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Genre analysis of three page blocks of two aircraft maintenance manuals (AMMs)

By:

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ABSTRACT

In aircraft maintenance domain, written communication is the main medium to communicate, with the English language as the main language for all aircraft technical documentation. When performing aircraft maintenance activities, the Aircraft Maintenance Personnel (AMP) refer to various types of technical documentation to assist them with the inspection, operation and maintenance of the aircraft. In the first phase of data collection, twenty-three Malaysian AMP from the aviation industry were interviewed to discover the types of technical documentation that influence and complement their reading activities. The analysis revealed that there were three types of documents used by the AMP. Interestingly, even though there were numerous documents used by them, the interviews revealed that the AMM was the main reference for aircraft maintenance activities.

Geared by the findings of the semi-structured interviews, the second phase of data collection of this study attempted to analyse the genre of AMM, the most central part of the thesis. This second phase focused on move analysis of the three *Page blocks* of the AMM of two aircrafts. The moves and steps were designed and analysed following Lassen's (1999) and Lago and Lloret's (2012) framework. The framework showed that the first three moves corresponded to the three *Page blocks* and the steps illustrated how the text achieved the communicative purpose of each move. As for the language features, it was found that Move 1 (*Orienting reader's understanding towards the aircraft subsystem and its operation*), was realised by the relational processes through the indicative declarative mood. This is parallel with the communicative purpose of this move, which is to inform. Move 2 (*Anticipating and solving problems*), on the other hand, was realised by the relational and material processes that were written in the indicative declarative and imperative moods to fulfil two main functions: to inform and to instruct. As for Move 3 (*Outlining steps and procedures for maintenance exercises*), it was realised mostly by the material process in the form of the imperative mood as its purpose is mainly to instruct. Hence, the language features for each move were determined by its communicative purpose.

The final analysis focused on the verb form tenses and modals to determine their relationships with the communicative purpose of three moves using the guidelines of the Simplified Technical English (STE) (ASD, 2013). The findings suggested that the simple present tense in the active verb form was the most dominant in the three moves. This corresponded with the guidelines given in the ASD-STE100 (ASD, 2013), which stated that the active voice should be used in the procedural writing, and as much as possible in the descriptive writing. On the other hand, the modal verbs *may*, *can* and *must* were mostly found across the three moves. These three modal verbs were used to signify logical probability and prediction.

The findings of this study are expected to contribute towards designing and teaching the ESP modules for aircraft maintenance students, the future AMP. Not only that, it is also expected that the findings would contribute towards designing the English Language Proficiency Test (ELPT) for the AMP.

Table of Contents

List of Tables

List of Figures

AUTHOR'S DECLARATION

I declare that work in this thesis was carried out in accordance with the Regulations of the University of Sheffield. The work is my own, except where indicated by reference in the text, and no part of this dissertation has been submitted for any other academic award. Views expressed in the dissertation are those of the author.

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CHAPTER 1

INTRODUCTION

1.1 Overview

Aircraft maintenance refers to activities that include aircraft safety monitoring, maintenance, overhaul, repair, inspection or modification of the aircraft components, to ensure the continuous airworthiness status of the aircraft (Petrov, 2007). The Aircraft Maintenance Personnel (AMP) are responsible for completing and certifying the aircraft maintenance tasks. The term AMP refers to engineers, technicians or mechanics who are responsible for the safety and reliability of the aircraft to be certified as being airworthy. In aircraft maintenance domain, written communication is the main medium to communicate with the English language as the main language used in all written documentation. In this context also, the AMP are classified as the readers of the documents produced by the aviation authority, aircraft makers, air operators and/or Maintenance Repair and Overhaul (MRO) organisations. Even though there are various types of documents used by the AMP, the AMM will be their main reference for aircraft maintenance activities.

The AMM is a formal document containing all the basic information on the operation and maintenance of the aircraft and its on-board equipment (Kinnison & Siddiqui, 2013). It is divided into four levels which are grouped according to chapters called ‘chapterisation’. Each chapter is then divided according to specialised sub-topics which are called ‘*Page block*’. The term *Page block* refers to the specific types of information contained in the AMM, which is formatted according to the Air Transport Association (ATA) standard. In general, *Page block* is a page numbering system of the AMM. There are nine *Page blocks* (see Section 4.3.2.2) in total which are outlined by the ATA. However, for this study, only the first three *Page blocks* are compiled as the AMM corpus: 1) Description and operation (*Page block* 1-100), 2) Troubleshooting (*Page block* 101-200), and 3) Maintenance practices (*Page block* 201-300).

1.2 Research Context

The Civil Aviation Authority Malaysia (CAAM) (2014), mentioned in their Airworthiness Guidance (AG1101) that Malaysian AMP's English language proficiency is decreasing, especially the young AMP. They also added that the level of English Language Proficiency (ELP) among the AMP has been part of the causes of incidents and accidents that happened on the hangar floors or workshops. Situations like misinterpreting the instructions written in the AMM and misunderstanding shift handover reports were among the repercussions due to lack of ELP among the AMP. Due to this, the CAAM (2014) has revised the policy of ELP for the AMP.

The AMP that refers to engineers, technicians or mechanics are seen as important entities in the aviation industry for the safety and reliability of the aircraft maintenance operations. Aircraft maintenance licensing is not a mandatory for all AMP. Due to that, there are personnel may be licensed or unlicensed. Only the AMP who hold a title as Licensed Aircraft Maintenance Engineer (LAME) are responsible to certify that the maintenance tasks performed have been completed satisfactorily and that the aircraft can be declared as airworthy. In order to be the LAME, the AMP should obtain the certificates from the National Aviation Authority (NAA), and these certificates are issued once the AMP are successful in the written, oral and practical examinations (Yadav & Nikraz, 2012). The AMP who are unlicensed, on the other hand, are responsible to advise and assist the LAME in performing maintenance tasks. Even so, both the LAME and AMP are required to be proficient in the English language.

The CAAM (2011, 2020) outlined the ELP requirements for two different groups of the AMP as stated in the CAAM Part-66 Aircraft Maintenance Licence (AML). The first ELP requirement is for the group of future AMP such as aircraft maintenance students who wish to apply for licensing. It is stated that the personnel should provide:

> (…) evidence of proficiency in English language, for issuance of AML - Evidence of qualification at least SPM or equivalent which is acceptable to the Authority with credits in English Language (p. 5).

The SPM (Malaysian Certificate of Education) can be said to be equivalent to the British General Certificate of Secondary Education (GCSE). A credit in English Language, on the other hand, means the students should obtain at least a C grade in

English Language. In this case, the aircraft maintenance students should pass their English subject with at least a C before applying for licensing.

As for the AML personnel or LAME, the CAAM (2011, 2020) states that:

> He/she is able to read, write and communicate to an understandable level in the English language (p. 8).

Not only that, the CAAM (2011, 2020) also states that,

> (…) the holder of an Aircraft Maintenance Licence (AML) may not exercise certification privileges unless he / she is able to meet the competency level in the English language (p. 3).

In other words, the LAME is not only required to be able to read, write and communicate in English but is also not allowed to certify the aircraft as airworthy without a suitable level of ELP. However, there was no definite statement on achieving a suitable level of ELP for the LAME. Due to that, the CAAM (2014) requires for an ELP test to be conducted in order to improve and maintain the level of ELP of future AMP and AML personnel. Because of the recent CAAM (2014) policy change regarding the ELP among Malaysian AMP, Aviation English teaching and testing for the AMP has become a major focus in the aviation industry as well as in Maintenance Training Organisation (MTO), including this university, Universiti Kuala Lumpur Malaysian Institute of Aviation Technology (UniKL MIAT).

UniKL MIAT is one of the MTOs in Malaysia that offers courses in aircraft maintenance technology. Students who take these courses can be the future AMP who will be working in the field of aircraft maintenance. To align with the requirements set by the CAAM, the courses for the technical subjects have adopted the CAAM Part 66 Programmes. The purpose is to prepare the students with a Basic CAAM Category B1 or CAAM Category B2 AML. In order to be a LAME, the students are required to get two years of working experience in the related field and they have to complete the CAAM Part-66 Category B1. Students who graduate from the aircraft maintenance training centres like UniKL MIAT, can be classified as having been successfully in obtaining the CAAM Part-66 Category A1. This credential provided them with the essential knowledge to become an Aircraft Maintenance Technician (AMT) before they can pursue their licensing programme (CAAM Category B1 or CAAM Category B2 AML).

As the MTO, all the technical subjects consist of theory and practical fundamentals as required by the CAAM. Due to this, the students need to go through hands-on experience performing aircraft maintenance activities every semester. Their practical trainings and assessments include general workshop practices and aircraft systems simulation that are conducted at the workshops and hangar. These practical trainings and assessments expose the students to a lot of aircraft technical documentation such as logbook, task cards, Service Manual (SM), Repair Manual and Aircraft Maintenance Manual (AMM). Since the students are required to undergo practical trainings and assessments, they will need to familiarise themselves with all forms of documentation used in the university.

As pointed out by the International Civil Aviation Organization (ICAO) (2003), aircraft maintenance trainee technicians "need to know not only the importance of using the maintenance manuals but also to understand the language and the structure of the documents" (p. 1-3). As the MTO, all the reference books, manuals, assessments and Worksheet for Practical (PWS), including the medium of instructions are all written and conducted in the English language. In addition to that, the ability to read, understand and interpret technical documentation used in the aviation industry is essential since this is one of the skills required when the students work in the aviation industry. The situation arises where a majority of UniKL MIAT students are non-native English speakers, and have been found to be less proficient in the English language (CAAM, 2014). English language incompetency among the students has become one of the causes to the low ability to read, understand and interpret technical documentation. In order to assist the students to overcome this problem, there is a need for UniKL MIAT English lecturers to be able to master and develop the ability to learn how to read, analyse and describe technical documentation pertaining to the aircraft maintenance activities, especially the AMM.

1.3 Research Problem and Research Motivation

The ESP approach to genre analysis is the most popular approach used among the ESP researchers. Studying genres that are related to the ESP is vital in preparing students to use the English language in their target context. This is because the target genres would help the ESP teachers to develop effective ways on how to teach students to use and understand the language in specific areas (Hyon, 2017). There are three important areas to be discussed to set the direction of this study. Firstly, the ESP approach to genre analysis, followed by the notion of aircraft maintenance domain and finally the Aircraft Maintenance Manual (AMM) corpus.

1.3.1 The ESP approach to genre analysis

The first motivation for this study is associated with the need to understand the genre of AMM through the ESP approach to genre analysis. Teachers who teach the ESP are required to focus on when, where and why learners need to learn the language that is used in the classroom and in the workplace (Basturkmen, 2010). In addition to that, teachers also need to identify types of English language skills needed by the learners before the ESP courses can be designed and developed. This includes studying the texts in specific genres to illustrate the English language and types of the communication used in the target genres (Basturkmen, 2010). As language content of the ESP courses is essential in its course design, the ESP teachers are required to study the target genre in order to understand the nature of the language. Apart from application of needs analysis to develop the ESP courses, genre analysis can also be applied to identify the content and the organisation of the specific texts, and to investigate particular linguistic features. Because of these, genre analysis is one of the popular frameworks to analyse texts based on the parameters that help define the texts as belonging to a certain genre (Davis, 2015).

Genre analysis in the school of ESP accentuates both the social function and form of spoken and written language in academic and research settings, in which the focus of analysis is generally on the structure and moves within the text. Swales' (1990) CARS (Create a Research Space) model was among the most influential model which basically focuses on how the communicative purposes of members of discourse community are realised through stages and moves within the texts. Swales' (1990) approach to genre analysis is based on the three major levels: 1) communicative events, 2) communicative purposes, and 3) discourse community. According to Swales (2004, p. 228-229), move in genre analysis is realised by a rhetorical unit that is described by the communicative function and grammatical features in a written or spoken discourse. This communicative function, according to Bhatia (1993), "reflects accumulated and conventional social knowledge available to a particular discourse or professional community" (p. 21). Another popular approach to genre analysis is the model proposed by Bhatia (1993) in three different fields: business letter, lab report introduction and legal case. These three models were originally grounded on Swales' (1990) CARS model. Bhatia's (1993) move structure models prove that Swales' (1990) CARS model can be extended to a new move structure model for different types of genres.

To the best of my knowledge, there are very few studies on genre analysis which focus on technical manuals. For example, there are two studies that investigated moves of technical manuals. The first study was by Lassen (1998), who studied the genre of technical manuals and developed a 4-move framework for Booster Manual. Lassen's (1998) 4-move framework was then adopted by Lago and Lloret (2012) to analyse the Silestone Manuals. Other studies that are associated with genre analysis but focusing on grammatical features of technical manuals are also very limited. For example, Oktay (2011) studied the Systemic Functional Grammar (SFG) in operation manuals. Xiong (2019) focused on the experiential meaning of the manual of household electric appliances. Even though there are very few studies in the genre of technical manuals, the studies mentioned above are very important for this study. For instance, Lassen's (1998) and Lago and Lloret's (2012) move framework had been adopted to design and develop a move framework for the genre of AMM. While Oktay's (2011) analysis is one of the studies that I referred to for linguistic analysis.

1.3.2 Aircraft maintenance domain and English language needs of the Aircraft Maintenance Personnel (AMP)

The second motivation for this study relies on the need to understand the concept of aircraft maintenance domain, its communities that include the AMP and the communicative activities that entail the English language skills. Van den Bergh, De Bruecker, Beliën and Peeters (2013) assert that aviation industry is unique and not comparable to any other transportation industry. Each flight, according to Van den Bergh et al. (2013) consists of more than just take-off and landing in which authority and maintenance requirements must both be met. This is because this activity involves maintenance inspection that must be performed with care and is of key importance. This is to ensure that every plane leaving the ground is reliable, safe and airworthy. In the same vein as Van den Bergh et al. (2013), Petrov (2007) asserts that airworthiness is a complex feature of air transportation system since airworthiness defines the level of risks during the aircraft operation that relates to the level of fitness for the flight of the aircraft or part of the aircraft. The issue of airworthiness does not just rely on the level of fitness of the aircraft, it also relies on the specific type of the English language used in the aviation (Petrashchuk, 2016). Unlike any other industry, the English language used in the aviation industry is highly regulated and due to this, further regulations are outlined for the ELP requirements for the personnel in this industry (Petrashchuk, 2016). Due to this, the ICAO and the National Aviation Authority (NAA) included ELP as one of the requirements and the requisite of the ELP has proven that the English language is vital in the aviation industry.

