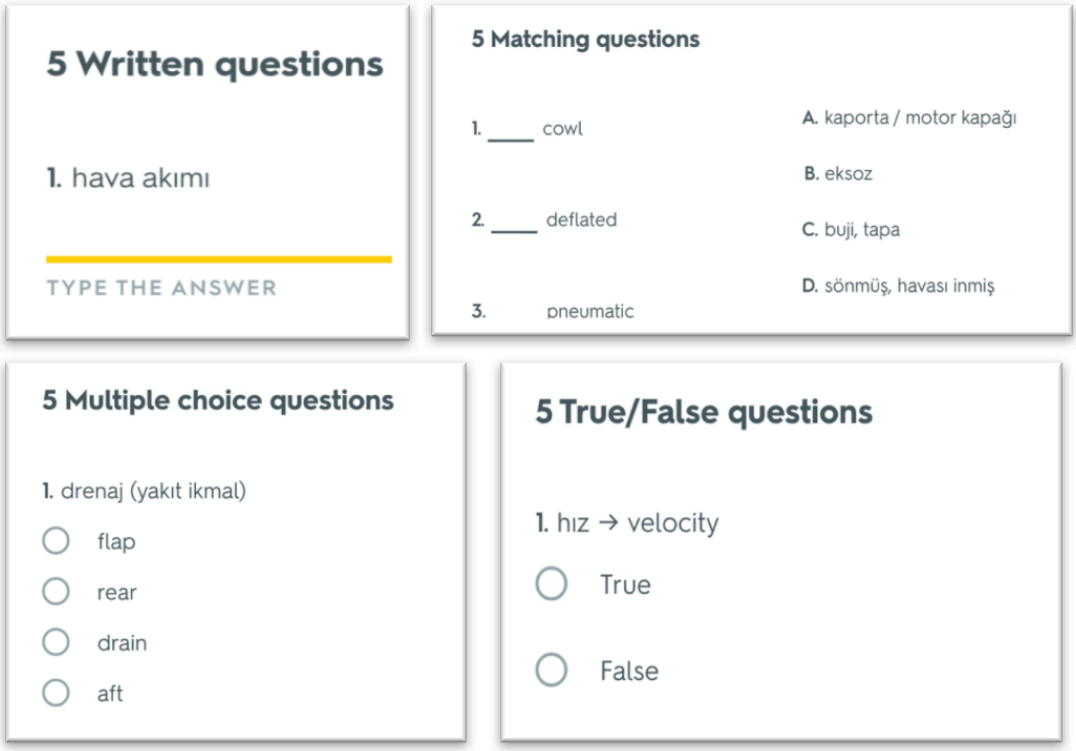

Figure 3.8. *Question Types in Test Section*

The remaining two sections are "matching" and "gravity," both of which are more game-like sections. In the matching sections, the learners are expected to match the words with their translations. All the words are given together and scrambled as presented in Figure 3.9. The sixth section is gravity, in which students are required to type the translation of a given word. The target word starts to come down from the upper part of the screen, and the learner has to type the translation until it touches down as in Figure 3.10. This section is divided into three categories as easy, medium, and hard. The learner can choose among these, and can also the select language of the prompt and the text to be written.

Figure 3.9. *Matching Section*

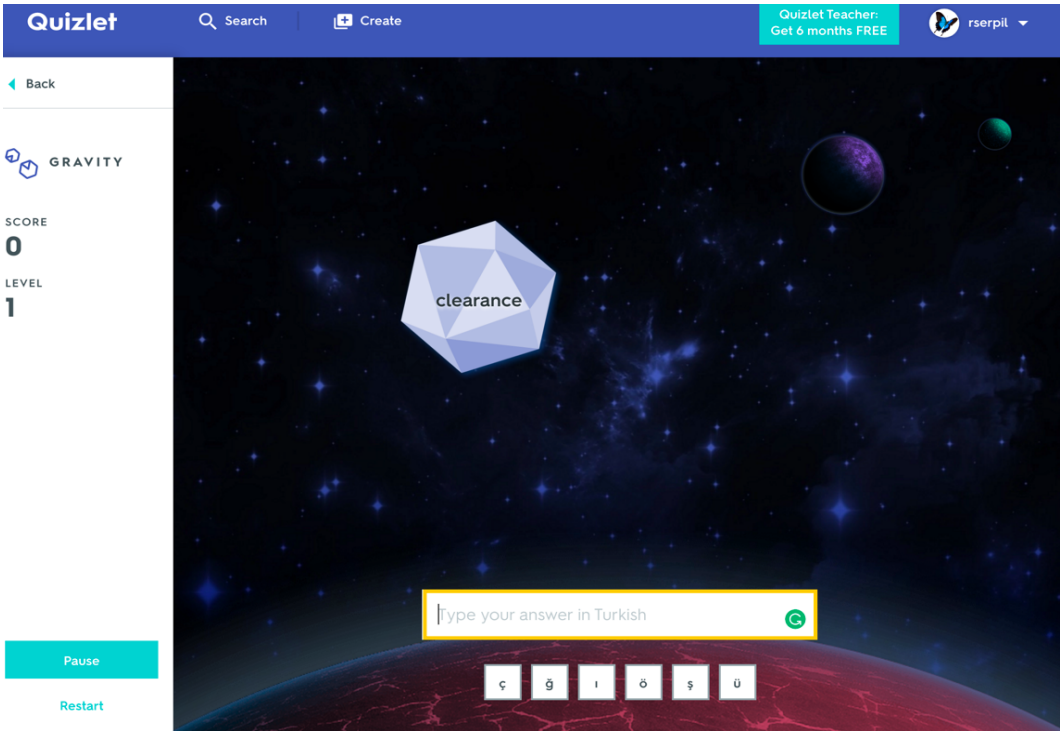

Figure 3.10. *Gravity Section*

The final section of the application includes “live” option, which can only be activated by the teacher, preferably in a classroom environment. For this option, the learners cannot see it on their own study screen unless activated by the teacher. When activated, a code is given to the learners. Once they have logged into the system using the codes, teams are formed randomly or by preference. Then, the learners see a word above their screen, and then they have to choose the translation of it. The fastest team is the winner. All the self-study material vocabulary sets can be seen in Appendix, 5, 6, 7, and 8.

3.3. Data Collection Procedure

In this study, data collection procedure lasted for six weeks. The first week of the data collection was the application of the vocabulary test. Once the test was applied, the words known by at least 50% of the students were eliminated and the remaining 80 words formed the self-study material. Each set included in self-study material included 20 words as Schmitt and Schmitt (1995) suggest that a learner can learn around 20 words a week, and Wallace (1984) indicates this number can vary between 10 and 20 words per week. During the next four weeks, the participants and the researcher met for 30 minutes, and the participants studied each set starting from set one. As not all the sections of a study can be finished in just 30 minutes, the participants were asked to study on their own during the rest of the week. This procedure was applied for all four sets of words. The sixth week of the data collection procedure was the application of the post-test to see if the self-study material helped learners with their technical vocabulary learning.

3.4. Data Analysis

3.4.1. Database analysis

For the analysis of the target research database, the most important question to be answered is which methods to be used to distinguish the technical vocabulary from the other words.

For the identification of technical vocabulary in a text, there are four methods identified by Chung and Nation (2004) as follows:

1. Using a rating scale
2. Using a technical dictionary
3. Using clues provided in the text
4. Using a computer based approach

In their study, Chung and Nation (2004) compare all these methods, and try to find the one yielding the most reliable and efficient results. Based on this study, they mention that the rating scale approach has a 100% rate of all the measures they applied, and is the most accurate one by having the perfect overlap with the terms identified by Dorland's dictionary which contains technical words of anatomy. The other method, computer-based approach, is not as accurate as the rating scale method, it has a "rough estimate of the technical terms although it is not inclusive enough because it also identifies collocates and has difficulty in identifying terms that are also commonly used outside the field of specialization". However, the average rate of this method was 82.7% satisfactory. Furthermore, when compared with the rating scale approach, it is more time saving.

Hence, for the aims of this study, a computer-based approach would be more appropriate as it is efficient in terms of both time and accuracy, as put by Chung and Nation (2004): "In terms of practicality, the computer-based approach works very well and if common collocates are included as well as terms, it is quite successful." The corpus analysis tool used here is *AntWordProfiler* developed by Laurence Anthony (2014). Most of the studies focusing on creating wordlists have used RANGE program developed by Nation (Yang, 2015; Liu and Hun, 2015; Li and Qian, 2010). However, in his personal website Nation states that "*AntWordProfiler* is a much more modern version of the RANGE program with numerous extra features."

3.4.2. AntWord profiler

AntWordProfiler is a computer-based corpus analysis tool used for vocabulary profiling. This program includes two different tools, which are "Vocabulary Profile Tool," and "File Viewer and Editor Tool".