The ICAO and the NAA are responsible for controlling all aircraft maintenance activities which include aircraft technical documentation and the AMP, to ensure all aircraft are airworthy. Written communication is the main medium in the aircraft maintenance domain. The written communication typically takes place through technical documentation produced by the airline manufacturers and airline operators (Alderson, 2009). The purpose of these technical documentation, according to the Federal Aviation Authority (FAA) (2008a), is to assist the AMP with the inspection, operation and maintenance of the aircraft. In order to understand the information in the manuals, the AMP must first access and study the technical documentation before they actually perform the aircraft maintenance activities. Since all the technical documentation are written in the English language, it is a must for the AMP to be proficient in the said language.

Shawcross (2005), stresses that reading is the most dominant skill used as the AMP spend about 20% of their working hours consulting written materials such as the Aircraft Maintenance Manual (AMM), the Illustrated Parts Catalogue (IPC), the Airworthiness Directives (ADs) and the Structural Repair Manual (SRM). Even though their responsibilities require them to read a variety of technical documentation, reading skills cannot be said to be the most important skill for the AMP as it is not mentioned elsewhere. The CAAM (2011, 2020) for instance, did not mention any specific English language skills required by the AMP as they put it "able to read, write and communicate (p. 8)" and "able to meet the competency level in the English language (p. 3)". Not only that, the Federal Aviation Authority (FAA, 2008b, 2018) and the Joint Aviation Requirements (JAR) (1998), also did not mention directly which skill is more important but they stated the skills listed below as requirements for the AMP to obtain a mechanic certificate:

> FAA (2008b, 2018) - The requirements for obtaining mechanic certificate are: be able to read, write, speak, and understand the English language (p. 13-3).
>
> JAR (1998) - Certifying staff must be able to read, write and communicate to an understandable level in the language(s) in which the technical documentation and organisation procedures necessary to support the issue of the certificate of release to service are written (p. 4).

Even though the FAA's and JAR's English requirements are not for Malaysians, these aviation authorities also did not stress any particular English skills required for their AMP. Although reading was not mentioned as the main skill required, reading skill is still important for the AMP to perform aircraft maintenance, alteration or preventive maintenance.

It should be noted that studies on English language needs of AMP are presently unavailable when this study was conducted. The study on language needs of the AMP received attention only recently and it is still in its infancy. For example, Burda and Maciejowski (2019) conducted a research to identify the communicative needs of Polish Air Force University students and the challenges that the course developers and instructors confronted. Another research that focused on the AMP was a study by Sukma, Rochmawati and Fatmawati (2019). They studied the methods in designing the ESP modules for aircraft maintenance students of aviation polytechnic. Helguera (2019), on the other hand, studied English language training needs among the AMP in Argentina. Therefore, the present study is of significance as the research to date has not yet discovered the communities of aircraft maintenance, the communicative activities of aircraft maintenance domain and the nature of the AMP in Malaysian context.

1.3.3 Aircraft Maintenance Manual (AMM) corpus

The last motivation for this study is associated with the intention to propose AMM as a genre. AMM is a formal document which tells the readers how the maintenance tasks should be carried out on an aircraft (Skybrary, 2017). The AMM is designed according to the guidelines of Air Transport Association (ATA) Specification 100 (ATA, 1999; GAMA, 1978) and it is written in Simplified Technical English (STE) (ASD, 2013). ATA Specification 100 is a referencing standard for aircraft commercial documentation such as the AMM. The purpose is to standardise the layout of the manuals since the readers of the manuals are mostly dealing with different types of aircraft in a single day. The standardisation of the layout for all AMMs will ease the process of finding the specific information needed. Hence, the standardisation of the layout minimises the time for the readers to learn how to use different types of aircraft manuals and at the same time makes it easier for them to switch from one manual to another (Chapparo, Groff, Chapparo & Scarlet, 2002).

According to ATA (1999) and General Aviation Manufacturers Association (GAMA) (1978), AMM is divided into four levels which are separated by the ‘chapterisation’ (‘chapterisation’ is discussed in Section 4.3.2.1) and each chapter is organised according to its *Page block* (see Section 4.3.2.2). The term *Page block* refers to the specific types of information contained in each chapter of AMM, which is formatted according to ATA standard. There are nine *Page blocks* in total which are outlined by the ATA and GAMA. Each *Page block* signifies a different purpose. For example, the first *Page block* describes the characteristics and the operation of the subsystem, and the title given for this *Page block* is ‘Description and Operation’. The second *Page block*, which is called ‘Troubleshooting’, provides the guidelines on how to troubleshoot any possible defects that might happen in the subsystem while the third *Page block* which is called ‘Maintenance Practices’, guides the readers on procedures to maintain the subsystem. Hence, when the readers refer to these *Page blocks*, they will be able to differentiate the content of each *Page block*.

It is worth noting that there are very few studies that focus on AMM as the main data for analysis. Chapparo and Groff (2001, 2002) for example, studied the usability of AMM’s content which they claimed can lead to maintenance errors if the information provided contained unclear procedures, misleading and insufficient information. Zafiharimalala and Tricot (2010), on the other hand, conducted a study on the structure of the AMM focusing on the use of signals in it. Another study by Zafiharimalala, Robin and Tricot (2014) focused on the use of the AMM to understand the reasons the AMP do not refer to the AMM when performing aircraft maintenance activities. Although researches have been carried out on the AMM, these studies were mainly focusing on the content and organisation of the AMM. Gabrielatos and Sarmento (2006), on the other hand, studied the central modals in aviation manual. Last but not least, another study that is related to the AMM was by Heald and Zajac (1998), who analysed compound nouns in simplified English which is one of the rules of writing the AMM. Based on the background above, this study is of significance as there has never been, to my knowledge, any genre analysis conducted with regard to the AMM. Concerning this issue, it appeared that there is a need to study the genre of AMM.

1.4 Research Aim and Research Questions

This thesis aims to analyse the genre of AMM with three *Page blocks* as the main corpus, the present study embraces the ESP approach to genre analysis as its main framework to study the move structure and analyse the linguistic features in these three *Page blocks*. The ESP approach is selected because the genre of AMM has yet to be discovered. Hence, the present study seeks to fill the research gaps by exploring the discourse community of aircraft maintenance, move structure and linguistic features of the AMM focusing only on three *Page blocks*. In order to explore further this area of interest, the following research questions are formulated:

1. Who are the key members in the discourse community of aircraft maintenance and what are the communicative activities that influence or complement their reading activities? (Chapter 3)
2. What is the structure of moves and steps of three *Page blocks* of the AMMs, and how are the steps illustrated to achieve the purpose of each move? (Chapter 5)
3. How do the verb form tenses and modals differ to realise each move and steps of three *Page blocks* of the AMMs? (Chapter 6)

The first question is directed at defining the notion of discourse community of aircraft maintenance to understand the social contexts of the discourse in order to relate them to the use of technical documentation. This will provide an insight into the relationship between the readers and the writers to determine the position of the AMP as the readers.

The second question seeks to determine the move structure of the texts in the genre of aircraft maintenance that serves the writers' communicative purposes. The previous studies of Lassen's (1998) and Lago and Lloret's (2012) model to move analysis of technical manuals will be discussed to identify a suitable model of moves as a foundation to the present study. The quantitative analysis of the frequency of occurrence in each move and its steps will be used to determine which of these steps show higher frequency of occurrence and at the same time the obligatory steps in each move can be identified. The linguistic features focusing on the verb types and sentence mood that realise each move and its steps will be observed and discussed.

The last question is motivated by the need to identify what types of verb form tenses and modals used by the technical writers to communicate with the readers. In addition to that, this study seeks to find out the functions of these verb form tenses and modals that realised the moves in three *Page blocks*. This will be answered by the quantitative analysis to investigate the frequency of verb form tenses and modals. The results and the discussion involved comparing the total number of occurrences and the frequency of each verb form tense in the corpus. The findings of the quantitative analysis will be used in reviewing the functions of these verb form tenses and modals used in the three *Page blocks* to differentiate the features found in each move.

It is hoped that the findings obtained from these three research questions will provide empirical data for genre analysis intended, for my own institution, for the field of Aviation and for the field of ESP.

1.5 Definition of Key Terms

This section provides the definitions of certain concepts as they are used in this study. These key terms mainly focus on the terms used in the aviation industry as they are not common among linguists but are common among the AMP. The following terms will be used in the entire chapters as the key terms.

1. Aircraft Maintenance Personnel (AMP) - This term refers to novice, experienced and qualified technical people who work in the aviation industry specialising in aircraft maintenance.

2. Aircraft maintenance - Aircraft maintenance refers to the activities for the purpose of airworthiness such as overhaul, repair, inspection or modification of the aircraft components.

3. End-user - This term is frequently used in Chapter 3 to describe the readers of the aircraft technical documentation which are produced by the aviation authority and the aircraft makers that are represented by the Original Equipment Manufacturer (OEM).

4. Technical documentation - This term refers to the written documents pertaining to the aircraft maintenance activities such as Aircraft Maintenance Manual (AMM), Airworthiness Directive (AD), Notices, Illustrated Parts Catalogue (IPC) and Service Manual (SM). The AMP are required to refer to these publications for aircraft maintenance activities. These publications are produced by three different organisations viz. the aviation authority, the aircraft manufacturers and the end-users.

5. Aircraft Maintenance Manual (AMM) - This term refers to the formal document which details the way the maintenance tasks should be carried out on an aircraft in order to ensure that it is airworthy. The term AMM will be the main term used in this thesis.

6. Chapterisation - Chapterisation refers to the organisation of the AMM, in which it is divided into chapters and each chapter is then divided into sections. This Chapterisation is divided and organised by following the guidelines given in the ATA Specification 100.

7. Page block - This term will be the main term used in this thesis as this is the corpus that will be analysed. *Page block* refers to specific types of information contained in the AMM, which is formatted according to Air Transport Association (ATA) standard. In general term, *Page block* is a page numbering system of the AMM. There are nine *Page blocks* in an AMM and each *Page block* has its own function

following the ATA standards. However, not all nine pages are included in the AMM.

8. Subsystem - This term is frequently used in certain chapters such as in Chapters 5 and 6. In aircraft maintenance, subsystem refers to the associated parts related to the system in the aircraft.

1.6 Thesis Organisation

This thesis comprises a total of seven chapters with this introduction being the first. The thesis is organised in an alternative format thesis form in which every chapter has its own literature review and methodology. This format is different from the conventional way of writing a thesis. The following briefly present the aim and the content of each chapter.

Chapter 2 discusses the major concepts of genre analysis that focuses on the ESP approach to genre analysis. This chapter also includes the three-interrelated concepts: discourse community, communicative purpose and genre. The aim of this chapter is to review the approach to genre analysis in order to determine the most suitable approach to be applied for this study. The concepts will provide a basis for working with the texts subject to its analysis, and will cover a presentation of the chosen analysis model as well as a discussion on the very concept of genre.

Chapter 3 provides an analysis of the discourse community of aircraft maintenance domain to understand their goals and the purpose of communication in order to achieve these goals. This chapter aims to define the key members in the discourse community of aircraft maintenance and to find the types of communicative activities that influence or complement their reading activities.

Chapter 4 describes the process involved in designing and building a sample corpus of the AMM. This chapter wishes to discuss on how and why only certain parts of the components of the AMM are selected for analysis. The chapter discusses the notion of building a corpus, introduces the AMM and elaborates on the structure of the AMM. The discussion on the structure of the AMM leads to the proposal of a text selection procedure to ensure the representativeness of the corpus sample is achieved.

Chapter 5 presents the most central part of the thesis, the analysis of the main texts that I have been working on: three *Page blocks* of the AMM of two aircraft. The chapter aims to develop the move model for these three *Page blocks*. The linguistic structures focusing on transitivity and mood system that realise each move and its steps will also be observed and discussed. The results from the analysis will then be used to analyse the frequency of occurrence of each step in each move to determine the obligatory and non-obligatory steps.

Chapter 6 extends the study with an investigation of the verb form tenses and modals used that realised each move and its steps. The analysis focuses on reviewing the functions and the factors that influence the use of these verb form tenses and modals in the three *Page blocks* to differentiate the features found in each move. The analysis of this chapter will also be guided by the ASD-STE100 (ASD, 2013) to look into the rules of writing that governed the linguistic features of the AMM.

Chapter 7 gives a summary of this thesis by summarising the findings in relation to the main research questions and discussing the strengths and limitations of the study. Finally, the chapter discusses on the directions for future work.

CHAPTER 2

MAJOR CONCEPTS OF GENRE ANALYSIS

2.1 Overview

This chapter functions as a review of the literature and as a means of positioning this research within the major concepts of genre analysis. Specifically, this chapter covers the concepts of genre analysis based on the ESP approach that comprise important components like discourse community, communicative purpose and move analysis. Apart from that, this chapter also covers the review of literature that are related to linguistic analysis in order to identify the boundaries in analysing moves. The discussions on the related theory and previous studies in this area, however, will be introduced and discussed in the relevant forthcoming chapters.

2.2 The Notion of Genre Analysis

When defining a genre, the most influential definitions are usually taken from three different school of genre theory: New Rhetoric Studies, Systemic Functional Linguistics (SFL) and English for Specific Purposes (ESP). The following discusses the definitions from the view of three schools of genre theories and their characteristics (Table 2.1).

Table 2.1

Summary of Three Schools of Genre Theory

School of genre theory	Definition of genre	Characteristics
New Rhetoric Studies	Genre is 'a particular type of discourse classification based in rhetorical practice and consequently open rather than closed and organised around situated action' (Miller, 1984, p. 155).	• Describes a body of North American scholarship from a variety of disciplines concerned with L1 teaching, including rhetoric, composition studies, and professional writing. • Uses ethnographic rather than linguistic methods for analysing texts. • Focus of analysis is more on situational context rather than the structure and tends to use ethnographic rather than linguistic tools for analysis.
Systemic Functional Linguistics (SFL)	Genre is a 'staged, goal-oriented, and purposeful social activity that people engage in as members of their culture' (Martin, 1984, p.25).	• Operates from the premise that language structure is integrally related to social function and context. • 'Functional' refers to the work that language does within particular context, while 'Systemic' refers to structure of language that realises the meaning (Hyon, 1996). • Focus of analysis is more on primary and secondary education texts and less on professional work. • Applies Halliday's schemes of: Field - what the activity is Tenor - the relationship between participants, and Mode - the system of delivery
English for Specific Purposes (ESP)	Genre is 'a class of communicative events, (…) shares some set of communicative purposes (…) recognised by the expert members' (Swales, 1990, p. 58)	• Describes genre as a communicative event that are characterised by both communicative purposes and various patterns of structure, style, content and intended audience. • Emphasises both on the social function and form of spoken and written language in academic and research settings. • Focus of analysis is generally in structure and moves within the text.

As can be seen in Table 2.1, each school of genre theory devises its own approach in analysing the genre. For example, New Rhetoric Studies mainly focuses on situational context rather than the structure of the text itself by employing ethnographic research as its approach. Systemic Functional Linguistics (SFL), on the other hand, focuses on the language structure that is integrally related to social function and context using mostly Halliday's framework theory to analyse the language. The ESP based on the framework proposed by Swales, emphasises both the social function and form of spoken and written language in academic and research settings by focusing on the move analysis. The ESP and SFL genre analysis are apparently different yet are complementary to each other, and these two approaches to genre analysis could be more advantageous when used together.

This study employs the ESP approach to genre analysis as its main framework and complementing it with the SFL approach. Combining the ESP and SFL genre analysis is not a new motion. This exercise has been applied in genre pedagogy. As Hyland (2007) points out, the function of genre analysis is to reveal the rhetorical pattern of a genre through analysing moves and communicative stages that make up the genre. The SFL, on the other hand emphasises the language, drawing on functional grammar which then becomes the tool that a teacher can use in classrooms. The following sections discuss the concept of the ESP approach to genre analysis in order to understand the concept of move analysis. This is followed by the discussion on SFL as part of defining a boundary in move analysis.

2.3 The ESP Approach to Genre Analysis

The notion of genre in the ESP was originally adopted from the definition of genre provided by Swales in 1990 that states:

> A genre comprises a class of communicative events, the members of which share some set of communicative purposes. These purposes are recognised by the expert members of the parent discourse community, and thereby constitute the rationale for the genre. This rationale shapes the schematic structure of the discourse and influences and constrains choice of content and style (p. 58).

In light of the above definition, it can be inferred that there are three major areas that shape a genre as summarised by Swales (1990): 1) communicative events, 2) communicative purposes and 3) discourse community.

This study adopted the ESP approach to genre analysis as its main framework to study the move structure of three *Page blocks* of the Aircraft Maintenance Manual (AMM). The ESP approach was selected because the genre in the field of aircraft maintenance has yet to be discovered. Not only that, the present study is of significance as there has never been, to my knowledge, any move analysis conducted with regard to the AMM. Hence, Swale's (1990) approach is seen to be the most suitable approach to uncover the nature of aircraft maintenance activities before move analysis of the AMM can be conducted.

According to Bawarshi and Reiff (2010), a typical ESP approach to genre analysis begins with identifying a genre within a discourse community and defining the communicative purpose the genre is designed to achieve. The following sections review the concepts of discourse community and communicative purpose that accompany the typical set of genres.

2.3.1 The concept of discourse community

As Bawarshi and Reiff (2010) point out, it is important to define a genre in relation to discourse community. This is because discourse community is a key aspect in investigating a genre, as it provides information on the context of the text as well as its communicative purpose. Meanwhile, Johns (1997), states that discourse community is represented by the texts and the language used in the text. The text and language enable its members to maintain their goals, their connection, and to communicate efficiently with one another. This is supported by the definition given by Flowerdew (2000) where he defines discourse community as a group of people who are in similar socio-rhetorical networks. They work together to achieve their common goals through their shared communicative purposes that include sharing the same language, beliefs and practice. However, if the writer cannot define the goals that represent the community's conventions, it is difficult for the writer to produce a text within a discourse community (Abdi, Rizi & Tavakoli, 2010).

According to Swales (1990, p. 24), there are six characteristics of discourse community as listed below:

1. has a broadly agreed set of common public goals,
2. has mechanisms of intercommunication among its members,
3. uses its participatory mechanisms primarily to provide information and feedback,
4. utilises and hence possesses one or more genres in the communicative furtherance of its aims,

5. has acquired some specific lexis, and
6. has a threshold level of members with a suitable degree of relevant content and discourse expertise.

Ramanathan and Kaplan (2000, p. 176), valued Swales' notion by stressing that the characteristics listed above contribute in the form of:

1. providing a baseline template from which to begin talking about genres,
2. allowing one to begin to conceptualise disciplinary discourse communities as sub-cultures that have relatively systematic, albeit generally implicit, rules regarding membership, goals, participation, and patterns of communication.

In other words, Swales' proposal on the characteristics of discourse community helps the analyst to relate the genres with the concept of discourse community.

Bhatia (1993: p. 49-52) extends the concepts of discourse community on two different groups based on the Swales' definition:

1. Writers
    - There are no restrictions in using the linguistic resources, however the writers must follow certain standard practices within the boundaries of a particular genre.
2. Readers
    - Readers can be the specialist members of any professional or academic community.
    - They are credited with the knowledge of the structure of the genres because they regularly participate as part of their daily work due to their experience and training within the specialist community that shapes the genre.
    - They have a greater knowledge of the construction and use of specific genres than those who are non-specialists.

It can be inferred that the readers and the writers in the discourse are the community that shaped the genre. The function of genre analysts in the discourse community, according to Bhatia (1993), is to distinguish between genres and their sub-genres through minor changes and modification in the communicative purpose of the texts used by the readers and the writers in the discourse.

In order to define the discourse community of aircraft maintenance domain, the ethnography study with the discourse community sample is conducted as to complement the textual analysis in this study (see further discussion in Chapter 3). The purpose is to understand the social contexts of the discourse in order to relate them to the technical documentation used (Hyland, 2002). This will provide an insight of the relationship between the readers and the writers of the discourse in order to identify the position of AMP as the readers in the discourse (Bhatia, 1993).

2.3.2 The concept of communicative purpose

The concept of communicative purpose was initially mentioned by Swales (1990) which he includes the term 'communicative purpose' when defining the concept of genre (see Section 2.1). He continues the definition of genre with:

> Communicative purpose is both a privileged criterion and one that operates to keep the scope of a genre as here conceived narrowly focused on comparable rhetorical action. In addition to purpose, exemplars of a genre exhibit various patterns of similarity in terms of structure, style, content and intended audience. If all high probability expectations are realised, the exemplar will be viewed as prototypical by the parent discourse community. The genre names inherited and produced by discourse communities and imported by others constitute valuable ethnographic communication, but typically need further validation (Swales, 1990, p. 58, cited in Askehave, 1999, p. 15).

Askehave (1999) notes the nature of the term 'communicative purpose' stated by Swales is rather slippery. This is because the term was defined as "the primary determinant of genre-membership on shared purpose rather than on similarities of form" (p. 16). Askehave (1999) also adds that it was difficult to recognise the communicative purpose of a genre as there is a probability of other communicative purpose that might be acceptable within the same genre. For example, communicative purposes of news might be: (1) to organise public behaviour, or (2) to present the paymaster of the broadcasting, even though its main communicative purpose is to keep their audiences up to date with the events in the world (Askehave, 1999). This diversity of communicative purposes led to difficulty to find and determine the clear definition of the phenomenon of 'communicative purpose' of the genre. To conclude, Askehave (1999) argues that the 'sets of purpose' associated with a text makes it very difficult to use the concept as a tool for categorising texts and for analysing texts in general. He also refrains from assigning 'one' purpose to a text as the purpose of a text is 'subjective' (p. 21). To support this notion, according to Bhatia (1993), any major changes in the communicative purpose are likely to result a different genre.

Orlikowski and Yates (1994), on a side note, state that 'members of a community rarely depend on a single genre for their communication' (p. 542). They explain further that the members of the community tend to use multiple, different, and interacting genres over time. Hence, it is advisable to examine the set of genres to understand the community's communicative purposes.

Since the examination of the context in which a genre produced would help the analyst to understand the community's communicative purposes, in-depth investigation of the discourse community that make up the genre of AMM will be conducted for the present study. The examination would lead to the identification of the communicative purposes of the move structure of the genre of AMM in the present study.

2.4 The Concept of 'Move' in Genre Analysis

According to Henry and Roseberry (2001), when defining a genre, it will be associated with the texts that describe a sequence of segments that are called 'moves'. Swales (2004, p. 228-229) defines move in genre analysis as "a discoursal or rhetorical unit that performs a coherent communicative function in a written or spoken discourse". This communicative function "reflects accumulated and conventional social knowledge available to a particular discourse or professional community" (Bhatia, 1993, p. 21).

Biber, Connor and Upton (2007) define move analysis as describing the communicative purposes of a text by categorising various discourse units within the text in accordance with the communicative purposes or also called rhetorical moves. The concept of genre analysis using rhetorical move was first introduced by Swales in 1981 to describe the rhetorical patterns of research articles (Biber, Connor & Upton, 2007; Sabet & Minaei, 2017). According to Sabet and Minaeei (2017), rhetorical pattern is a type of organised technique that is used by the writers to communicate their ideas.

Move analysis leads to the development of the move structure of the text. According to Lago and Lloret (2012), not all genres belong to a fixed move structure as the structure may change depending on the communicative purposes which were developed in the text. Not only that, the features of each move and its steps depend on the frequency of their occurrence in the text. Some of moves are classified as 'obligatory' because these moves frequently occur. On the other hand, moves that do not frequently occur are classified as 'optional' (Swales, 1981). These 'optional' moves are referred to as 'steps' by Swales (1990) or 'strategies' by Bhatia (1993). The "move-step-structure" of genres may be subject to flexibility due to the 'obligatory' versus 'optional' status of the steps, based on the frequency of occurrence of each move (Kanoksilapatham, 2005). In order to classify the status of Moves, Kanoksilapatham (2005) recorded the frequencies of individual move in each section. This is to determine the frequency of a particular move to be considered as 'conventional' (p. 272). Kanoksilapatham (2005) set the 'cut-off frequency of 60 per cent of occurrence' as potential measure of move stability for any move posited in her study. For Kanoksilapatham (2005), a move must occur in 60 per cent of the appropriate sections before it can be classified as conventional move. If the frequency of occurrence is below 60 per cent, then it is considered as optional.

In order to conduct move analysis, Biber, Connor and Upton (2007) assert that 'there are no strict rules for doing a move analysis' (p. 33). Biber et al. (2007, p. 34), in addition to that, recommend ten steps of the typical move analysis process as shown in Table 2.2.

Table 2.2

General Steps to Conduct a Corpus-Based Move Analysis (Adapted from Biber, Connor and Upton, 2007, P. 34)

STEP	**PROCESS**
Step 1	Determine rhetorical purposes of the genre.
Step 2	Determine rhetorical function of each text segment in its local context. Identify the possible move types of the genre.
Step 3	Group the functional and/or semantic themes (either in relative proximity to each other or often occur) in similar locations in representative texts. These reflect the specific steps that can be used to realise a broader move.
Step 4	Conduct pilot-coding to test and fine-tune definitions of move purposes.
Step 5	Develop coding protocol with clear definitions and examples of move types and steps.
Step 6	Code full set of texts, with inter-rater reliability check to confirm that there is clear understanding of move definitions and how moves/steps are realised in texts.
Step 7	Add any additional steps and/or moves that are revealed in the full analysis.
Step 8	Revise coding protocol to resolve any discrepancies revealed by the inter-rater reliability check or by newly 'discovered' moves/steps, and re-code problematic areas.
Step 9	Perform linguistic analysis of move features and/or other corpus-facilitated analyses.
Step 10	Describe corpus of texts in terms of typical and alternate move structure and linguistic characteristics.

Biber et al.'s (2007) steps to move analysis is also known as top-down approach. Top-down approach usually entails an analyst to identify the communicative purpose(s) of the genre before move structure can be produced. Lieungnapar and Todd (2011) however, commented that one disadvantage of top-down approach is that the analyst might "subjectively" identify the communicative purposes to develop move structure and then investigate linguistic features in a certain move to support the move analysis. Lassen (2006, as cited in Lieungnapar & Todd, 2011), in addition to that, states the communicative purposes of the text investigated may also be developed based on the contextual setting of the text itself and hence, there is no "one-to-one relationship" between linguistic form and its communicative function. It can be said that by using this approach, there is a possibility that the linguistic features analysed might not support the features of communicative purpose of the developed move structure.

Another approach to move analysis that is also worth mentioning is the method proposed by Bhatia (1993). Unlike Biber et al.'s (2007), Bhatia's (1993) motion to analyse unfamiliar genres consists of seven steps as summarised in Table 2.3.

Table 2.3

Seven Steps to Analyse Unfamiliar Genres (Bhatia, 1993, P. 63-84)

STEP	**PROCESS**
Step 1	Place the given genre-text in a situational context by looking at one's prior experience. If the analyst is not familiar with the text, the analyst is advisable to study related previous literature.
Step 2	Survey existing literature that includes linguistic analyses of the genre/variety in question or other related or similar genres/varieties.
Step 3	Refine the situational/contextual analysis by placing the texts in a situational/contextual framework. Define the speaker or writer of the text, the audience, their relationship and their goals.
Step 4	Select suitable corpus to determine the right kind and size of corpus.
Step 5	Study the institutional context that includes (1) methodology that the genre is used and (2) the rules that govern the use of language in such institutional settings.
Step 6	Determine the levels of linguistic analysis.
Step 7	Use specialist information in genre analysis to check the findings against reactions from a specialist informant.

As noted earlier, Bhatia's (1993) approach focuses on the texts in an unfamiliar genre. To determine the communicative purpose of the text, the analyst needs to place the text in a situational context in order to explain why the genre is written the way it is (Bhatia, 1993). This requires the analyst to have the background knowledge of the specialist discipline, which s/he gets from his or her own experience, from the experts in the genre or from the previous literature. On the other hand, Lieungnapar and Todd (2011) point out that, if the analyst uses his or her background knowledge to identify the communicative purpose of a genre, this will result in the analyst relying too much on his/her own intuition. Relying on the experts in the genre, may also pose another difficulty because the experts may not always agree with the purposes of the genre.

In conclusion, both steps proposed by Biber et al. (2007) and Bhatia (1993) can be summarised based on few important fundamentals. First, identifying the communicative purpose of the texts require the analyst to have the background knowledge of the specific genre (Bhatia, 1993). Second, Biber et al. (2007) suggest to perform inter-rater reliability to test the level of agreement for the definitions of move purposes. Then, both Biber et al. (2007) and Bhatia (1993) suggest to conduct linguistic analysis of move and its steps.

Since the genre of AMM is yet to be discovered and I lack familiarity with the texts, it is pivotal to position the texts in a contextual framework to define the writer of the texts, the audience, their relationship and their goals in using the texts. In order to understand the background of the genre in this study, the steps suggested by Biber et al. (2007) and Bhatia (1993) were adopted with some modifications to suit the need of the present study. For example, in order to understand the communicative purpose of the genre of AMM, I included the experts with vast experience with the AMM to assist me with the communicative purposes of AMM. However, I also faced the problem highlighted by Lieungnapar and Todd (2011), whereby these experts did not always agree about the purposes of the genre. In order to overcome this, I combined both the input from the experts and the findings from the review of literature to analyse the genre of AMM (Chapter 3).