The main tool of the program is vocabulary profile tool through which a target text can be compared to three pre-existing vocabulary level lists. The pre-existing lists are 1st 1000 words in GSL, 2nd 2000 words in GSL, and in AWL created by Coxhead. As can be seen in the Picture below, this tool enables the user to compare the lists in terms of the tokens they contain, presents statistics indicating how much of the target text includes GSL 1, GSL 2 or AWL words, creates wordlists by both including the words from the pre-existing lists, and excluding the words from pre-existing lists. It is a very user-friendly and fast software to conduct corpus linguistics research. Figure 3.11 below shows a sample screenshot from Vocabulary Profile Tool Main Frame.

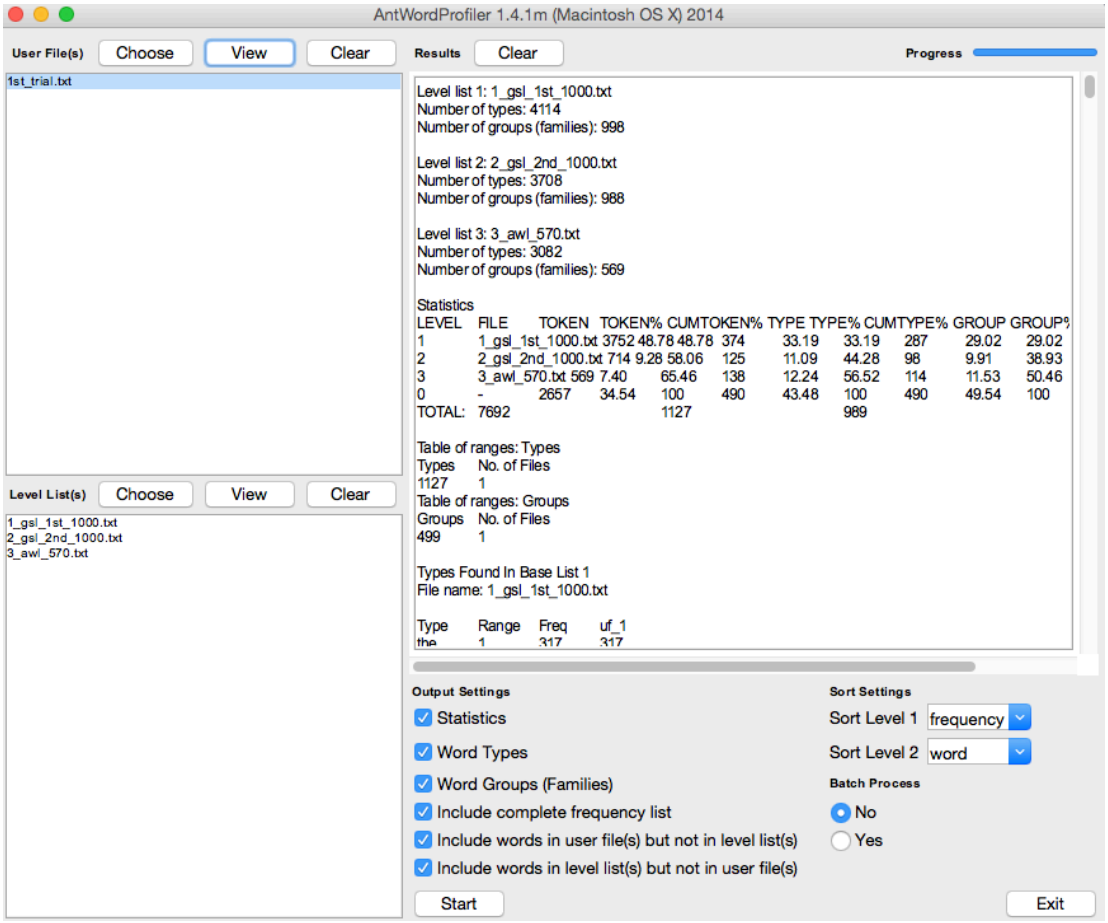

Figure 3.11. *Vocabulary Profile Tool Main Frame*

The second tool embedded in the software is the file viewer and editor tool, which allows the user to see an individual file, and draws attention to different words in different vocabulary level lists via color-coding system. When the screenshot in Figure 3.12 is analyzed, the percentages on the right symbolizes how much of the words in the given

vocabulary level lists forms the corpus. For example, in Figure 3.12 below, 65.5% of the corpus is comprised of GSL 1, GSL 2, AWL, with each being 48.8%, 9.3% and 7.4% respectively. GSL 1 vocabulary levels list is represented with color red, GSL2 is color green, AWL is color blue and all the other words which are not included in any of these vocabulary level lists are represented by **black**. With this tool, the user can see all the words in or out of the vocabulary level lists in the original text in a color-coded manner. In addition to this, Table 6 shows that through the same tool only non-level list words can also be diagnosed.

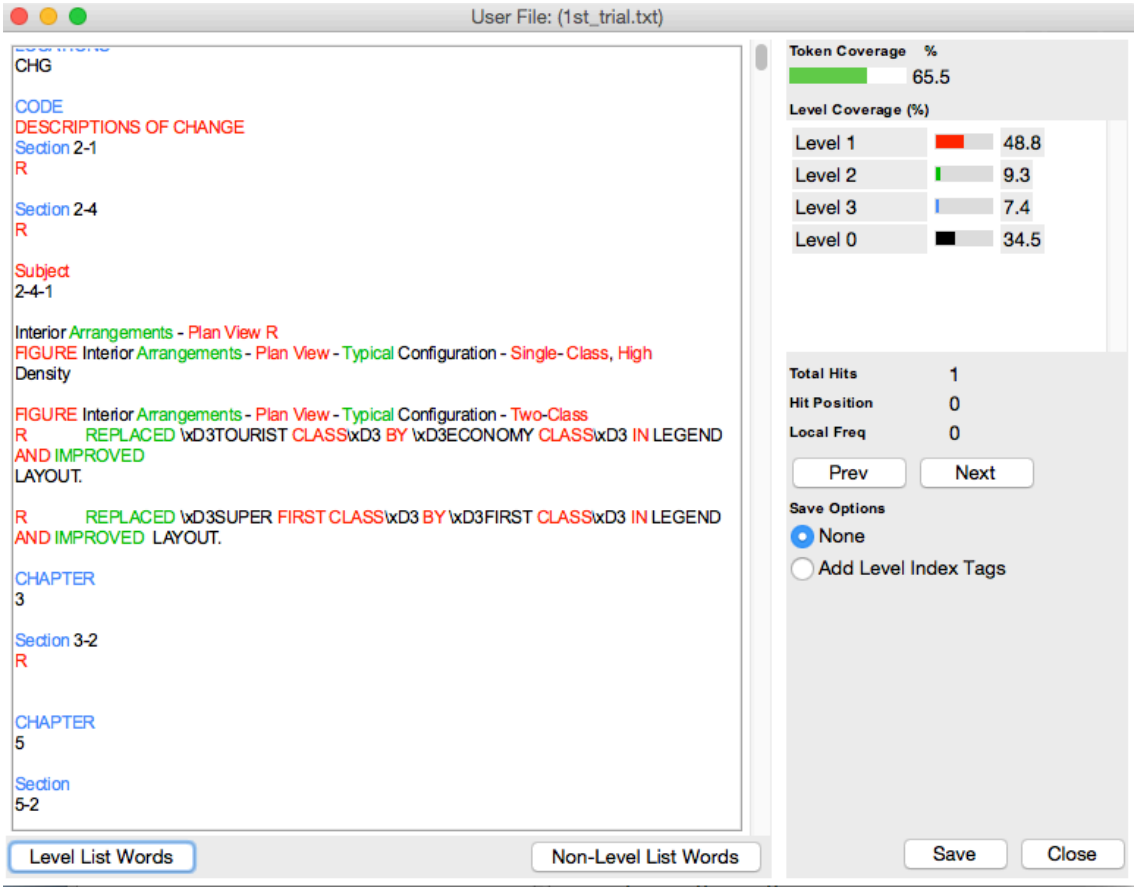

Figure 3.12. *File Viewer and Editor Tool Main Frame*

3.4.3. Test analysis

For the analysis of the pre-test and post-test results, Statistical Package for Social Sciences (SPSS) was used. Percentages were used to eliminate the known vocabulary in the pre-test. To compare the mean scores of pre-test and post-test to analyze the differences, paired-sampled t-test was carried out.

3.5. Setting and the Participants

The current study was carried out at the Department of Airframe and Powerplant Maintenance of the Faculty of Aeronautics and Astronautics of Anadolu University. The participants were 75 first-year students who were taking the Aircraft Maintenance Terminology course. 19 of the participants were excluded from the analysis, as they either did not take the pre-test or the post-test and just participated in the self-study part, or they did not finish all four sets of the self-study material. Except one female, all the students were male, their ages varying between 18 and 21. Some of these participants studied one year of English at the School of Foreign Languages on a voluntary basis. As the language education in this school is for general English, the participants' preparatory school attendance was not taken into consideration. At this point, the structure of the student groups in study should also be mentioned. Jackson (2011, p.320) explains six different quasi-experimental research designs as following:

- *Single-Group, Post-test Only Design:* There is only one group of participants who were tested at the end of the treatment.
- *Single-Group, Pre-test/Post-test Design:* There is only one group of participants who were tested at the beginning and end of the treatment.
- *Single-Group, Time-Series Design*: There is only one group of participants who were tested at the beginning and end of the treatment multiple times.
- *Nonequivalent Control Group, Post-test Design:* There are at least two groups of nonequivalent participants who were tested at the end of the treatment.
- *Nonequivalent Control Group, Pre-test/Post-test Design*: There are at least two groups of nonequivalent participants who were tested at the beginning and end of the treatment.
- *Multiple Group, Pre-test/Post-test Design:* There are two or more participant groups who were tested at the beginning and end of the treatment multiple times.