2.4.1 Swales' move model

According to Biber, Connor and Upton (2009), Swales developed the discourse approach to move analysis specifically in the field of ESP in 1981. The initial purpose of his move analysis was to address the needs of advanced non-native English speakers (NNSs) to learn how to read and write a research article in English. Based on 48 introduction sections in research articles from different disciplines, Swales (1981) first proposed a four-move structure, in which he later revised and modified to a new Swales' Create-A-Research Space (CARS) model that consists of three-move pattern as shown below:

Move 1:	Establishing a territory	
	Step 1	Claiming centrality **and/or**
	Step 2	Making topic generalisation(s) **and/or**
	Step 3	Reviewing items of previous research
Move 2:	Establishing a niche	
	Step 1A	Counter-claiming **or**
	Step 1B	Indicating a gap **or**
	Step 1C	Question raising **or**
	Step 1D	Continuing a tradition
Move 3:	Occupying the niche	
	Step 1A	Outlining purpose **or**
	Step 1B	Announcing present research
	Step 2	Announcing principal findings
	Step 3	Indicating RA structure

Swales' CARS model is widely used in academic research articles. Among others, Atai and Habibie (2009), who studied genre analysis on Research Article Introductions (RAIs) within three sub-disciplines of applied linguistics: English for Specific Purposes (ESP), Psycholinguistics, and Sociolinguistics. Using Swales' (1990) CARS three-move pattern, they analysed 90 RAIs from a wide range of journals in corresponding sub-disciplines. They concluded that the move structure of RAIs indicate no significant differences across the above-stated sub-disciplines to CARS model.

Anthony (1999) analysed RAIs in software engineering to validate the accuracy of Swales' (1990) CARS model. He found that the model successfully fit in software engineering to describe the overall framework. However, the results revealed that classification of definitions and examples into an appropriate step was missing. The model, however, was hampered by weak definition of individual step. This is because many steps were found to be redundant due to the variety of disciplines. For Anthony (1999), the more serious problem was due to the absence of a separate 'evaluation of research' step in the original model.

Biber, Connor and Upton (2009) classified Swales' model as largely predictable in RAIs. Khalid (2013) also argued that Swales' model did not have explicit and specific step to help the writer to deal with the extensive occurrence of definitions of important terms and examples for the illustration of complex concepts after Move 1. Sawaki (2014, p. 77) pointed out that there were two general issues with the CARS model: (1) the inflexibility of its prefixed design, and (2) the lack of reliable identification criteria for move structure elements. These limit their applicability and new elements of studies could not fit into the model.

Based on the discussions above, it can be concluded that different steps in Swales' (1990) CARS model can still be adopted in other disciplines with necessary modifications. Even though this CARS model was originally meant for RAI in academic context, this model, however, has had a tremendous impact on genre analysis in other areas such as other components of research articles in the field of ESP and teaching of academic writing. Not only that, the CARS model can also be implemented and extended to suit different types of genres as proven by Bhatia (1993).

2.4.2 Bhatia's move model

Although the fields of study are different, based on the Swales' (1990) model, Bhatia (1993) proposes three models for three different types of studies. As for Bhatia's (1993) work on genre analysis, the most famous framework was business letters, specifically sales promotion letters. According to Bhatia (1993), sales promotion letter is unsolicited letter addressed to a selected group of prospective customers. The main communicative purpose of sales promotion letters is to persuade the customers to buy a product or service, in which the letter should be able to capture the attention of the potential customers. Hence, Bhatia (1993) proposed seven moves to prepare the sales promotion letter as shown below:

1. Establishing credentials
2. Introducing the offer
    a. Offering the product or service
    b. Essential detailing of the offer
    c. Indicating value of the offer
3. Offering incentives
4. Enclosing documents

5. Soliciting response
6. Using pressure tactics
7. Ending politely

Another type of genre that could be beneficial to discuss here is the genre of legislation cases as proposed by Bhatia (1993). He elaborated that legal language:

> (…) encompasses several usefully distinguishable genres depending upon the communicative purposes they tend to fulfil, the settings or contexts in which they are used, the communicative events or activities they are associated with, the social or professional relationship between the participants taking part in such activities or events, the background knowledge that such participants bring to the situation in which that particular event is embedded (p. 187).

Even though there were a variety of cases and judgments related to legislation, Bhatia (1993) narrowed his area of genre analysis to legislation and cases. Bhatia (1993) defined the communicative purpose of this genre as directive, to impose obligations and to confer rights. He also pointed out that the legislative writing is different from other varieties of English because the writer who created the legal texts is only a parliamentary draftsman. On the other hand, the readers of these texts are lawyers and judges, who are responsible for interpreting these provisions for ordinary citizens. Based on this notion, Bhatia (1993) proposed the following model as his move structure:

1. Identifying the case
2. Establishing facts of the case
3. Arguing the case
   a. Stating history of the case
   b. Presenting arguments
   c. Deriving *ratio decidendi*
4. Pronouncing judgment

The final model of move structure proposed by Bhatia (1993) was a move structure model for lab report introduction. This model was developed based on his move structure model for article introductions. The communicative purpose of this lab report introduction was to report the results obtained from the experimental research and it was written for a specific readership, which is the teacher. However, when comparing the structure and purpose of the lab report to research introduction, Bhatia (1993) concluded that this text-type may also be called as academic introductions. Hence, there were sections that replicated the structure of RAI, in which he then summarised them to three move structure as shown below:

1. Stating aim of the experiment
2. Establishing field
3. Explaining theory

As noted earlier, the three models mentioned above were proposed by Bhatia (1993), which originally grounded on Swales' (1990) CARS model. Table 2.4 below shows the summary of the three models of move structure for three different genres.

Table 2.4

Summary of Bhatia's Three Model of Move Structure for Three Different Genres

Business letter move structure	**Lab report introduction move structure**	**Legal case move structure**
1. Establishing credential 2. Inducing the offer a. Offering the product or service b. Essential detailing of the offer c. Indicating value of the offer 3. Offering incentives 4. Enclosing documents 5. Soliciting response 6. Using pressure tactics 7. Ending politely	1. Stating aim of the experiment 2. Establishing field 3. Explaining theory	1. Identifying the case 2. Establishing facts of the case 3. Arguing the case a. Stating history of the case b. Presenting arguments c. Deriving *ratio decidendi* 4. Pronouncing judgment

It can be summarised that the models proposed by Bhatia (1993) indicate that the Swales' (1990) CARS model can be extended to a new move structure model for different types of genres. Dudley-Evans (2000) described the initial proposed of genre analysis by Swales (1990) and Bhatia (1993) as generalised models that mostly applied to academic articles written in all academic fields. Hence, it can be concluded that the move structure proposed by Swales (1990) and Bhatia (1993) are important as their frameworks help analysts in defining the move structure and the role of each move in their texts.

2.5 Defining a Boundary

According to Connor and Mauranen (1999), the identification of moves in a text depends on two things. First, it is important to start from the rhetorical objectives of the texts, and to relate any aspects of analytical interest to these. Second, the text must be divided into meaningful units, essentially on the basis of linguistic clues. In short, to analyse moves we need both function indicators and boundary indicators. Connor and Mauranen (1999) identify the boundary based on the linguistic clues that are generally used in the texts to indicate the internal boundaries.

In move analysis, defining a boundary is important as moves organise the flow of information within a text (Davis, 2015). According to Davis (2015), some textual boundaries can be seen as physical such as headwords and phrases that are used as hints that can be accepted as the boundaries of certain moves. Other types of moves as mentioned by Davis (2015), are the spacing or indentations for new paragraphs even though some moves might go beyond the paragraph boundaries. However, it can be argued that the limits of a move cannot be immediately signalled by the headwords or clauses. Bhatia (1993) commented that he found the approaches that the researchers designed on their own were difficult and most of the time the boundaries were not reliable enough. In addition to that, Kanoksilapatham (2005, p. 270) states that the "absence of rules leads to questions of the reliability and empirical validity of the analysis". To overcome this issue, Kanoksilapatham (2005) sets the boundaries based on 'content and linguistic criteria' in analysing the moves of research article. Similar to Kanoksilapatham's (2005) framework, Holmes (1997, p. 325) demarcated the move in his study as a segment of text that is "shaped and constrained by a specific communicative function". According to Holmes (1997), this communicative function is visible through the content of each move, which is defined by the linguistic cues.

2.5.1 Linguistic clues for the identification of boundaries in genres

Most of the written texts are divided into segments such as sub-texts, chapters or sections. These segments are usually marked by the titles. According to Biber, Conrad and Reppen (1998, p. 123), these segments are not merely divided, but rather they often reflect major shifts in communicative purpose. They also add that differences in communicative purpose correspond to the linguistic differences which are more elusive than the titled divisions. Hence, it is more difficult to control such differences in use. Due to this, the very first step to analyse a text, according to Fontaine (2013), is to identify individual clauses. This is because the clause is the main unit of interest for the systemic functional linguist and it is through the clause that the meanings of the text are realised. Hence, the analyst must be able to divide the language into sections before he/she can complete the analysis. Fontaine (2013) also recommends looking at the language analytically to understand how the language works by identifying the components and their groupings or relations and how they function.

There are many ways to chunk a text. For instance, de Waard and Maat (2012) divided the text into clauses with a single (finite, or in some cases non-finite) verb in it, and decided not to segment out clauses that act as a subject and restrictive relative clause. Khalid (2013) segmented her text based on four elements: (1) the discourse markers, (2) changes in the thematic patterns, (3) tense and process changes, and (4) introduction of new lexical references and evaluative lexis.

Apart from that, Biber, Connor and Upton (2007) state that, moves and their component steps are identified by the functional and semantic purposes. However, due to different moves have different functional and semantic purposes, it seems reasonable to expect that move purposes will be realised through variations in linguistic features. Generally, there are three different types of linguistic analysis.

Firstly, lexical associations, in which the analyst investigates how the linguistic feature is systematically associated with particular words. Generally, the centre of the study will be the analysis of the meaning and use of the words, which is called lexicography (Biber, Conrad & Reppen, 1998). The area of the study basically will focus on (p. 21):

1. How common are different words?
2. How common are the different senses for a given word?
3. Do words have systematic associations with other words?
4. Do words have systematic associations with particular registers or dialects?

Secondly, grammatical associations, in which the analyst investigates how the linguistic feature is systematically associated with grammatical features in the immediate context. This includes morphology (the structure of words), syntax (the way words are arranged into sentences), and other properties of words, such as the grammatical classes that include nouns, verbs and adjectives (Biber, Conrad & Reppen, 1998, p. 55). Matthiessen and Halliday (2009) point out that grammar is a phenomenon of studying the rules of language which are interpreted based on different theories. Hanania and Akhtar (1985), in addition to that, note the grammatical choices are determined by the rhetorical considerations, and they showed that the choice of verb tense depends on the degree of generality intended. It can be concluded that there are a variety of techniques that can be adopted to perform linguistic analysis of a text. According to Thompson (2013), when conducting the linguistics analysis, it should go beyond than merely describing syntactic structures, and aim to explain why language is structured the way it is.

Lastly, the analysis of texts can also include both words and grammatical structure, or called lexico-grammatical associations. More attention has been paid on the lexico-grammatical analysis to relate it with the specific genres. For example, Love (1993) examined lexico-grammatical features of an introductory geology textbook that analysed the grammatical metaphor, features of verb type, subject-noun phrase, and choice of thematisation. The most influential model in studying the linguistic features however, is the framework proposed by Halliday in 1985 that is called Systemic Functional Grammar (SFG).

When defining the boundaries for the present study, a preliminary chunking of texts began with finding the source for recognition of elements. This was done by identifying the text division, in this case, the headings and subheadings were first identified. These headings and subheadings act as paragraph divisions and there are considered as a straightforward source. This type of paragraph divisions usually indicates a different content according to the sections and order of the presentation. On the other hand, linguistic clues under different headings and subheadings demonstrate internal coherence, tenses and process change and typographical cues as shown in the examples given below:

1. Situation 1 - The change of the subject (underlined) in the thematic position in both sentences indicates the shift in the generic structure of the text such as:

   Hydraulic system B includes the equipment necessary to store, pressurize, deliver, control, monitor, and filter the hydraulic fluid to operate the systems supplied by system B (Fig.2). Hydraulic fluid for system B is stored in a pressurized reservoir. (D&O, Text 13)

2. Situation 2 - Forms and tenses changes such as present/past, active/passive voice (underlined). For example,

   The system B reservoir is installed in the left body fairing area (Fig. 1). The reservoir is an airtight vessel consisting of a metal shell with supply, return, drain and balance line parts and fitted with attaching lines. (D&O, Text 13)

3. Situation 3 - Introduction of different types of verbs that indicate different types of processes, in this case, behavioural/material process (underlined) as in:

   The auto-throttle system is an electromechanical servosystem that controls the airspeed of the airplane by automatically positioning the throttles to maintain a selected airspeed. The auto throttle system consists of an autopower amplifier, the captain's mach/airspeed indicator, a system engage switch (…) (D&O, Text 2)

As noted earlier, the analysis of texts can also embrace lexico-grammatical associations with Halliday's systemic functional grammar (SFG) is the most influential.

2.5.2 Halliday's Systemic Functional Grammar (SFG)

According to Bloor and Bloor (2004), Systemic Functional Linguistics (SFL) is a 'system of meanings' when using the language. Normally, when people use language, their language acts construct meaning. Systemic Functional Grammar (SFG) which is part of SFL, is looking at words and sentences. In other words, it looks at language forms and then it studies how the forms of language represent meanings.

Thompson (2013), defines functional grammar as the study of linguistic forms in relation to the meaning that they express by investigating linguistics in two different areas: (1) the types of meanings that the writers might want to express, or the functions that they want to perform, and (2) the types of wordings that the writers can use to express these meanings. These meanings depend on the context such as the types of society that the readers or writers are associated with.

2.5.2.1 Metafunction

A central concept of SFG theory is that of metafunction as illustrated in Figure 2.1 below.

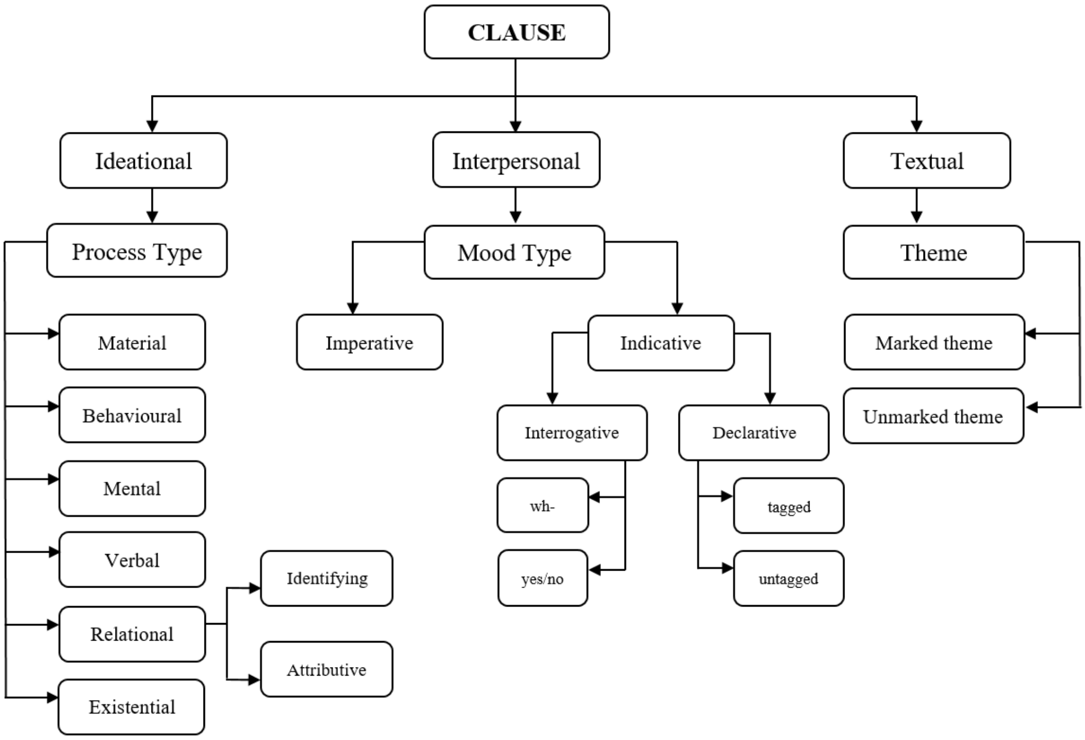


Figure 2.1 Halliday's systemic functional linguistic (1994)

There are three types of metafunctions that define the function of a clause as can be seen in Figure 2.1. The three metafunctions are: ideational, interpersonal and textual. The following sections discuss the three metafunctions.

2.5.2.1.1 Ideational metafunction

The ideational metafunction concerns with the transmission of ideas. Its function is that of representing processes or experiences like actions, events, processes of consciousness, and relations that covers "all phenomena and anything that can be expressed by a verb: event, whether physical or not, state, or relations", (Halliday, 1985; Halliday, 1976, p. 159, as cited in Darani, 2014). The ideational metafunction is divided into two sub-functions or modes, namely the experiential and the logical (Bloor & Bloor, 2004). The experiential metafunction focuses on the grammar of the clauses as a representation that involves process type system called Transitivity. Transitivity is the 'relationships established between the process, the participants and the circumstances encoded in the clause' (Banks, 2002, p. 3), as Eggins (2004, p. 214) points out below:

1. the selection of a process: the process choice will be realised in the verbal group of the clause as in '*Last year Diana <u>gave</u> blood*',

2. the selection of participants: participants will be realised in the nominal group such as, '*Last year* *__Diana__* *gave* *__blood__*',
3. the selection of circumstances: circumstantial meanings are expressed through adverbial groups or prepositional phrase, such as '*__Last year__* *Diana gave blood*'.

Eggins (2004) divides Transitivity to two different types of clause, namely process type which she categorises as major system, while another is called circumstantial or minor system as illustrated in Figure 2.2.

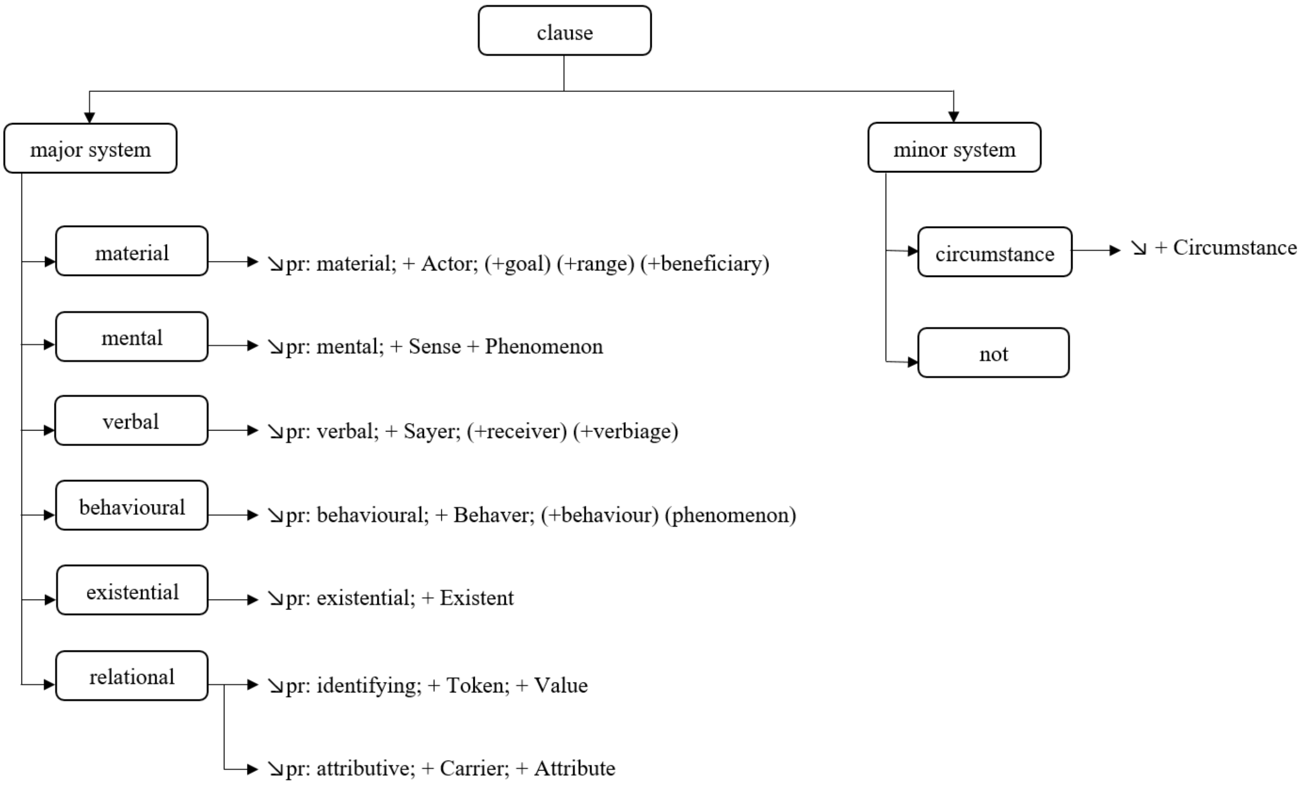


Figure 2.1 Transitivity (adapted from Eggins, 2004, p. 214)

The six types of processes in the transitivity system which is shown in Figure 2.2 are discussed below.

a. Material Process

The clauses under *Material* processes, according to Eggins (2004), describe the process of doing, usually concrete, tangible actions or in semantic definition, it is a process in which 'some entity does something or undertakes some action' (p. 215). Halliday and Matthiessen (2004) classify this process as 'doing-and-happening'. The clauses under this process can usually be identified by asking question such as '*What did x do*?'. There are two participants in the materials process, namely (1) Actor, and (2) Goal, for example:

Table 2.5

Examples of material process

The drain valve The buzzer	controls makes	potable water drainage. a loud noise to let people know.
Actor	Pr: material	Goal

b. Mental Process

Mental process shows the connotation of feeling or thinking as in '*I hate injections*', and '*I don't understand her letter*' (Eggins, 2004, p. 225). To recognise this type of process, the questions such as '*What do you think/feel/know about x?*' can be applied. There are three different types of verbs used to represent mental process: (1) cognition (verbs of thinking, knowing, understanding), (2) affection (verbs of liking, fearing), and (3) perception (verbs of seeing, hearing) (Eggins, 2004, p. 225). In the mental process, there are two participants called senser and phenomenon, as shown in Table 2.6.

Table 2.6

Examples of Mental Process

Example 1		
Jessy	hates	flowers.
Senser	Pr: affection	Phenomenon
Example 2		
Aminah	hears	a loud noise from the aeroplane.
Senser	Pr: perception	Phenomenon

c. Verbal processes

Verbal processes are clauses of saying, as in ‘*What did you say*? – *I said it’s noisy in here*’ (Halliday & Matthiessen, 2004), with *you* and *I* functioning as Sayer. The participants of this process are: sayer (participant who speaks), receiver (the one to whom the verbalisation is addressed), verbiage (a name for the verbalisation itself) (Muhammad Rayhan Bustam, 2011, p.28). Table 2.7 illustrates the examples of verbal process.

Table 2.7
Examples of Verbal Processes

Example 1			
My office mates	are discussing	about the latest news.	
Sayer	Pr: verbal	Cir: manner	
Example 2			
Her mother	asked	her	a lot of questions.
Sayer	Pr: verbal	Receiver	Verbiage

d. Behavioural process

According to Eggins (2004), the meaning realised in behavioural process is categorised as ‘mid-way’ between mental and material processes. This is because, according to Halliday and Matthiessen (2004), this behavioural process has no clearly defined characteristics of their own. The boundaries of this process are difficult to be distinguished, and hence, Bustam (2011, p. 28) suggests two principles as a rule of thumb to identify behavioural process:

(1) the verb for behavioural process is intransitive, in which it has only one participant, and
(2) the verb for behavioural process indicates an activity that both the physical and mental aspects are indispensable to it.

Table 2.8 shows the examples of behavioural process.

Table 2.8

Examples of Behavioural Process

She	sighed	with despair.
He	coughed	loudly.
Behaver	Pr: behavioural	Cir: manner

e. Existential Process

Eggins (2004) asserts that existential processes represent experience by positing that 'there was/is something'. This type of process is easy to identify as the structure involves the use of the word 'there'. The function of the word 'there' is to represent the Subject called existential Subject in the clause. This existential process employs the verb *be* or synonyms such as *exit*, *arise* and *occur* followed by a nominal group that functions as Existent.

Table 2.9

Examples of Existential Process

There There	are are	three indicating discs on the lower right aft fuselage. three control units, one for each fire area.
	Pr: existential	Existent

Halliday and Matthiessen (2004) point out that, any existing phenomenon can be construed as a 'thing': person, object, institution, abstraction, action or event.

f. Relational Process

Relational processes serve to 'characterise' and 'identify' (Halliday & Matthiessen, 2004). There are two types of relational processes, namely Attributive and Identifying. Each of these two types represents three kinds of relation which are: (1) intensive, (2) possessive and (3) circumstantial as summarised below.

Table 2.10

Summary of Types and Sub-Types of Relational Process (Eggins, 2004, p. 239-249)

Type	Sub-type & Definition	Example
Attributive Participants: Carrier & Attribute	**Intensive** • *x* is a member of the class *a*	• Diana[Carrier] is[Intensive] a talkative dinner guest[Attribute] • She[Carrier] became[Intensive] suspicious[Attribute]
	Circumstantial • Often expressed in the Attribute (prepositional phrase or an adverb of location, manner, cause etc.)	• The bomb[Carrier] was[Intensive] in her luggage[Attribute/Cir:location] • The operation[Carrier] lasted[Pr:circumstantial] one hour[Attribute]
	Possessive • Possession may be encoded through the participants - the Attribute • The possessor, and the process remaining intensive	• This[Carrier] is[Pr:intensive] yours[Attribute/Possessor] • You[Carrier/possessor] have[Pr:possession] 8 pints of blood[Attribute:possessed] • The bag[Carrier/possessed] belonged to[Pr:possession] the boyfriend[Attribute/possessor]
Identifying Participants: Token & Value	**Intensive** • *x* serves to define the identity of *y*	• You[Token] are[Intensive] the skinniest one here[Value] • Her smile[Token] expressed[Intensive] pleasure[Value]
	Circumstantial • Meaning is encoded within either the participants or the process • If meaning is encoded through the participants, both the Token and the Value will be circumstantial elements of time and place	• The operation[Token] took[Intensive] one hour[Value] • A milk bottle[Token] holds[Pr:circumstantial] one litre of liquid[Value]
	Possessive • Identifying possessive process is to own • Can be in a form of passive • The Token or Value can be the Subject	• Her boyfriend[Token/Possessor] owned[Pr: possessive] the house[Value/Possessed] • The house[Value/Possessed] was owned by[Pr: possessive] her boyfriend[Token/Possessor]

According to Cordeiro (2018), the system of transitivity is usually realised simultaneously with the interpersonal meanings. The following section discusses the interpersonal metafunction.

2.5.2.1.2 Interpersonal metafunction

Bloor and Bloor (2004) assert that language in interpersonal metafunction is used to enable humans to participate in communicative acts with other people, to take on roles and to express and understand feelings, attitude and judgments. Interpersonal metafunction is realised by mood to indicate the clauses and their meanings. The mood comprises subject and finite elements (Cordeiro, 2018), and these are the fundamental elements to interpersonal meaning (Fontaine, 2013).

Hence, when analysing a clause for interpersonal metafunction, the clause will be categorised according to mood and residue (Halliday, 1994), with the mood element further analysed into subject and finite. The relations between 'what sentences mean, and their uses' can be said as the reasons to analyse mood (Davidson, 2001). This is because the moods classify sentences, while uses classify utterances such as to make assertions, to give orders, to express wishes and to ask questions. Davidson (2001) also states that the associated classes of utterances are identical, such as utterances of imperatives are commands and utterances of interrogatives are question-asking. Table 2.11 shows the examples of sentence patterns and their types.

Table 2.11

Examples of Sentence Pattern in Association with The Characteristics and Sentence Types

Sentence pattern	**Characteristics**	**Sentence types**
Mike is leaving	Subject-whole verb	declarative
Is Mike leaving?	Part of verb-subject-rest of verb	interrogative
Leave!	Verb by itself	imperative
How awful Mike is leaving! *What a shock Mike is leaving!*	*How* (…) or *What a* (…) - followed by remainder of sentence	exclamatory

To sum up, the mood system can be illustrated in Figure 2.3.