In this study, the second type of quasi-experimental design which is *Single-Group, Pre-test/Post-test Design* was adopted. The first-year Airframe and Powerplant Maintenance Department students formed a single group, and they were administered a vocabulary test at the beginning and the end of their treatment.

4. RESULTS AND DISCUSSION

4.1. Introduction

This chapter presents the results of the analysis in three subsequent sections. The first section focuses on the results of corpus software tool, and the formation of aircraft maintenance word list based on frequency and expert opinion. The second section explains the self-study material created for this study by focusing on which words took place in the material, their selection criteria and Turkish translations. The third section provides the details about the results of the vocabulary tests by presenting the SPSS results.

4.2. Aircraft Maintenance Word List

The first research question in this study aims to create a data-based technical word list based on frequency and expert opinion. The database compiled for the study includes 93,290 words. Through the corpus tool, AntWordProfiler, these words were analyzed with a comparison to three base-lists. The results of this analysis can be seen in Table 4.1 below.

Table 4.1. *Results of AntWordProfiler*

LEVEL	***File***	***Token***	***Token %***	***Cum Token%***
1	Gsl 1st 1000	45193	48.44	48.44
2	Gsl 2nd 1000	9094	9.75	58.19
3	Awl 570	9807	10.51	68.7
0	-	***29196***	***31.30***	100
TOTAL		93290		

As the table above suggests, among the 93,290 words, 48.44% of them are included in the GSL first 1000 words, which are the most common words in English language. The 9.75% of them are in the second 1000 of the GSL which means 58.19% of the words in the target database are in the GSL, among the first 2000 most frequent words. The 10.51% of the words are among the AWL of Coxhead. The first three levels constitute the 68.7% of the whole database. The level "0" or the remaining 29,196 of tokens are the words that are not in any of the level lists. Therefore, they have the potential of being technical words and the main focus of this study.

Coxhead's AWL coverage in this study was found to be similar to the previous studies. In the studies of Li and Qian (2015), Zhang (2013), Vangpumivitch, Huang and Chang (2009), and Cheng and Ge (2007), the coverage of AWL was really close to the coverage of AWL in aircraft maintenance word list (AMWL) being 10.46%, 10.39%, 11.17% and 10.07% respectively, which supports the previous research focusing on the place of AWL in academic texts. Although the target database was not written for academic purposes, AWL still plays an important role in it. However, when the results were analyzed from a field-specific perspective, there are some differences with the previous research. The coverage of 10.51% is relatively higher than the AWL coverage in other discipline-specific research like Munoz (2015) who found a coverage of 6% AWL in agriculture RAs, or Cobb and Horst (2004), who identified a coverage of 6.27% of AWL in medical texts.

As Table 4.1 demonstrates, the number of words that are not included in base-lists is 29,196. A word list including such a high number of words is both not feasible for classroom use (Ward, 2009) and also, we cannot be sure if all these words are real technical words. For this aim, they were needed to be reexamined and reduced. As mentioned in the methodology section, the first step the researcher took was to select the first 250 words based on their frequency. The whole list can be seen in Appendix 1 with their frequencies and ranges. When the first 250 words determined, to confirm that every word is a technical word in aircraft maintenance field, the researcher consulted three different dictionaries. If a word was not in any dictionaries, it was excluded from the list, creating a 196-word technical word list (See App.2). This final list created based frequency and dictionary check was sent to two experts in the field, and they reanalyzed the word list by deciding which words are encountered more than the others. The lists formed by the experts were compared (See App. 3 and App.4), and the common words

in both lists created the Aircraft Maintenance Terminology Word List (AMTWL). The whole list can be seen in Table 4.2 below.

Table 4.2. *Aircraft Maintenance Word List*

a/c	defuel	fairing
center of gravity	towing	installation
jacking	valve	allowable
aft	intake	altitude
exhaust	interior	departures
fwd (forward	strut	gpu (ground power unit)
fr (frame)	apron	overheat
clearance	aerodrome	retraction
centerline	discharge	wingtip
mlg (main landing gear)	galley	coefficient
lh (left hand)	reverse	cylinder
rh (right hand)	approx.	gearbox
flap	faa	takeoff weight
take-off	exit	ramp
compartment	airline	runway
velocity	deceleration	taxiway
apu (auxiliary power unit)	hydraulic	icao
tank	inbound	gear
drain	outbound	pavement
layout	referenced	inlet
fuselage	differential	rear
nlg (nose landing gear)	datum	overpressure
crew	nozzle	vertical
thrust	overflow	horizontal
nacelle	radius	lp (low pressure)
emergency	starter	plug
connector	aileron	antennas
airflow	spoiler	deflated
cockpit	brake	hp (high pressure)
cowl	suction	retracted
refuel	cabin	conditioning
probe	rib	compressor
pax	exterior	idg (integrated drive generator)
pneumatic	turbine	
slat	absorber	

4.3. Self-Study Material

Based on the word list created by the frequency analysis and expert opinion, an online self-study material was created. This material consisted of 80 technical words. The application of the pre-test revealed that some words were known by many of the students; hence, they were eliminated from the study material. The words eliminated from the list were known by at least 50% of the students. Table 4.3 below shows the words that are not included in the study, and also their percentages, how many of the students know them. The more detailed list for the percentages of all the items in the pre-test can be seen in Appendix 12.

Table 4.3. *Eliminated Technical Words*

Technical Word	***%***	***Technical Word***	***%***
a/c	69	connector	50
center of gravity	74	cockpit	87
centerline	52	refuel	50
lh (left hand)	61	turbine	82
rh (right hand)	61	cabin	94
tank	87	compressor	74
emergency	74	exit	89
airline	65	hydraulic	69
spoiler	55	brake	56
vertical	55	horizontal	53
lp (low pressure)	79	hp (high pressure)	85
absorber	50		

The above table reveals two aspects of the students' technical vocabulary knowledge. First, some words that are used in general English like "left" and "hand" can form a new combination "left hand", and the students are able to understand the meaning of this new combination as it has a literal meaning. The second aspect is that the students don't have difficulty in recognizing cognates, which means the words that are also used in their L1. For example, "tank" is also used as "tank" in their L1 with a pronunciation

difference, or “hydraulic” is used as “hidrolik” in the students’ L1. The result of this can support the findings of Gülşeker Solak and Çakır (2012), who argue that cognates, when the large number of them is taken into consideration in Turkish and English, can have a facilitating effect on language teaching and learning especially for the beginner level learners. Although the current study doesn’t focus on general English, the same rule may apply for the first-year aircraft maintenance students if they are regarded as beginners in their field.

Upon the pre-test, the final word list that is used for the self-study material was formed. The self-study material included 80 words and their Turkish translations which are shown in Table 4.4 below.

Table 4.4. *Self-Study Material Word List*

Technical Term (English)	***Turkish Translation***
1. jacking	1. kaldırma (kriko vs. ile)
2. aft	2. arka (geri)
3. exhaust	3. egzoz
4. fr(frame)	4. çerçeve, çatı (uçak)
5. velocity	5. hız
6. drain	6. drenaj (yakıt ikmal)
7. airflow	7. hava akımı
8. pneumatic	8. havalı (hava dolu) / basınçlı hava ile çalışma
9. cowl	9. kaporta / motor kapağı
10. intake	10. hava girişi (uçak motorunda)
11. deceleration	11. hızın azalması (yavaşlama)
12. inlet	12. hava giriş yeri
13. rear	13. arka
14. retraction	14. içeri çekme (iniş takımı, kumanda vs.)
15. deflated	15. sönmüş, havası inmiş
16. plug	16. buji, tapa
17. reverse	17. ters yön
18. fwd (forward)	18. ileri
19. clearance	19. izin (iniş, kalkış vs. için)
20. flap	20. kanatçık (uçağın kanadında gövdeye yakın kısımda yer alır)
21. take-off	21. kalkış (uçağın kalkması)
22. layout	22. plan/tasarım
23. pax (passengers)	23. yolcular
24. thrust	24. itki (itme kuvveti)