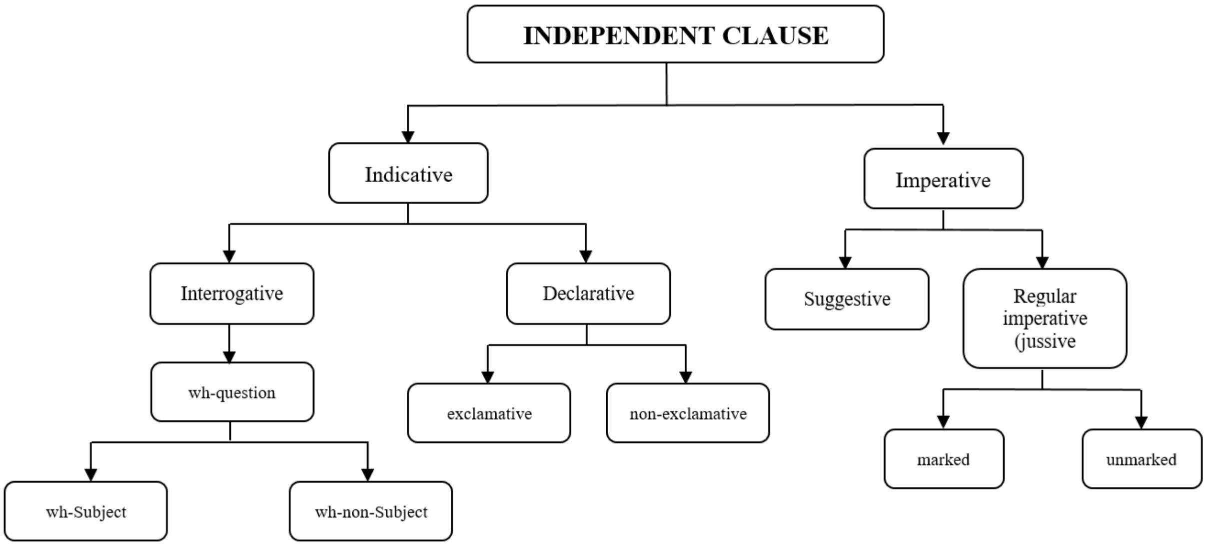


Figure 2.2 The mood system (adapted from Fontaine, 2013, p. 135)

According to Fontaine (2013), interrogative and declarative moods are expressed by inverting the subject and finite as in '*can you believe that?*' or '*you can believe that*' (p. 134-135). The third person singular such as *he*, *she* or *it* are the source of mood indicators in the indicative mood. Imperative mood, on the other hand does not have the inflectional markers and most frequently, neither the subject nor the finite is expressed. However, it can be argued that imperative clauses are finite and therefore there must be a finite element, which can be recovered. Some would argue that the imperative is marked by a null affix. Halliday (2002, as cited in Fontaine, 2013, p. 136), explains that 'it is present in all clauses of all moods, but its significance can perhaps be seen most clearly in the imperative (because) the speaker is requiring some action on the part of the person addressed'. Imperative clauses can be identified by checking the effects of adding an overt subject and finite element and comparing this with the resultant structures in both positive and negative polarity. According to Fontaine (2013), by doing so, we will find the effect of negative polarity contrasting the imperative mood with the indicative mood in English.

2.5.2.1.3 Textual metafunction

The textual metafunction of the language allows for the analysis of theme and cohesive devices. The language in this metafunction is used to relate what is said (or written) to the rest of the text and to other linguistic events. This involves the use of language to organise the text itself. The textual metafunction is realised through the word order of the sentences, whereby the writer sequences the message for the reader through numerals such as first, second, third and fourth. Halliday (1977, p. 181) as cited in Forey and Sampson (2017, p. 131), states that the function of the textual metafunction is:

> (…) specifically that of creating a text, of making the difference between language in the abstract and language in use in other words, it is through the semantic options of the textual component that language comes to be relevant to its environment.

Textual metafunction is analysed through theme and rheme system. Theme in English refers to the initial position of the clause or called as first group or phrase that has some function in the experiential structure of the clause. If theme is realised by the initial position, rheme is realised by non-initial position.

2.5.3 Summary

Bloor and Bloor (2004) state that all three metafunctions operate simultaneously in the creation of meaning in relation to the context and there are usually misunderstood by being independent. Hasan's (2009, p. 9) concept, that concurs with this notion states that the metafunctions "are not hierarchised; they have equal status, and each is manifested in every act of language use: in fact, an important task for grammarians is to describe how the three metafunctions are woven together into the same linguistic unit". To support this, Halliday (1994, p.xiii) states:

> All languages are organised around two main kinds of meaning, the 'ideational', or reflective, and the 'interpersonal', or active. These components, called 'metafunctions' in the terminology of the present theory, are the manifestations in the linguistic system of the two very general purposes which underlie all uses of language: (i) to understand the environment (ideational), and (ii) to act on the others in it (interpersonal). Combined with these is a third metafunctional component, the 'textual', which breathes relevance into the other two.

Although there are three metafunctions under SFG, this study narrows down to adopt only the ideational and interpersonal metafunctions. Therefore, when analysing linguistic features to realise all the moves in Chapter 5, this study will be based on system of transitivity and mood system.

2.6 Introduction to Simplified English (SE)

In her interesting analysis of the use of phrasal verbs and the choice of common English vocabulary, Thrush (2001) categorises three different types of English systems: Plain English, Controlled Language and Simplified English. One common purpose of these systems is to produce English that is readable, accessible and usable.

According to Thrush (2001), Plain English is a language intended to be used for a variety of documents, settings, and purposes, and allows the writer much more opportunity to use the language. Consequently, Plain English is more popular to be used for government documents, especially those intended for consumers, taxpayers, and other non-specialist readers.

Controlled Language Systems, on the other hand, are designed for human and machine translation to improve the clarity of communication among professionals in the same line of work. A controlled language (CL), which can be categorised as a restrictive language, refers to a system that limits the language to a set number of core vocabulary, with guidelines on grammar, mechanics, and style of writing (Spaggiari, Beaujard & Cannesson, 2003, Disborg, 2007). However, according to Reuther (2003), the definition of CL actually depends on the intended application scenario. The first aim of CL is to improve the readability, comprehensibility, clarity, and consistency of text, targeted for human readers (Reuther, 2003) or labelled as human oriented (Disborg, 2007). Another aim of CL is to improve translatability of technical text to be machine-oriented (Disborg, 2007). These purposes of CL were summarised by Heald and Zajac (1998) as to simplify the reading and writing of technical documentation like the user manuals or maintenance manuals.

On another note, Muegge (2009) states that CL differs from general language in two significant ways:

1. The grammar rules of a controlled language are typically more restrictive than those of a general language.
2. The vocabulary of a controlled language typically contains only a fraction of the words that are permissible in a general language.

The vocabulary of CL can be divided into approved and unapproved words. Approved words include the information such as the correct spelling of the word, its syntactic category, a definition and one or more suggestions of the words that might be used to express the same meaning (Disborg, 2007). By following these rules, the quality of the technical documentation can be improved due to the lessening of the ambiguities, colloquialisms, and synonyms (Mogensen, 2004).

The specific rules for CL differ from the grammar of ordinary language, which according to Mogensen (2004, p. 250) serve two purposes:

1. to make sure that writers use the terms and sentence structures that are permitted in the controlled language system in question, and
2. to make texts less ambiguous.

CL has been used in the technical domain, such as Caterpillar Tractor Company which developed a 900-word specialised vocabulary or called Fundamental English in 1971, which has been used successfully for writing product documentation. Apart from that, CL was also used by Douglas Aircraft Company in 1979 to construct a dictionary of about 2,000 words to be used in their technical manuals.

Simplified English (SE) is the term used by the European Association of Aerospace Industries (AECMA) for its own controlled version of the language specific to aircraft maintenance (Thrush, 2001). AECMA SE, according to Disborg (2007), consists of limited vocabulary and a set of rules intended to increase the readability of technical texts. It is called a "controlled language" because these rules imposed on the writers in the areas of:

- Simple syntax
- A limited number of words
- A limited number of clearly defined meanings for these words by implementing the rule of each word can only have one meaning
- A limited number of parts of speech for the words, where each word has only one part of speech

According to Shubert, Holmback and Spyridakis (1995), Simplified English (SE) project started in 1979 with a request made by the Association of European Airlines, which approached the AECMA to investigate a possible form of controlled English to be used by all the manufacturers in their maintenance manuals (Knezevic, 2015). After researching several types of CLs that existed in other industries, AECMA decided to produce its own CL. AECMA SE Guide was first released in 1986 (ASD, 2013) and later was adopted by the Air Transport Authority (ATA), the Aircraft Industries Association (AIA), as well as Boeing distributed its maintenance manuals which were written in SE since 1990. ATA (1999) states in its manual called the ATA Specification 100 that the writing rules and vocabulary used in aircraft manuals should be in accordance with the AECMA SE Document. Boeing, in addition to that, used SE in their procedural documents because they wanted a set of writing rules that would provide uniform, comprehensible documents for their customers. This is due to the fact that their users could be native or non-native English speakers. Hence, they hoped that SE restrictions would provide the readers with consistent documentation to guide them through their tasks.

The three types of the language systems above were all based on the research on how the readers process the texts, so they tended to focus on the same principles of writing, particularly on the reduction from the vast vocabulary of English to terms most readily understood and, on the use of easily processed syntactic forms. The discussions on CL and SE are related to the development to the latest language system that is used in the aviation industry called Simplified Technical English (STE).

In 2004, AECMA became ASD (Aerospace and Defence Industries and Associations of Europe, 1989/2009), and the SE was revised and became an official specification called ASD-STE100. The creation and the correct application of the ASD-STE100 standard has significantly reduced the number of human errors made during the execution of maintenance tasks.

Similar notion to CL and SE, STE is categorised as a restricted language, which was designed and developed to eliminate ambiguity. It is an international specification that consists of writing rules and a dictionary of controlled vocabulary, for the preparation of maintenance documentation in a controlled language (ASD, 2013). STE focuses on the rule of readability so that it is easier for the readers to learn and understand the text without the need to be translated.

ASD (2013) divides its STE restrictions into two parts: Part 1 - writing rules, and Part 2 - dictionary. This study only analyses the writing rules in the AMM specifically the rules of grammar. The following discussion will only cover the first part of STE-guide. There are nine different categories of ASD-STE100 restrictions as shown in Table 2.12.

Table 2.12

ASD-STE100 Restrictions in Nine Different Categories (adapted from ASD, 2013, p. 1-0-3 – 1-0-7)

Section	Rule	Elaboration
Section 1	Words	This section provides the technical writers with the rules in using words and their forms, technical names and verbs, which are stated in the ASD-STE100 dictionary. It also includes the rules of consistency in spelling.
Section 2	Noun phrases	This section requires the technical writers to use noun clusters, in which they are not recommended to use noun clusters of more than three nouns. The writers are also required to use articles where appropriate.
Section 3	Verbs	This section requires the technical writers to use the approved forms and tenses of verbs. This includes the usage of active and passive voice, as well as the approved verbs to describe actions and procedures.
Section 4	Sentences	This section provides the technical writers with the types of sentences allowed to be used such as short sentences, vertical lists and connecting words. According to the core concept of STE, sentences should be as short as possible. In line with that the writers are told to write about one topic in each sentence, to use tabular layout for text containing a lot of information and to present information slowly in a logical order by using connecting words such as: *thus*, *and*, *but*, etc. Furthermore, the writers are also told to omit words in order to keep sentences short.
Section 5	Procedures	This section provides the technical writers with the given rules on how to write the procedures. For example the writers are told to use a maximum of 20 words per sentence, to write one instruction per sentence if not more than one action is done at the same time, and to use the imperative form.
Section 6	Descriptive writing	In this category the technical writers are given instructions on how to write descriptions. For example, the writers are required not to use more than 25 words per sentence, and to use paragraphs in a way that shows the logical order of the text. Furthermore, they are also required to apply different rules for how paragraphs should be written using commands.
Section 7	Warnings, cautions and notes	In this category, the technical writers are given the instructions on how to write warnings, cautions and notes, in which the writers are provided with the types of sentences required when writing these three safety notes.
Section 8	Punctuation	In this category, rules are given concerning how to use

	and word counts	punctuations and how word counts are performed. The only unapproved punctuation to be used when writing the manuals is semicolons.
Section 9	Writing practices	In this category, instructions are given on how to rewrite the sentences when a word-for-word replacement is not sufficient according to other rules of STE together with general writing practices. This section also includes the rule on how to use correctly the approved words.

Referring to Table 2.12 above, this thesis focuses on two sections to analyse the linguistic features in order to identify the boundaries to move analysis, namely Section 3 (Verbs) and Section 7 (Warnings, Cautions and Notes). Section 3, which covers the rules on using the verbs in writing the manuals consists of eight sub-rules, which are summarised in Table 2.13 below.

Table 2.13

Summary of ASD-STE100 Rules of Verbs (adapted from ASD, 2013, p.1-3-1 – 1-3-6)

Rule	**Topic area**	**Elaboration**
Rule 3.1	Verbs listed in the Dictionary (Part 2)	This rule covers the forms of verb that are listed in the Dictionary, which is included in ASD-STE100. The forms of verb that are approved such as *Adjust*, *Adjusts*, *Adjusted*, *Adjusted*, with the second form *Adjusted* to be used as past participle.
Rule 3.2	"-ing" form of verb	ASD-STE does not allow the of "-ing" form of verb as in '…*is adjusting*' unless it is part of a Technical Name. However, the verbs with "-ing" that are used as a Technical Name such as '*grinding wheel*', '*polishing jag*', and '*warning*' are allowed to use.
Rule 3.3	Approved forms of verb	This rule states that the approved forms of verb as shown below are allowed to be used in writing the AMM. - The infinitive (TO ADJUST, or simply ADJUST) - The imperative ("command" form) (ADJUST something) - The simple present tense (it ADJUSTS, you, we, they ADJUST) - The simple past tense (it ADJUSTED) - The past participle as an adjective (the ADJUSTED linkage) - The future tense (you will ADJUST)
Rule 3.4	Past participle as an adjective	This rule allows the technical writers of AMM to use past participle only as an adjective, either with a noun or after the verbs TO BE, TO BECOME such as 'The wires become disconnected.' (Adjective after "*become*"). There are some irregular verbs, which are not permitted to be used such as "*been*" or "*gotten*".
Rule 3.5	Past participle with a form of the verb HAVE	Technical writers are not permitted to use past participle with a form of the verb HAVE to make an unapproved tense such a '*has adjusted*' or '*has been adjusted*'. Instead it has to be written as '*adjusted'* or '*was adjusted*' (after a form of TO BE)
Rule 3.6	Past participle with a helping verb	Technical writers are not allowed to use past participle with a helping verb such as 'can', 'must' or 'will and a form of the verb 'TO BE' to make a complex verb. For examples: '*can be adjusted*', '*will be adjusted*' or '*must be adjusted*'. Instead these verbs should be written as '*you can adjust*', '*will adjust or adjusts*' or '*adjust the..*'.
Rule 3.7	Active voice	This rule requires the technical writers to use only the active voice in procedural writing, and as much as possible in descriptive writing. Hence, the passive sentence such as '*The circuits are connected by a switching relay*' is considered as Non-STE (Simplified Technical English). Instead, it has to be written as '*A switching relay connects the circuits*.'
Rule 3.8	Describing action	This rule requires the technical writers to use the verb (not a noun or other part of speech) if there is an approved verb to describe an

		action. This is because the primary function of a verb is to express action. For example, 'The meter gives an indication of 450 ± 22 ohms' is labelled as Non-STE. Instead the sentence should be written as 'The ohmmeter shows 450 ± 22 ohms'.