Table 4.4. *Self-Study Material Word List (Continued)*

25. nacelle	25. uçak motorunu örten ve içine alan kısım
26. fuselage	26. uçak gövdesi
27. defuel	27. yakıt boşaltmak
28. rib	28. iskelet / çatı (uçak kanatlarında)
29. valve	29. valf / vana
30. towing	30. çekmek
31. exterior	31. dış kısım
32. interior	32. iç kısım
33. discharge	33. yük/akım boşaltmak
34. wingtip	34. kanat ucu
35. compartment	35. bölüm
36. aileron	36. kanatçık (uçağın sağa sola yatışını sağlayan yüzey)
37. crew	37. mürettebat
38. probe	38. prop (dışarıdaki hava sıcaklığını ölçmek için kullanılır)
39. slat	39. kanatçık (kanadın ön tarafında bulunan kumanda yüzeyi)
40. differential	40. diferansiyel (türev)
41. aerodrome	41. havaalanı
42. inbound	42. geliş, gelen
43. outbound	43. gidiş, giden
44. referenced	44. başvurulan, referans olarak verilen
45. datum	45. başlangıç noktası (başlangıç değeri)
46. nozzle	46. lüle (hava nozulu)
47. overflow	47. fazla olma, taşma
48. overpressure	48. aşırı basınç
49. suction	49. emme, emiş gücü
50. retracted	50. geri çekilmiş
51. fairing	51. krenaj (kaplama)
52. allowable	52. izin verilebilir
53. pavement	53. kaplama (yol)
54. gear	54. takım (iniş takımı)
55. taxiway	55. taksi yolu (ir kara havaalanında hava araçlarının taksi yapmaları ve meydanın bir noktasını diğerine bağlamayı amaçlayan tanımlanmış yollar)
56. runway	56. pist
57. strut	57. dikme, destek
58. ramp	58. rampa, ramp hizmeti
59. apron	59. apron (bir kara havaalanında hava araçlarının yolcu, posta ve kargo indirme-bindirme, yakıt ikmali, bakım ve park etme amaçlarına yönelik tanımlanmış alan.)

Table 4.4. *Self-Study Material Word List (Continued)*

60. galley	60. uçak mutfağı
61. antennas	61. anten
62. departure	62. kalkış (giden uçuşlar)
63. coefficient	63. katsayı
64. cylinder	64. silindir
65. installation	65. kurulum
66. conditioning	66. havalandırma
67. overheat	67. aşırı ısınma
68. altitude	68. irtifa
69. radius	69. yarıçap
70. starter	70. starter (motor çalıştırma)
71. approx. (approximately)	71. yaklaşık /ortalama
72. gearbox	72. dişli / vites kutusu
73. take-off weight	73. kalkış ağırlığı
74. icao (international civil aviation organization)	74. uluslararası sicil havacılık örgütü
75. faa (federal aviation academy)	75. federal havacılık idaresi (ABD)
76. gpu (ground power unit)	76. yer güç ünitesi (jeneratör)
77. idg (integrated drive generator)	77. dahili güç ünitesi
78. nlg (nose landing gear)	78. burun (ön) iniş takımı
79. apu (auxiliary power unit)	79. yardımcı güç ünitesi
80. mlg (main landing gear)	80. ana iniş takımı

As mentioned before, if Turkish airline companies are not authorized to translate the maintenance manuals by FAA, the students may have difficulty in following English-written manuals as they get their education in Turkish. Therefore, creating a self-study material based on a technical word list can enable the students to work on a highly-restricted vocabulary because these words are taken directly from field-specific texts, and these word lists and materials created based on them can better meet the needs of the ESP students (Nation and Waring, 1997).

This study also supports the findings by Ward (2009), who asserts the importance of specialized word lists in helping ESP teachers to set vocabulary, and during self-study material preparation, having a technical word list provided an easier way to choose the target words. The study also goes in line with Nation (2016), who mentions that word lists can be an aid for course design. This can be especially important of ESP course design for aircraft maintenance students as no graded word list studies have been carried out in the target field.

Creating a self-study material especially for first year students can also be beneficial as they are at the early stages of their education including technical words, and as Nation (2016) mentions, high-frequency words should be focused on in the early stages of language instruction.

4.4. Vocabulary Test

In order to find whether self-study material implementation had an effect on students' vocabulary knowledge, a paired samples t-test was carried out, and the mean differences of the students' test results were analyzed. Before the final analysis, to be able to carry out t-test, both pre-test and post-test questions were equalized by excluding the words in the pre-test, which were not included in the post-test. Therefore, both pre-test and the post-test analysis was carried out of 80 questions. Table 4.5 shows the descriptive statistics of the two vocabulary tests. As the table indicates, the results of the pre-test and the post-test differ from each other. The mean score of pre-test is, *M*=15.48, and the mean score of post-test is, *M*=51.27. The test results of each student can be seen in more detail in Appendix 11.

Table 4.5. *Descriptive Statistics of Vocabulary Test Scores*

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre-Test	15.48	56	12.669	1.693
	Post-Test	51.27	56	18.710	2.500

As Table 4.6 below shows in detail, the results of the paired-samples t-test revealed that there is a statistically significant difference between the mean vocabulary test scores of the pre-test (*M*=15,48, *SD*=12,6) and post-test (*M*= 51,27, *SD*= 18,7), t(55)=-17.580, p<.001 (two-tailed).

Table 4.6. *Paired Samples T-test*

	Paired Differences							
				95% Confidence Interval of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1								
Pre-Test- Post-test	-35.786	15.228	2.035	-41.215	-30.358	-17.580	55	.000

The comparison of the pre-test and post-test results showed that self-study material helped learners with their technical vocabulary learning which supports that field-specific technical word lists can be effective for vocabulary learning (Liu and Han, 2015), and also effectivity of small scale corpora rather than building large non-discipline specific word lists (Ward, 2009). Although it was done in general-English purposes, Khezrlou, Ellis and Sadeghi (2017) tries to find out the impact of explicit, implicit, and international learning on vocabulary acquisition and reading comprehension and reaches the conclusion that explicit vocabulary instruction was a powerful tool for vocabulary teaching as the participant with explicit vocabulary teaching scored higher in their test and also the students in this group preserved the long-term vocabulary knowledge. Despite the current study only focuses on receptive vocabulary knowledge without a delayed post-test to measure the long-term vocabulary retention, it still supports that explicit vocabulary teaching can be an effective tool in language classes, and in the current context in ESP classes.

5. CONCLUSION

This study was an attempt to define the most frequent technical words in an aircraft characteristics manual for aircraft maintenance students. Creating such a word list was an effective way to design a self-study material for the first-year Airframe and Powerplant Maintenance Department students at Anadolu University Aviation Faculty, because as mentioned by Nation (2013), specialized vocabulary requires a strategic approach underscoring the selection of the words to learn and the way to learn them, and forming an isolated word-list was an attempt to find an answer to what to teach and learn in a specific context.

The attempt to generate a word-list resulted in 103 most frequent words used in aircraft characteristics manuals which formed the AMWL. The generation of the word list started with analyzing the target database via a corpus analysis tool, AntWordProfiler. This analysis revealed which words are not included any GSL and AWL sub-lists and can have the potential of being technical vocabulary. Next, for the purposes of the study, the first 250 most frequent words were selected and looked up in three different technical dictionaries to ensure that they are technical words specific to aviation field. This sifting decreased the number of words to 196, which was sent to two experts for their opinions about the most important and frequently-encountered technical words. The results of the expert analysis finalized the AMWL with 103 words in it. Thanks to the small amount of words included in the list, an online self-study course was also possible to create by making use of AMWL. The self-study material included 80 words presented in four different sets, and these sets were studied individually for a four-week period, giving a week for each set of the words. The number of words was reduced to 80, based on the pre-test results.

The results of the pre-test and post-test analysis also revealed that the self-study material was effective in terms of teaching technical vocabulary as the paired-samples t-test demonstrated a statistically significant difference, with $p<.001$. Although the teaching material and test were a restricted treatment by only focusing on providing the Turkish equivalents of some technical vocabulary focusing on receptive knowledge, it still can be beneficial for the students' studies in their departments and in their careers when the medium of instruction in their departments is taken into consideration. The results of the study also supported the previous research revealing the improving effect of explicit

vocabulary instruction (Khezrlou, Ellis and Sadeghi, 2017), and by promoting the idea of field-specific vocabulary lists (Hyland and Tse, 2007).

6. SUGGESTIONS FOR FURTHER STUDY

The quasi-experimental design was only an attempt to create a technical word list and a self-study material based on this list for the first-year Airframe and Powerplant Maintenance Department students. The limited number of available texts to build a database has yielded this small-scale study. However, further studies can be carried out by looking into various aspects as follows:

- This study only included three types of planes and their characteristics manuals. A database compiled of actual maintenance manuals for different types and brands of planes can provide better results and variations in terms of technical words to be included in an aircraft maintenance word list.
- The self-study material aimed at teaching only the receptive vocabulary knowledge. A more detailed course material can be further studied, and not just the definitions but also some sample sentences can be included. A more detailed study can help create a glossary for aircraft maintenance students and ESP teachers in the field. This study also dealt with individual words; however, as collocations can also play an important role, a corpus-based study can also be used to reveal the collocational patterns.
- As only the receptive vocabulary knowledge was tested, further studies focusing on the productive vocabulary knowledge or the relationship between vocabulary knowledge and reading comprehension in the maintenance field can be carried out.
- Further studies in the field focusing on students with different language proficiency and vocabulary needs can also help with improved course design, because this study included only first year students without exposure to any prior technical vocabulary instruction.

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APPENDICES

Appendix-1. *First 250 words and their frequencies*

Groups NOT Found In Base Lists			
Group		**Range**	**Frequency**
1.	Aircraft	3	2654
2.	airport	3	1466
3.	ac	3	1065
4.	gear	3	756
5.	pavement	3	631
6.	cg	3	602
7.	jacking	3	456
8.	aft	3	436
9.	acn	3	382
10.	mrw	3	363
11.	exhaust	3	312
12.	fwd	3	311
13.	cargo	3	290
14.	fr	3	290
15.	clearances	3	286
16.	runway	3	282
17.	ramp	3	263
18.	taxiway	3	261
19.	centerline	3	258
20.	min	3	242
21.	wv	2	233
22.	mlg	3	209
23.	effectivity	3	182
24.	lh	3	172
25.	rh	3	172
26.	cfm	2	167
27.	compartment	3	164
28.	deleted	3	163
29.	isa	3	163
30.	mac	3	158
31.	cbr	3	152
32.	takeoff	3	152
33.	flap	3	149
34.	braking	3	148
35.	pw	3	139
36.	static	3	132
37.	velocities	3	131

38.	configuration	3	129
39.	apu	3	128
40.	tank	3	126
41.	psi	3	123
42.	height	3	121
43.	meters	3	118
44.	drain	3	117
45.	layout	3	116
46.	fuselage	3	115
47.	mn	3	112
48.	nlg	3	112
49.	crew	3	110
50.	jack	3	109
51.	thrust	3	109
52.	potable	3	105
53.	nacelle	3	104
54.	breakaway	3	103
55.	emergency	3	103
56.	fuel	3	98
57.	payload	3	98
58.	gal	3	97
59.	gross	3	96
60.	subgrade	3	96
61.	iae	2	92
62.	airflow	3	89
63.	radii	3	89
64.	chg	3	88
65.	icao	3	87
66.	cockpit	3	86
67.	contours	3	85
68.	acf	1	81
69.	lcn	3	80
70.	mtow	3	80
71.	refuel	3	79
72.	pax	3	78
73.	pneumatic	3	77
74.	turbine	3	76
75.	deck	3	74
76.	cabin	3	72
77.	rib	3	71
78.	fillet	3	69
79.	leap	2	67

80. exterior	3	66
81. footprint	3	66
82. compressor	3	65
83. idg	3	65
84. oat	3	65
85. earthing	3	64
86. installed	3	64
87. mlw	3	64
88. ultra	3	64
89. elevation	3	63
90. probe	3	63
91. defuel	3	62
92. mzfw	3	60
93. towing	3	60
94. xd3	2	60
95. intake	3	57
96. interior	3	57
97. pcn	3	57
98. apron	3	56
99. connector	3	56
100. reference	3	55
101. strut	3	55
102. pavements	3	54
103. trent	1	54
104. valve	3	54
105. aerodrome	3	53
106. discharge	3	53
107. cc	3	52
108. ge	1	52
109. reverse	3	52
110. iso	3	51
111. approx	3	50
112. faa	3	50
113. rr	1	50
114. cb	3	49
115. cf	1	49
116. gravity	3	48
117. leveling	3	48
118. ar	3	47
119. bogie	2	47
120. exit	3	47
121. mg	3	47

122.airline	3	46
123.al	3	46
124.cowl	3	46
125.deceleration	3	46
126.hydraulic	3	46
127.inbd	3	46
128.mto	2	46
129.outbd	3	46
130.alpha	3	45
131.referenced	3	45
132.cement	3	44
133.clearance	3	44
134.differential	3	44
135.portland	3	44
136.slat	3	44
137.usable	3	44
138.compartments	3	43
139.cowls	3	43
140.datum	3	43
141.jacks	3	43
142.overflow	3	42
143.gc	3	41
144.gears	3	41
145.ng	3	41
146.nozzle	3	41
147.oxygen	3	41
148.radius	3	41
149.scaled	3	41
150.subgrades	3	40
151.starter	3	39
152.aileron	3	38
153.mtw	3	38
154.spoiler	3	38
155.x	3	38
156.brake	3	37
157.auxiliary	3	36
158.catering	3	36
159.connectors	3	36
160.suction	3	36
161.pits	3	35
162.absorber	3	34
163.bb	3	34

164.deplaning	3	34
165.inlet	3	34
166.jacked	3	34
167.reservoir	3	34
168.z	3	34
169.absorbers	3	33
170.bl	3	33
171.concrete	3	33
172.naca	3	33
173.rear	3	33
174.symmetrical	3	33
175.toda	3	33
176.tow	3	33
177.mpa	3	32
178.overpressure	3	32
179.velocity	3	32
180.vertical	3	32
181.airbus	3	31
182.galleys	3	31
183.horizontal	3	31
184.lane	3	31
185.lp	3	31
186.sharklet	3	31
187.asda	3	30
188.coverages	3	30
189.ld	3	30
190.lavatory	3	29
191.plug	3	29
192.dual	2	28
193.probes	3	28
194.protector	3	28
195.psia	3	28
196.replenishment	3	28
197.antennas	3	27
198.deflated	3	27
199.deg	3	27
200.hp	3	27
201.asu	3	26
202.port	3	26
203.oversteer	1	25
204.retracted	3	25
205.towbar	3	25

206.twin	3	25
207.ultralow	3	25
208.updated	3	25
209.abreast	3	24
210.accumulator	3	24
211.cl	3	24
212.conditioning	3	24
213.fste	3	24
214.lineup	2	24
215.preconditioned	3	24
216.shoring	3	24
217.truck	3	24
218.amm	3	23
219.fairing	3	23
220.hpgc	3	23
221.installation	3	23
222.recirculation	3	23
223.refueling	3	23
224.galley	3	22
225.graphs	3	22
226.toilet	3	22
227.uld	3	22
228.accessory	3	21
229.allowable	3	21
230.altitude	3	21
231.departures	3	21
232.flaps	3	21
233.gpu	3	21
234.gse	3	21
235.overheat	3	21
236.pit	3	21
237.retraction	3	21
238.sill	3	21
239.slats	3	21
240.wingtip	3	21
241.xd5s	3	21
242.atc	3	20
243.cna	3	20
244.coefficient	3	20
245.cylinder	2	20
246.disch	3	20
247.gearbox	3	20

248.ife	3	20
249.mooring	3	20
250.nipple	3	20

Appendix-2. *Word list sent to experts*

A/C (aircraft)	AIRFLOW
GEAR	RADII
PAVEMENT	ICAO (international civil aviation organization)
CG (center of gravity)	COCKPIT
JACKING	COWL
AFT	LCN (load classification number)
ACN (aircraft classification number)	MTOW (maximum design take-off weight)
MRW (maximum design ramp weight	REFUEL
EXHAUST	PROBE
FWD (forward)	PAX (passenger)
CARGO	PNEUMATIC
FR (frame)	TURBINE
RUNWAY	DECK
CLEARANCE	CABIN
RAMP	RIB
TAXIWAY	FILLET
CENTERLINE	EXTERIOR
MLG (main landing gear)	FOOTPRINT
EFFECTIVITY	COMPRESSOR
LH (left hand)	IDG (integrated drive generator)
RH (right hand)	OAT (outside air temperature)
FLAP	SLAT
TAKE-OFF	ABSORBER
COMPARTMENT	EARTHING
ISA (international standard atmosphere)	INSTALLED
VELOCITY	MLW (maximum design landing weight)
MAC (mean aerodynamic chord)	ULTRA
CBR (California bearing ratio)	ELEVATION
BRAKING	CONTOURS
JACK	DEFUEL
SUBGRADE	MZFW (maximum design zero fuel weight)
STATIC	TOWING
CONFIGURATION	VALVE
APU (auxiliary power unit)	INTAKE
TANK	INTERIOR
HEIGHT	PCN (pavement classification number)
DRAIN	STRUT
LAYOUT	APRON
FUSELAGE	REFERENCE
NLG (nose landing gear)	AERODROME
CREW	DISCHARGE
POTABLE	GALLEY
THRUST	CC (cargo compartment)
NACELLE	REVERSE
BREAKAWAY	APPROX
EMERGENCY	FAA (federal aviation administration)
FUEL	CB (conveyor belt)
PAYLOAD	GRAVITY
GROSS	LEVELING
CONNECTOR	PIT
HYDRAULIC	BOGIE
INBD	EXIT
OUTBD	AIRLINE
ALPHA	DECELERATION
REFERENCED	ACCUMULATOR
CEMENT (Portland cement)	CL (cargo loader)
DIFFERENTIAL	CONDITIONING