Another rule in the ASD-STE100 that is related to this study is Section 7 that covers the guidelines to write the safety notes that consist of Warnings, Cautions and Notes, which are labelled as *Precautionary Note* (PN) in this study. Table 2.14 below summarises the guidelines that are covered under Section 7.

Table 2.14

Summary of ASD-STE100 Rules of Writing Warning, Caution and Note (adapted from ASD, 2013, Section 7: p.1-7-1 – 1-7-4)

PN	**Topic area**	**Elaboration**
Warning and Caution	Start with a simple and clear command	This rule requires warnings and cautions to begin with a Simple and clear command. This command tells the users what they must do to avoid the danger and/or damage. The command should not be hidden as a general comment with other background information. The technical writers are required to start with the command, and then give the supporting information. For example: '*Do not get the engine oil on your skin. The oil is poisonous. It can go through your skin and into your body*'.
	Be specific	When writing warnings and cautions, it is a must to tell the users exactly what they must do and what can happen. This is to get their attention immediately. Technical writers are not permitted to write the warning or caution as a general comment such as, '*Extreme cleanliness of oxygen tubes is imperative*'. Instead, it should be written as '*Make sure that the oxygen tubes are fully clean*'.
	Add brief explanation	The technical writer is recommended to add a brief explanation to a warning or a caution if necessary. It is needed to inform the readers of a reason for the warning or caution. For example, '*If the grabber is not engaged, damage to the pylon structure can occur*'. The purpose of the brief explanation is to give a clear idea of the possible risk if the readers do not obey the instructions.
	Identify command correctly	Brief explanation and risk statements that are added to a command helps the readers to easily identify that the safety note is either warning or caution. For example: '*Extreme cleanliness of oxygen tubes is imperative*' – Non-STE Instead, it should be written as '*Make sure that the oxygen tubes are fully clean*' – STE
	Condition in warning and	If a condition is necessary before the technician continues with the task, this condition should be positioned first in the warning and

	caution	caution. For examples: ‘*Before you open the circuit breakers…,*’ *‘before you move the ailerons…*’.
Notes	Notes as information	The purpose of notes is to give additional information for the readers to obey the instructions written in the work steps. Therefore, the technical writers are not permitted to write the notes in imperative form of the verb such as: ‘*The gyroscope will become stable after approximately 15 seconds*.’ If note is written in the imperative form, the note will become a work step. If the technical writers think there is a need to use imperative, they have to consider writing the note as a procedural step as shown in the example below: ‘*(6) Make sure that the avionics ventilation continues to operate correctly*.’

The analysis to categorise the verb form tenses of three *Page blocks* of the AMM will be performed with the guidelines stated in the ASD-STE100 (ASD, 2013). The following is the discussion on the verb form tenses.

2.6.1 Related studies on Controlled and Simplified English

As noted previously, there are three different types of English systems: Plain English, Controlled English (CE) and Simplified English (SE) (Thrush, 2001). These English systems produce English that is readable, accessible and usable. The following section discusses previous studies in the areas of CE and SE.

The first study in the area of CE was by O’Brien (2003). He analysed eight CE rule sets to find out to what extent the Controlled Languages (CLs) shared the common rules. The eight CE rule sets which were included in the analysis were: AECMA Simplified English, Attempto Controlled English, Alcatel’s COGRAM, IBM’s Easy English, GM’s CASL, Océ’s Controlled English, Sun Microsystem’s Controlled English and Avaya’s Controlled English. According to O’Brien, only AECMA SE was classified as a Human-Oriented Controlled Language (HOCL), while the other seven were classified as Machine-Oriented Controlled Languages (MOCLs). O’Brien (2003) analysed CL based on these three rules:

1. lexical - examples: vocabulary usage, abbreviation, prefix/suffix usage and spelling.

2. syntactic - examples: subject-verb agreement, modifier usage, adjective/adverb functionality and ellipsis.
3. Textual - examples:
   a. text structure rules - layout, sentence length, keyword usage, word counting.
   b. pragmatic rules - textual devices, verb form usage, text type structure, text type labelling.

Her analysis revealed that there was only one rule, which was common to all CLs; the rule which promoted short sentences. O'Brien (2003) concluded that the definition of CL is largely individual for the eight CE rule sets which were tested. Lastly, the linguistic phenomena included in CL rules varied to a significant extent from one organisation to the next. Hence, this is not helpful for any organisation who wishes to implement CL to build on the work of others.

Hence, CL is important when writing the documentation for the products of a company as the documentation is not prepared for entertainment. By using CL, the instructions and information that have to be communicated to fulfil the needs of the company to sell products would be perfectly understandable to customers. This leads to fewer misunderstandings and fewer risks of errors, raising the clarity and readability of its texts. In technical documentation, communicative function is of primary importance. Hence, it is necessary to ensure that the use of language to describe a specific task is unambiguous (Mogensen, 2004).

To date, most of the studies in the discourse of technical manuals focused on SE. For example, Shubert, Spyridakis, Holmback and Coney (1995) examined the effect of two document types written in SE and non-SE towards native and non-native English speakers. The investigation includes the comprehensibility, identification of content location, and task completion time procedure documents for airplane maintenance. Two different procedures were chosen as their texts, with one written in SE and another in non-SE. They found that the use of SE significantly improved the comprehension of procedures by native and non-native English speakers, with the greatest benefit to non-native English speakers.

Another example of the study was by Chervak, Drury and Oullette (1996). They conducted a test on the efficacy of SE for comprehension of documentation that was used by Aircraft Maintenance Technicians (AMTs) at the work site. They used actual examples of workcards which were produced by Boeing in pre-SE maintenance manual language and modified according to SE standards. This is to ensure that workcards represented actual writing practice by those who write the maintenance manual procedures. Thus, the workcards could be said as to be realistic to AMT. The readability level of the workcards were also tested using Flesch-Kincaid reading score and classified as "easy" and "difficult". Chervak et al. (1996) found that their SE workcards allowed non-native English speakers to achieve the same level of performance as native speakers. However, this is not the case with the non-SE versions of the workcards.

Shubert, Holmback and Spyridakis (1995) conducted three inter-related project to test the effects of SE as it was used in maintenance procedure documents in the airline industry. Their study examined the effects of document type (SE versus non-SE) and passage (Document A versus Document B) on the translatability of these documents. This study revealed that Spanish speakers produced qualitatively better translations of SE documents than non-SE documents.

To conclude, these three studies indicated positive impacts. The maintenance procedure documents and the workcards showed that the use of SE:

1. is comprehensible to non-native English speakers,
2. improves level of understanding among non-native English speakers, and
3. produces better translations of SE documents.

Heald and Zajac (1998), on the other hand, examined the SE rules for Noun Phrase as outlined in AECMA SE Guide (AECMA, 1995), now known as ASD-STE100. Their area of research was on linguistics and communicative principles for CLs. There were two major issues mentioned by Heald and Zajac (1998):

1. *Do not make noun clusters of more than three nouns* - The definition of a noun as in "more than three nouns" leads to difficulty to understand by the readers who have poor knowledge of English as most compound nouns are in fact names which are more than three words long. The readers also might face difficulty to understand a phrase if the relationship between the words is not clear.
2. *Use hyphens to show relationship between the most closely related words* - This became an issue when some of the Technical manuals were in fact names of parts such as 'nose wheel steering system shutoff'. Wrongly positioning the

hyphen between the words can convey different meaning. With the rule that the Technical Names are not permitted to be changed, the number of hyphens per compound permitted is not stated clearly.

They concluded that the problems in interpreting and applying the rule of Noun Phrases could be clarified if the interaction between the rules and their domain of application were made explicit. Due to that, Heald and Zajac (1998) suggested that:

- Technical Names are excluded from the domain of application of the rules.
- A dictionary of technical names is provided which would contain properly hyphenated names.
- The application of the hyphenation rule could then be restricted to names of parts or tools, for which a terminological dictionary could also be provided, alleviating the need for this problematic rule altogether.
- The three nouns rule could then be applied to other cases, but counting a hyphenated compound as a single noun.

To conclude, these previous studies are not directly related to this study. However, the discussions above are important to my study as they helped me to understand the features of AMM. As for the AMM of two aircraft for this study, it was found that these AMMs were manufactured between 1997 and 1998. Hence, the AECMA SE Guide was used as the guidelines on how to write the manuals. Since the AECMA manual could not be retrieved, the ASD-STE100 manual was used for the verb form tenses analysis in Chapter 6. Even though the ASD-STE 100 is more recent compared to the AECMA, this manual was developed according to the AECMA. Due to this, it is assumed that the writing rules that involved grammar such as tenses were similar to the AECMA SE Guide. The only changes made were associated with revising the explanatory texts, examples and additional notes instead of the writing rules (ASD, 2013, p. H1-3).

2.7 The Concept of Tenses and Modals

The tenses are the combination of tense and aspect. Tense has been defined as the grammatical category that establishes a relationship between two time locations: time of utterance and the time of the situation. There are three basic tenses that form the backbone of linguistic work on time reference in grammar, which are the present, past and future. These three tenses can be described as: present tense means coincidence of the time of the situation and the present moment, past tense means location of the situation prior to the present moment, future tense means location of the situation after the present moment (Comrie, 1985, p. 36). Since tense locates the time of the situation relative to the situation of utterance, tense can then be described as deictic. Aspect, on the other hand, deals with the internal temporal constituency of the situation as summarised in Table 2.15.

Table 2.15

The English Tense-Aspect Systems (adapted from Larsen-Freeman, Celce-Murcia, Frodesen, White, & Williams, 2016, p. 107)

THE TENSE-ASPECT COMBINATIONS IN ENGLISH				
Aspect Tense → ↓	*Simple*	*Perfect*	*Progressive*	*Perfect Progressive*
	Ø	*have + -en*	*be + -ing*	*Have + -en be + -ing*
Present	eat/eats talk/talks	has/have eaten has/have talked	am/is/are eating am/is/are talking	has/have been eating has/have been talking
Past	ate talked	had eaten had talked	was/were eating was/were talking	had been eating had been talking
Future	will eat will talk	will have eaten will have talked	will be eating will be talking	will have been eating will have been talking

Larsen-Freeman, Celce-Murcia, Frodesen, White and Williams (2016) confirm that generally, there are 12 combinations of tense and aspect.

The purpose of tense-aspect in the present study is to indicate the different patterns of verb forms and tenses used in three *Page blocks*. This is of importance as ASD (2013) mentions three types of tenses: Simple present tense, Simple past tense and Future tense that should be used when writing the technical manuals.

Generally, when discussing about the concept of tenses, it would be associated with the concept of time and rhetorical factors. However, as pointed out by Malcolm (1987), tense choice in English for Science and Technology (EST) can be postulated as not dependent on time lines, non-temporal and not solely associated with the contextual uses. As for this study, the tense choices of technical manuals focused on the use of verb form tenses to identify the pattern of verb form tenses in each move and its steps. As ASD-STE100 (ASD, 2013) only stresses three types of tenses: Simple present, Simple past and Future tense, the tense choice for the present study is predicted as also not dependent on time lines, non-temporal and not solely associated with the contextual uses (Malcolm, 1987).

Apart from verb form tenses, this thesis also includes an analysis on modality (Chapter 6) as this topic is not covered in the ASD-STE100 (ASD, 2013). Yet, modal verbs are found in the present corpus. There are two types of modality, namely necessity and possibility, while epistemic and deontic modality are the forms that exist in the classification types. The examples of the modal verbs and their meanings are illustrated in Table 2.16:

Table 2.16

Description of Modal Verbs, Definitions and Examples (Biber, Johansson, Leech, Conrad & Finegan, 1999, as cited in Torabiardakani, Khojasteh & Shokrpour, 2015, p.52, Larsen-Freeman, Celce-Murcia, Frodesen, White, & Williams, 2015, p. 142-143)

Meaning	Definition	Example
Must		
Obligation	Expressing the agent's responsibility to do something	You ***must*** not close the circuit breakers.
Necessity	Logical concludes something is likely/necessary based on evidence available	All ports ***must*** be masked or plugged to prevent the entrance of foreign material.
Should		
Obligation	The agent is obliged to do something	Engine fuel hose ***should*** be completely disconnected to avoid possibility of excessive pressure.
Recommendation	Logical concludes something is likely/necessary based on evidence available	Operators ***should*** page through the directory and write the file name.
Would		
Prediction	Is used for future time reference when there is the sense of possibility on the result due to certain situation	Distortion of bracket ***would*** result when bracket attach bolts are torqued.
Shall		
Suggestion	Is used in making suggestions that require confirmation or advice	Elements ***shall*** not be twisted, pulled or clamped under tension.
Obligation	The agent is obliged to do something	Cutting tools ***shall*** be of hardwood or soft plastic material.
Can		
Possibility	Expressing the degree to which something is possible	An electrical shock ***can*** cause injuries.
Ability	Evidence of an animate agent that is capable of doing something	The flaps and the slats ***can*** accidentally operate quickly.
Could		
Possibility	Expressing the degree to which something is possible	The pressure reaches a value that ***could*** damage the oxygen cylinder.
May		
Possibility	Expressing that there is less likelihood that the possibility will be realised	A missing lamp ***may*** allow spring contact to touch lamp socket.

		Lens ***may*** break.
Might		
Possibility	Expressing agent's doubt in the truth of proposition	Troubled mechanical ***might*** be located within motor/actuator assembly. Collapsed aluminum tubing ***might*** cause fuel flow restriction.