USABLE	FSTE (Full Size Trolley Equivalent)
DATUM	PRECONDITIONED
NOZZLE	SHORING
OVERFLOW	TRUCK
GC (ground connection)	AMM (Aircraft Maintenance Manual)
OXYGEN	FAIRING
RADIUS	HPGC (High Pressure Ground Connection)
SCALED	INSTALLATION
STARTER	RECIRCULATION
AILERON	REFUELING
MTW (maximum taxi weight)	GRAPHS
SPOILER	TOILET
BRAKE	ULD (unit load device)
AUXILIARY	ALLOWABLE
CATERING	ALTITUDE
SUCTION	DEPARTURES
ACCESSORY	GPU (ground power unit)
DEPLANING	GSE (ground support equipment)
INLET	OVERHEAT
RESERVOIR	RETRACTION
CONCRETE	SILL
REAR	WINGTIP
SYMMETRICAL	CAN (common nozzle assembly)
TODA (take-off distance available)	COEFFICIENT
TOW	CYLINDER
OVERPRESSURE	DISCH
VERTICAL	GEARBOX
HORIZONTAL	IFE (In-Flight Entertainment)
LANE	MOORING
LP (low pressure)	NIPPLE
SHARKLET	RAFT
ASDA (Acceleration-Stop Distance Available)	TAKEOFFWEIGHT
COVERAGES	CORPS
LD (lower deck)	CRADLES
LAVATORY	FDL (Fuselage Datum Line)
PLUG	
PROTECTOR	
REPLENISHMENT	
ANTENNAS	
DEFLATED	
HP (high pressure)	
TWIN-WHEEL	
ASU (air start unit)	
PORT	
RETRACTED	
TOWBAR	
ABREAST	

Appendix-3. *First Expert's Opinion*

A/C (aircraft)	***AIRFLOW***
GEAR	RADII
PAVEMENT	***ICAO (international civil aviation organization)***
CG (center of gravity)	***COCKPIT***
JACKING	***COWL***
AFT	LCN (load classification number)
ACN (aircraft classification number)	MTOW (maximum design take-off weight)
MRW (maximum design ramp weight	***REFUEL***
EXHAUST	***PROBE***
FWD (forward)	***PAX (passenger)***
CARGO	***PNEUMATIC***
FR (frame)	***TURBINE***
RUNWAY	DECK
CLEARANCE	***CABIN***
RAMP	***RIB***
TAXIWAY	FILLET
CENTERLINE	***EXTERIOR***
MLG (main landing gear)	FOOTPRINT
EFFECTIVITY	***COMPRESSOR***
LH (left hand)	***IDG (integrated drive generator)***
RH (right hand)	OAT (outside air temperature)
FLAP	***SLAT***
TAKE-OFF	***ABSORBER***
COMPARTMENT	EARTHING
ISA (international standard atmosphere)	INSTALLED
VELOCITY	MLW (maximum design landing weight)
MAC (mean aerodynamic chord)	ULTRA
CBR (California bearing ratio)	ELEVATION
BRAKING	CONTOURS
JACK	***DEFUEL***
SUBGRADE	MZFW (maximum design zero fuel weight)
STATIC	***TOWING***
CONFIGURATION	***VALVE***
APU (auxiliary power unit)	***INTAKE***
TANK	***INTERIOR***
HEIGHT	PCN (pavement classification number)
DRAIN	***STRUT***
LAYOUT	***APRON***
FUSELAGE	REFERENCE
NLG (nose landing gear)	***AERODROME***
CREW	***DISCHARGE***
POTABLE	***GALLEY***
THRUST	CC (cargo compartment)
NACELLE	***REVERSE***
BREAKAWAY	***APPROX***
EMERGENCY	***FAA (federal aviation administration)***
FUEL	CB (conveyor belt)
PAYLOAD	GRAVITY
GROSS	LEVELING
CONNECTOR	PIT
HYDRAULIC	BOGIE
INBD	***EXIT***
OUTBD	***AIRLINE***
ALPHA	***DECELERATION***
REFERENCED	ACCUMULATOR
CEMENT (Portland cement)	CL (cargo loader)
DIFFERENTIAL	***CONDITIONING***

USABLE	FSTE (Full Size Trolley Equivalent)
DATUM	PRECONDITIONED
NOZZLE	SHORING
OVERFLOW	TRUCK
GC (ground connection)	AMM (Aircraft Maintenance Manual)
OXYGEN	***FAIRING***
RADIUS	HPGC (High Pressure Ground Connection)
SCALED	***INSTALLATION***
STARTER	RECIRCULATION
AILERON	REFUELING
MTW (maximum taxi weight)	GRAPHS
SPOILER	TOILET
BRAKE	ULD (unit load device)
AUXILIARY	***ALLOWABLE***
CATERING	***ALTITUDE***
SUCTION	***DEPARTURES***
ACCESSORY	***GPU (ground power unit)***
DEPLANING	GSE (ground support equipment)
INLET	***OVERHEAT***
RESERVOIR	***RETRACTION***
CONCRETE	SILL
REAR	***WINGTIP***
SYMMETRICAL	CAN (common nozzle assembly)
TODA (take-off distance available)	***COEFFICIENT***
TOW	***CYLINDER***
OVERPRESSURE	DISCH
VERTICAL	***GEARBOX***
HORIZONTAL	IFE (In-Flight Entertainment)
LANE	MOORING
LP (low pressure)	NIPPLE
SHARKLET	RAFT
ASDA (Acceleration-Stop Distance Available)	***TAKEOFF WEIGHT***
COVERAGES	CORPS
LD (lower deck)	CRADLES
LAVATORY	FDL (Fuselage Datum Line)
PLUG	
PROTECTOR	
REPLENISHMENT	
ANTENNAS	
DEFLATED	
HP (high pressure)	
TWIN-WHEEL	
ASU (air start unit)	
PORT	
RETRACTED	
TOWBAR	
ABREAST	

Note: *Dark italic words were chosen by the expert.*

Appendix-4. *Second Expert's Opinion*

A/C (aircraft)	***AIRFLOW***
GEAR	***RADII***
PAVEMENT	***ICAO (international civil aviation organization)***
CG (center of gravity)	***COCKPIT***
JACKING	***COWL***
AFT	LCN (load classification number)
ACN (aircraft classification number)	***MTOW (maximum design take-off weight)***
MRW (maximum design ramp weight	***REFUEL***
EXHAUST	***PROBE***
FWD (forward)	***PAX (passenger)***
CARGO	***PNEUMATIC***
FR (frame)	***TURBINE***
RUNWAY	***DECK***
CLEARANCE	***CABIN***
RAMP	***RIB***
TAXIWAY	***FILLET***
CENTERLINE	***EXTERIOR***
MLG (main landing gear)	***FOOTPRINT***
EFFECTIVITY	***COMPRESSOR***
LH (left hand)	***IDG (integrated drive generator)***
RH (right hand)	***OAT (outside air temperature)***
FLAP	***SLAT***
TAKE-OFF	***ABSORBER***
COMPARTMENT	***EARTHING***
ISA (international standard atmosphere)	***INSTALLED***
VELOCITY	***MLW (maximum design landing weight)***
MAC (mean aerodynamic chord)	***ULTRA***
CBR (California bearing ratio)	***ELEVATION***
BRAKING	***CONTOURS***
JACK	***DEFUEL***
SUBGRADE	***MZFW (maximum design zero fuel weight)***
STATIC	***TOWING***
CONFIGURATION	***VALVE***
APU (auxiliary power unit)	***INTAKE***
TANK	***INTERIOR***
HEIGHT	PCN (pavement classification number)
DRAIN	***STRUT***
LAYOUT	***APRON***
FUSELAGE	***REFERENCE***
NLG (nose landing gear)	***AERODROME***
CREW	***DISCHARGE***
POTABLE	***GALLEY***
THRUST	***CC (cargo compartment)***
NACELLE	***REVERSE***
BREAKAWAY	***APPROX***
EMERGENCY	***FAA (federal aviation administration)***
FUEL	CB (conveyor belt)
PAYLOAD	***GRAVITY***
GROSS	***LEVELING***
CONNECTOR	***PIT***
HYDRAULIC	BOGIE
INBD	***EXIT***
OUTBD	***AIRLINE***
ALPHA	***DECELERATION***
REFERENCED	***ACCUMULATOR***
CEMENT (Portland cement)	CL (cargo loader)
DIFFERENTIAL	***CONDITIONING***

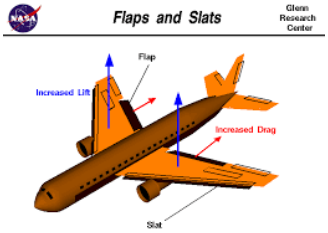
USABLE	FSTE (Full Size Trolley Equivalent)
DATUM	***PRECONDITIONED***
NOZZLE	SHORING
OVERFLOW	***TRUCK***
GC (ground connection)	***AMM (Aircraft Maintenance Manual)***
OXYGEN	***FAIRING***
RADIUS	HPGC (High Pressure Ground Connection)
SCALED	***INSTALLATION***
STARTER	***RECIRCULATION***
AILERON	***REFUELING***
MTW (maximum taxi weight)	***GRAPHS***
SPOILER	***TOILET***
BRAKE	ULD (unit load device)
AUXILIARY	***ALLOWABLE***
CATERING	***ALTITUDE***
SUCTION	***DEPARTURES***
ACCESSORY	***GPU (ground power unit)***
DEPLANING	***GSE (ground support equipment)***
INLET	***OVERHEAT***
RESERVOIR	***RETRACTION***
CONCRETE	SILL
REAR	***WINGTIP***
SYMMETRICAL	CAN (common nozzle assembly)
TODA (take-off distance available)	***COEFFICIENT***
TOW	***CYLINDER***
OVERPRESSURE	***DISCH***
VERTICAL	***GEARBOX***
HORIZONTAL	***IFE (In-Flight Entertainment)***
LANE	MOORING
LP (low pressure)	NIPPLE
SHARKLET	RAFT
ASDA (Acceleration-Stop Distance Available)	***TAKEOFF WEIGHT***
COVERAGES	CORPS
LD (lower deck)	CRADLES
LAVATORY	***FDL (Fuselage Datum Line)***
PLUG	
PROTECTOR	
REPLENISHMENT	
ANTENNAS	
DEFLATED	
HP (high pressure)	
TWIN-WHEEL	
ASU (air start unit)	
PORT	
RETRACTED	
TOWBAR	
ABREAST	

Note: *Dark italic words were chosen by the expert.*

Appendix-5. *Word Set 1 in Quizlet*

Quizlet **Set 1**

Study online at quizlet.com/_34q16s

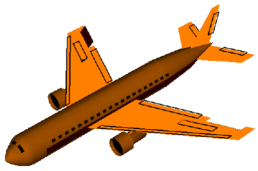
1.	**aft**	arka (geri)
2.	**airflow**	hava akımı
3.	**clearance**	izin (iniş, kalkış vs. için)
4.	**cowl**	kaporta / motor kapağı
5.	**deceleration**	hızın azalması (yavaşlama)
6.	**deflated**	sönmüş, havası inmiş
7.	**drain**	drenaj (yakıt ikmal)
8.	**exhaust**	eksoz
9.	**flap**	 kanatçık (uçağın kanadında gövdeye yakın kısımda yer alır)
10.	**fr (frame)**	çerçeve, çatı (uçak)
11.	**fwd (forward)**	ileri
12.	**inlet**	hava giriş yeri
13.	**intake**	hava girişi (uçak motorunda)
14.	**jacking**	 kaldırma (kriko vs ile)
15.	**plug**	buji, tapa
16.	**pneumatic**	havalı (hava dolu) / basınçlı hava ile çalışan
17.	**rear**	arka
18.	**retraction**	içeri çekme (iniş takımı, kumanda vs.)
19.	**reverse**	ters yön
20.	**velocity**	hız

Appendix-6. *Word Set 2 in Quizlet*

Quizlet **Set 2**

Study online at quizlet.com/_34q9oy

1. **aileron**

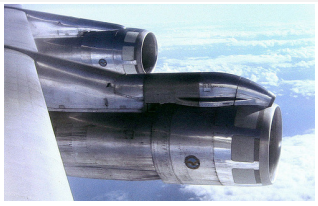


kanatçık (uçağın sağa sola yatışını sağlayan yüzey)

2. **compartment** bölüm
3. **crew** mürettebat
4. **defuel** yakıt boşaltmak
5. **differential** diferansiyel (türev)
6. **discharge** yük / akım boşaltmak
7. **exterior** dış kısım
8. **fuselage**

uçak gövdesi

9. **interior** iç kısım
10. **layout** plan / tasarım
11. **nacelle**

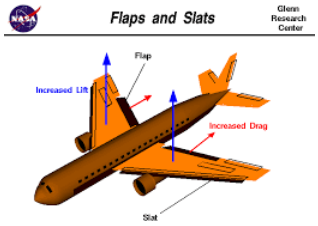


uçak motorunu örten ve içine alan kısım

12. **pax (passengers)** yolcular
13. **probe** prop (dışarıdaki hava sıcaklığını ölçmek için kullanılır)
14. **rib**

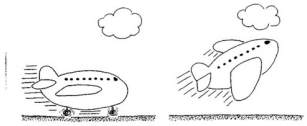
iskelet / çatı (uçak kanatlarında)

15. **slat**



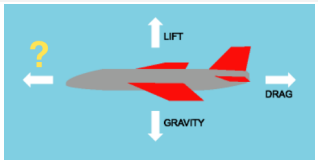
kanatçık (kanadın ön tarafında bulunan kumanda yüzeyi)

16. **take-off**



kalkış (uçağın kalkması)

17. **thrust**



itki (itme kuvveti)

18. **towing**

çekmek

19. **valve** valf, vana
20. **wingtip**

kanat ucu

Appendix-7. *Word Set 3 in Quizlet*

Quizlet

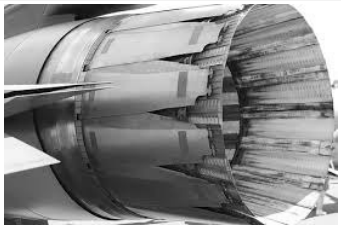
Set 3

Study online at quizlet.com/_34qa9t

1. **aerodrome** havaalanı
2. **allowable** izin verilebilir
3. **apron** apron (Bir kara havaalanında hava araçlarının yolcu, posta ve kargo indirme-bindirme, yakıt ikmali, bakım ve park etme amaçlarına yönelik tanımlan- mış alan.)
4. **datum** başlangıç noktası (başlangıç değeri)
5. **fairing** karenaj (kaplama)
6. **galley**

uçak mutfağı

7. **gear** takım (iniş takımı)
8. **inbound** geliş, gelen
9. **nozzle**



lüle (hava nozulu)

10. **outbound** gidiş, giden
11. **overflow** fazla olma, taşma
12. **overpressure** aşırı basınç
13. **pavement**

kaplama (yol)

14. **ramp** -ramp (Ramp hizmeti apronda uçakların park ettirilmesi, yolcu, bagaj ve kargonun yüklenmesi, boşaltılması ve apronda ihtiyaç duyduğu diğer hizmetlerin tamamını kapsar.)

-rampa

15. **referenced** başvurulan, referans olarak verilen
16. **retracted**

geri çekilmiş

17. **runway**

pist

18. **strut**

dikme, destek

19. **suction** emme, emiş gücü
20. **taxiway**

taksiyolu (Bir kara havaalanında hava araçlarının taksi yapmaları ve meydanın bir noktasını diğerine bağlamayı amaçlayan ta- nımlanmış yollar)

Appendix-8. *Word Set 4 in Quizlet*

Quizlet

Set 4

Study online at quizlet.com/_34qagw

1.	**altitude**	irtifa
2.	**antennas**	anten
3.	**approx. (approximately)**	yaklaşık/ortalama
4.	**apu (auxiliary power unit)**	yardımcı güç ünitesi
5.	**coefficient**	katsayı
6.	**conditioning**	havalandırma
7.	**cylinder**	silindir
8.	**departure**	kalkış (giden uçuşlar)
9.	**faa (federal aviation academy)**	Federal Havacılık İdaresi (ABD)
10.	**gearbox**	dişli/vites kutusu
11.	**gpu (ground power unit)**	yer güç ünitesi (jeneratör)
12.	**icao (international civil aviation organization)**	Uluslararası Sivil Havacılık Örgütü
13.	**idg (integrated drive generator)**	dahili güç ünitesi
14.	**installation**	kurulum
15.	**mlg (main landing gear)**	ana iniş takımı
16.	**nlg (nose landing gear)**	burun (ön) iniş takımı
17.	**overheat**	aşırı ısınma
18.	**radius**	yarıçap
19.	**starter**	starter (motor çalıştırma)
20.	**take-off weight**	kalkış ağırlığı

Appendix-9. *Pre-Test*

Ad-Soyad: _____ **Bölüm:** _____

Lütfen aşağıdaki İngilizce kelimelerin karşılarına Türkçelerini yazınız.

Bilmediğiniz kelimeleri boş bırakınız.

Örnek: plane *uçak*

1. a/c
2. center of gravity 74
3. jacking
4. aft
5. exhaust
6. fwd (forward)
7. fr (frame)
8. clearance
9. centerline
10. mlg (main landing gear)
11. lh (left-hand)
12. rh (right-hand)
13. flap
14. take-off
15. compartment
16. velocity
17. apu (auxiliary power unit)
18. tank 87
19. drain
20. layout
21. fuselage
22. nlg (nose landing gear)
23. crew
24. thrust
25. nacelle
26. emergency
27. connector
28. airflow
29. cockpit
30. cowl
31. refuel
32. probe

33. pax

34. pneumatic

35. turbine

36. cabin

37. rib

38. exterior

39. compressor

40. idg (integrated drive generator)

41. slat

42. absorber

43. defuel

44. towing

45. valve

46. intake

47. interior

48. strut

49. apron

50. aerodrome

51. discharge

52. galley

53. approx.

54. faa

55. exit

56. airline

57. deceleration

58. hydraulic

59. inbound

60. outbound

61. referenced

62. differential

63. datum

64. nozzle

65. overflow

66. radius

67. starter

68. aileron

69. spoiler

70. brake

71. suction

72. inlet

73. rear

74. overpressure

75. vertical

76. horizontal

77. lp (low pressure)

78. plug

79. antennas

80. deflated

81. hp (high pressure)

82. retracted

83. conditioning

84. fairing

85. installation

86. allowable

87. altitude

88. departures

89. gpu (ground power unit)

90. overheat

91. retraction

92. wingtip

93. coefficient

94. cylinder

95. gearbox

96. takeoff weight

97. ramp

98. runway

99. taxiway

100. icao

101. gear

102. pavement

103. reverse

Appendix- 10. *Post-Test*

Ad-Soyad: _____ Bölüm: _____

Lütfen aşağıdaki İngilizce kelimelerin karşılarına Türkçelerini yazınız.

Bilmediğiniz kelimeleri boş bırakınız.

Örnek: plane	*uçak*

1. jacking
2. aft
3. exhaust
4. fwd (forward)
5. fr (frame)
6. clearance
7. mlg (main landing gear)
8. flap
9. take-off
10. compartment
11. velocity
12. apu (auxiliary power unit)
13. drain
14. layout
15. fuselage
16. nlg (nose landing gear)
17. crew
18. thrust
19. nacelle
20. airflow
21. cowl
22. probe
23. pax
24. pneumatic
25. rib
26. exterior
27. idg (integrated drive generator)
28. slat
29. defuel

30. towing
31. valve
32. intake
33. interior
34. strut
35. apron
36. aerodrome
37. discharge
38. galley
39. approx.
40. faa
41. deceleration
42. inbound
43. outbound
44. referenced
45. differential
46. datum
47. nozzle
48. overflow
49. radius
50. starter
51. aileron
52. suction
53. inlet
54. rear
55. overpressure
56. plug
57. antennas
58. deflated
59. retracted
60. conditioning
61. fairing
62. installation
63. allowable
64. altitude
65. departures
66. gpu (ground power unit)
67. overheat
68. retraction
69. wingtip

70. coefficient

71. cylinder

72. gearbox

73. takeoff weight

74. ramp

75. runway

76. taxiway

77. icao

78. gear

79. pavement

80. reverse

Appendix-11. *Student's Grades for Pre-Test and Post-Test*

ID	Pre-Test	Post-Test
1	3	50
2	4	18
3	2	19
4	7	60
5	11	52
6	5	28
7	1	29
8	22	46
9	18	45
10	10	37
11	3	30
12	10	72
13	20	74
14	25	54
15	15	70
16	15	37
17	0	20
18	23	63
19	3	26
20	10	57
21	19	65
22	49	55
23	2	32
24	40	56
25	2	27
26	8	78
27	2	23
28	5	38
29	6	67
30	61	80
31	22	68
32	38	59
33	11	41
34	23	57
35	31	79
36	9	51
37	17	80
38	27	70

39	26	80
40	9	17
41	32	73
42	24	56
43	14	71
44	3	54
45	7	38
46	6	26
47	29	60
48	12	68
49	18	50
50	6	44
51	24	43
52	16	46
53	3	31
54	25	70
55	18	76
56	16	55

Appendix-12. *Pre-test results*

Technical Word	Percentage %	Technical Word	Percentage%
a/c	69	discharge	21
center of gravity	74	galley	3
jacking	2	approx.	3
aft	3	faa	10
exhaust	31	exit	89
fwd (forward)	35	airline	65
fr (frame)	15	deceleration	6
clearance	6	hydraulic	69
centerline	52	inbound	6
mlg (main landing gear)	37	outbound	6
lh (left-hand)	61	referenced	34
rh(right-hand)	61	differential	42
flap	44	datum	2
take-off	40	nozzle	13
compartment	29	overflow	6
velocity	21	radius	29
apu (auxiliary power unit)	26	starter	47
tank	87	aileron	40
drain	11	spoiler	55
layout	3	brake	55
fuselage	31	suction	3
nlg (nose landing gear)	31	inlet	6
crew	40	rear	8
thrust	40	overpressure	37
nacelle	2	vertical	55
emergency	74	horizontal	53
connector	50	lp (low pressure)	79
airflow	18	plug	11
cockpit	87	antennas	15
cowl	16	deflated	0
refuel	50	hp (high pressure)	85
probe	18	retracted	5
px	18	conditioning	6
pneumatic	29	fairing	0
turbine	82	installation	32
cabin	94	allowable	18
rib	5	altitude	31
exterior	5	departures	6
compressor	74	gpu (ground power unit)	34

idg (integrated drive generator)	3	overheat	34
slat	35	retraction	5
absorber	48	wingtip	19
defuel	19	coefficient	6
towing	3	cylinder	24
valve	34	gearbox	29
intake	5	takeoff weight	34
interior	11	ramp	31
strut	2	runway	24
apron	40	taxiway	42
aerodrome	3	icao	18
reverse	27	gear	35
pavement	3		

Appendix-13. *Voluntary participation form*

ARAŞTIRMA GÖNÜLLÜ KATILIM FORMU

Bu çalışma, "Uçak-Gövde-Motor-Bakım Öğrencileri için Bütünce-Temelli Teknik Kelime Listesi ve Bireysel Çalışma Materyali Geliştirme" başlıklı bir araştırma çalışması olup uçak manuellerinde en sık kullanılan İngilizce teknik kelimelerin belirlenmesi ve bu kelimelere dayalı online bireysel çalışma materyali geliştirme amacını taşımaktadır. Çalışma, Revan SERPİL tarafından yürütülmektedir ve sonuçları ile Uçak-Gövde-Motor-Bakım öğrencilerinin kullanımına yönelik teknik kelime çalışma materyali ortaya konacaktır.

- Bu çalışmaya katılımınız gönüllülük esasına dayanmaktadır.
- Çalışmanın amacı doğrultusunda, online çalışma materyali kullanılarak sizden veriler toplanacaktır.
- İsminizi yazmak ya da kimliğinizi açığa çıkaracak bir bilgi vermek zorunda değilsiniz/araştırmada katılımcıların isimleri gizli tutulacaktır.
- Araştırma kapsamında toplanan veriler, sadece bilimsel amaçlar doğrultusunda kullanılacak, araştırmanın amacı dışında ya da bir başka araştırmada kullanılmayacak ve gerekmesi halinde, sizin (yazılı) izniniz olmadan başkalarıyla paylaşılmayacaktır.
- İstemeniz halinde sizden toplanan verileri inceleme hakkınız bulunmaktadır.
- Sizden toplanan veriler belge-dosya şifreleme yöntemi ile korunacak ve araştırma bitiminde arşivlenecek veya imha edilecektir.
- Veri toplama sürecinde/süreçlerinde size rahatsızlık verebilecek herhangi bir soru/talep olmayacaktır. Yine de katılımınız sırasında herhangi bir sebepten rahatsızlık hissederseniz çalışmadan istediğiniz zamanda ayrılabileceksiniz. Çalışmadan ayrılmanız durumunda sizden toplanan veriler çalışmadan çıkarılacak ve imha edilecektir.

Gönüllü katılım formunu okumak ve değerlendirmek üzere ayırdığınız zaman için teşekkür ederim. Çalışma hakkındaki sorularınızı Anadolu Üniversitesi Yabancı Diller Yüksekokulundan Revan Serpil'e (mail/tel) yöneltebilirsiniz.

Araştırmacı Adı	: Revan SERPİL
Adres	: Anadolu Üniversitesi Yabancı Diller Yüksekokulu C-320
İş Tel	: 0 222 335 05 80-6181
Cep Tel	: 0 538 609 38 33

Bu çalışmaya tamamen kendi rızamla, istediğim takdirde çalışmadan ayrılabileceğimi bilerek verdiğim bilgilerin bilimsel amaçlarla kullanılmasını kabul ediyorum.
(Lütfen bu formu doldurup imzaladıktan sonra veri toplayan kişiye veriniz.)

Katılımcı Ad ve Soyadı:
E-Posta:
Tarih:
İmza:

Appendix-14. *Ethics committee approval*

Kayıt Tarihi: 15.02.2017	Protokol No: 20048

ANADOLU ÜNİVERSİTESİ ETİK KURULU KARARI

ÇALIŞMANIN TÜRÜ:	Yüksek Lisans Tez Çalışması
KONU:	Eğitim Bilimleri
BAŞLIK:	Uçak-Gövde-Motor-Bakım Öğrencileri İçin Bütünce-Temelli Teknik Kelime Listesi ve Bireysel Çalışma Materyali Geliştirme
~~PROJE~~/TEZ YÜRÜTÜCÜSÜ:	Prof. Dr. Gül DURMUŞOĞLU KÖSE
TEZ YAZARI:	Revan SERPİL
ALT KOMİSYON GÖRÜŞÜ:	-
KARAR:	Olumlu

ETİK KURUL ÜYELERİ — **İMZA/ TARİH** 23.02.2017

Prof. Dr. Aydın AYBAR
Rektör Yardımcısı / Etik Kurul Başkanı

Prof. Dr. Hayrettin TÜRK
Fen Bil.(Fen Fak.)

Prof. Dr. Yusuf ÖZTÜRK
Sağlık Bil.(Ecz. Fak.)

Prof. Dr. Esra CEYHAN
Eğitim Bil. (Eğitim Bil. Ens.)

Prof. Dr. Bülent GÜNSOY
Sos. Bil.(İkt. Fak.)

Prof. Dr. Münevver ÇAKI
Güz. San. (Güz. San. Fak.)