2.8 Conclusion

To conclude, the main aim of this chapter is to provide background information on the theories that are related to genre analysis. The theories as discussed earlier are those related to: discourse community, communicative purpose as proposed by Swales (1990) and Bhatia (1993), and certain theories working within SFG, SE and the concept of tenses and modals for linguistic analysis purposes. The discussion of the theories was chosen as the foundation to the analysis which follows. The theories and the previous research to specific parts of the analysis, such as discourse community, move analysis and linguistic features in technical manuals will be explained in their respective chapters.

CHAPTER 3

THE DISCOURSE COMMUNITY SAMPLE OF AIRCRAFT MAINTENANCE

3.1 Overview

Discourse community is a key concept of genre analysis in ESP as the texts used will correspond with the communicative purposes. Askehave (1999) suggests that the context in which a text is used should be analysed prior to identifying its purpose. Askehave (1999) also points out that it is important to study the contexts and participants in the genre to identify the purpose of the genre. To date, most studies on discourse communities in the field of aircraft maintenance have mainly focused on the safety issues that are related to human factors. The studies among others were to determine the maintenance errors occurred due to human factors (Drury, 1991; Hobbs & Kanki, 2008). As a result, there are no studies conducted on the background of discourse community of aircraft maintenance that I could refer to.

3.2 Purpose of the Study

This chapter aims to analyse the discourse community of aircraft maintenance to understand their goals and the purpose of communication in order to achieve these goals. The analyses conducted in this chapter are directed to answer the following research question:

- Who are the key members in the discourse community of aircraft maintenance and what are the communicative activities that influence or complement their reading activities?

The first part of the research question '*who are the key members in the discourse community of aircraft maintenance*' will be answered by studying the existing literature on interactions and goals of the discourse community (Bhatia, 1993). The second part of the research question '*what are the communicative activities that influence or complement their reading activities*' will be answered by the qualitative analysis of interviews conducted on a sample of a discourse community.

3.3 Review of Related Literature

The following section reviews the related literature of discourse community in order to identify the key members of aircraft maintenance. The discussion focuses on identifying the members in the community to understand their interactions and goals of the professional community.

3.3.1 The notion of discourse community

As previously mentioned in 2.3.1, discourse community signifies the features of texts and the language used in the texts for the community members to achieve and maintain their goals, to strengthen their group association, and to communicate efficiently with one another. Identifying the discourse community of aircraft maintenance is important as the following fundamentals can be determined: (1) the relationship of these communities, (2) how these communities communicate, (3) the purpose of communicating, and (4) the hierarchy in these communities.

3.3.1.1 Related studies on discourse community

As discussed in 2.4, Bhatia (1993) asserts that when analysing unfamiliar genre to determine the communicative purpose of the text, the genre analyst is recommended to place the text within a situational context to find the reason why the genre is written the way it is. Bhatia (1993) also suggests genre analyst to refine the situational or contextual analysis by defining the speaker or writer of the text, the audience, and their relationship and goals before selecting the corpus to be analysed. This requires input from a variety of disciplines to interpret, describe and explain the rationale underlying various professional and academic genres. In order to implement genre studies, Bhatia (2002) asserts:

> Interviews and case studies become increasingly important means of collecting data in academic and educational contexts, particularly for the investigation of developmental aspects of learner language, learning style preferences and writing practices of expert writers (p. 14).

Even though the approach mentioned above was meant for writing practice, the recommended methodology, which is interview, can be adopted to investigate the reading skills of the potential readers. There is a need to determine who the members are in the community to understand how they communicate and the purposes of their communication. Although this study focuses on reading skills, it is common to study the use of English language in different environments of the workplace as part of analysis.

Davis (2015) included the analysis of discourse community sample in his thesis to determine the exact definition for the genre of medical research articles (MRAs). His study on the discourse communities focused on the writers and readers of MRAs before analysing the genre of the articles. Focusing on Swales' (1990) terms in defining discourse community such as 'agreed set of common public goals', 'mechanisms of intercommunication', 'specialist lexis' and 'threshold level of members', he began his analysis of the discourse community by mapping the Swales' characteristics of discourse community. The mapping shows that the discourse community of MRAs comprised readers and writers that met the Swales' requirements. Using questionnaires and interviews as his methodology, Davis (2015) made a claim that MRAs have their own genre based on the sample of the members of the discourse community who read, write and edit the MRAs.

Another study that worth noting is by Thompson (2001), who studied the genre of PhD thesis. The purpose was to identify the options that were available for the thesis writers to organise their thesis writing in different disciplinary context. Before analysing the citation practices and the use of modal verbs in the thesis, Thompson (2001) conducted a series of interviews with eight PhD supervisors. He classified his participants as the readers of the theses. A theoretical framework to visualise the rhetorical context surrounding the thesis-as-text was developed. The framework focused on a writer, a text, and an audience. Thompson (2001), however, did not select the writers of the thesis as he assumed that this type of respondents would tell a different story. The findings obtained from the interviews revealed that the thesis was written primarily for evaluation by the examiners, hence thesis writers represented different department was marked differently with its own discourse community and practices.

Beaufort (1997), studied the notion of discourse community of writing in a workplace setting. Her framework for analysing discourse communities was based on the notion of communicative activities and the influencing factors as can be summarised in Table 3.1.

Table 3.1

Framework for Analysing Discourse Communities (Beaufort, 1997, p. 489)

Communicative activities	**Influencing factors**
• The modes of communication were conducted either via oral or written • The predominant norms for texts were relating to genre features • The rules for writers and specific writing tasks were based on the communicative situation	• Values and goals for the community that influence all aspects of text production • Material conditions as tools for communication that influence writing activities • Individual writers' histories, goals and skills

The communicative activities referred to the features of discourse community that described the pattern of communicative practice, while the influencing factors examined the communicative activities focusing on writing. By conducting two series of interviews with four office workers and the collection of documents produced in the company as her methodology, Beaufort (1997) found that the anthropological approaches as a theoretical construct is important in studying sites of writing as the validity of discourse community could be obtained.

Despite the fact that these studies focused only on the writers of the discourse community, they are important for the foundation of the methodological framework for this study. The framework for the present study is developed based on the combination of these previous studies: Beaufort's (1997) analysis to identify the discourse community's properties and the pattern of communicative practices, Davis' (2015) guidelines to map Swales' (1990) characteristics of a discourse community, and the rhetorical context of thesis-as-text by Thompson (2001). Even though these studies are not contemporary, I found them to be pivotal in the methodology for this study. However, in order to strengthen the methodological framework, it is also important to review previous studies on discourse community in ESP course design.

3.3.1.2 Related studies on discourse community in ESP course design

Defining the discourse community is vital in designing and developing the ESP materials that focus on the description and illustration of the communication and the use of language in the specialist field (Basturkmen, 2010). Basturkmen (2010) asserts that the ESP course design usually includes a stage in which the course developers identify what specific language and skills the language learners will need. In order to investigate the specialist communication, Basturkmen (2010) suggests three approaches which are: (1) ethnography, (2) genre analysis, and (3) corpus analysis. According to Basturkmen (2010), ethnography investigations are in-depth and circumstanced, generally focusing on a specific setting such as one programme or institution. Ethnography enables the ethnographers to analyse and describe the behaviour of the specific group to understand it from their perspectives. Genre analysis, on the other hand, involves the texts in a genre that have a common function or sets of functions and are often organised in conventional ways and use similar linguistic features. This involves discourse community that share the same expectations on how the genre is written or spoken. Corpus analysis on the other hand, defines specialist communication. This technique allows investigators to identify patterns in a body of data of the language used. The corpus is a collection of authentic written or spoken texts that represent language variety of a specific field. It is important to analyse and describe the specialist discourse as it is the heart of the ESP course design.

In order to describe the specialist communication, needs analysis framework is used to define the learners' needs. The aim of this analysis is to design the ESP course based on detailed empirical analysis of language situations in actual use (Alharby, 2005). The following review of related literature provides a sample of methodology to design the ESP course through analysing and describing the specialist discourse.

Wu and Chin (2010) investigated the English language needs of banking and finance professionals in Taiwan. The purposes of their study were to identify: the English skills used in the work settings, the communicative tasks, the difficulties that the participants might encounter, and their experiences with English courses and tests that they have taken after graduating. They began their studies with document analysis of written texts which were used in the financial service industry. Then, the exploratory unstructured interviews with two experts were analysed. Semi-structured interviews were then conducted with 16 professionals from ten financial institutions and followed by the questionnaire survey analysis with a sample of 241 domestics banking and finance employees. Based on the results obtained from the sample investigated, Wu and Chin (2010) claimed that the participants provided them with the results that have significant implications for their future endeavours in the ESP.

Another study was conducted by Khan, GhulamullahNaeem Mohsin, Hussain Dogar and Awan (2011). They applied two different types of instruments: questionnaire and semi-structured interviews. The purpose of their study was to find the needs of targeted situations, learners' needs, wants and their deficiencies to carry out the ESP courses. The questions asked in the interviews were divided into three domains, which include: (1) business description, (2) problems related to the business, and (3) social interaction while staying abroad. The combined use of questionnaires and interviews have proven that the contextual and need base situation in specific purposes of language functions could be gained.

Wozniak (2010) conducted Target Situation Analysis (TSA) to assess the language needs of French mountain guides. The data were gathered based on the triangulation procedure that involved unstructured interviews, non-participant observation of the foreign language certification process and a questionnaire. He concluded that the TSA with the experts, in this case, the certified mountain guides, have provided relevant and efficient means of getting to know the occupational community to understand the specialist domain.

Although the impetus for the previous studies was not directly associated with defining the discourse community in genre analysis, the findings and the descriptions of the methods have proven that the studies have helped the analysts to identify the specific needs of the learners in designing the course. In addition, the methods used for needs analysis also revealed that the interviews; semi-structured or unstructured interviews are important to define the specialist discourse in needs analysis.

To conclude, the methods used in designing the ESP course focused on two areas, the analysis of related texts in a specific genre and the analysis of the discourse community with target specialists as the key informants. The purpose is to understand the context of the specific genre. These fundamentals in designing the ESP course are important as the selection of the specialist informants to gather the data and design the interview questions would be valuable for the present chapter.

The following section discusses airworthiness as to explore the discourse community of aircraft maintenance. This is to identify the potential key members as the basis of the framework to define the discourse community.

3.3.2 Development of framework

The main concerns of this study are the readers of the technical documents used in aircraft maintenance, the technical documents and the writers of the technical documents. Hence, the basis of the framework comprises the readers, the texts and the writers in aircraft maintenance. According to Thompson (2001), the text is a physical and textual entity constructed within the text by the writer and the reader is portrayed as the entity that interprets the text. Thompson (2001) also adds that the reader too has the physical presence like the writer, while the text has the concrete existence within the minds of those who read it.

3.3.3 Discourse communities of aircraft maintenance

Aircraft maintenance is a complex, comprehensive and ongoing continuous process that involves maintenance activities such as inspection, maintenance and modification parts of an aircraft (Rao, Chaitanya & Vidhu, 2017). The purpose of aircraft maintenance is to ensure that the aircraft is airworthy. With the objective to ensure airworthiness, De Florio (2011) states three key elements that deserve special consideration: safe conditions, possession of the necessary requirements, and allowable limits (p. 3). In other words, the aircraft should be free from the conditions that can cause catastrophes leading to death, injury, damage of equipment and damage to the environment. In order to ensure the continuing airworthiness of an aircraft, there are five organisations that are responsible to set the regulations pertaining to the exercises of aircraft maintenance. The five organisations are the International Civil Aviation Organization (ICAO), the National Aviation Authority (NAA), the Original Equipment Manufacturer (OEM), the Air Operator, and the Maintenance and Repair and Overhaul (MRO) organisation.

Figure 3.1 shows the visual relationship of these five organisations.

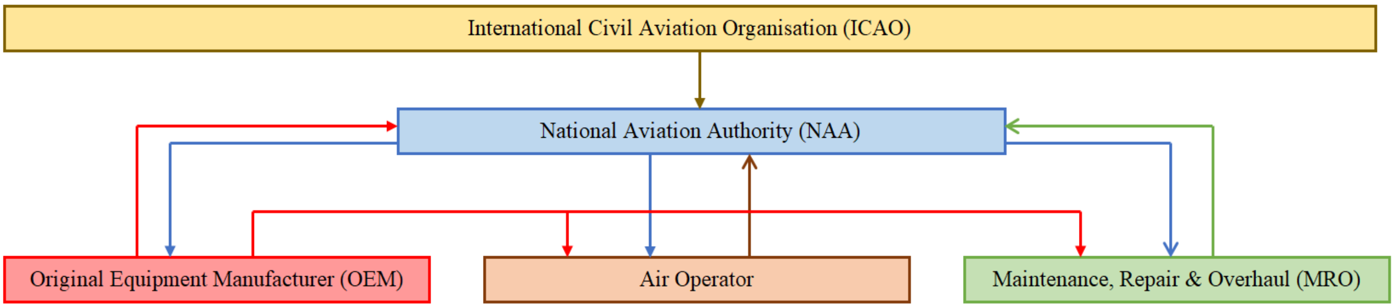


Figure 3.1 Hierarchical relationship of five organisations in the field of aircraft maintenance

The arrows represent the types of communication between these five organisations as one-way or two-way. The following is the description of the five organisations with their functions and responsibilities.

3.3.3.1 The International Civil Aviation Organization (ICAO)

The International Civil Aviation Organization (ICAO) officially came into existence on 4 April 1947 after the Government of the United States conducted exploratory discussions with other allied nations from the early months of 1944. The discussions involved 55 allied and neutral states. However, out of 55 states, only 52 of them attended the meeting. The outcome of 5 weeks of meetings was the Convention on International Civil Aviation, consisting of a preamble and 96 articles (De Florio, 2011). According to De Florio (2011, p. 6), the ICAO aims to develop the principles and techniques of international air navigation and to foster the planning and development of international air transport to:

1. ensure the safe of international civil aviation throughout the world,
2. encourage the arts of aircraft design and operation for peaceful purposes,
3. encourage the development of airways, airports, and air navigation facilities for international civil aviation,
4. meet the needs of the people of the world for safe, regular, efficient, and economical air transport,
5. prevent economic waste caused by unreasonable competition,
6. ensure that the rights of the Contracting States are fully respected and that every Contracting State has fair opportunities to operate international airlines,

7. avoid discrimination between Contracting States,
8. promote safety of flight in international air navigation, and
9. promote the general development of all aspects of international civil aeronautics.

The ICAO standardises the regulations through the creation, adoption, and amendments of 18 Annexes, which is known as International Standards and Recommended Practices. These standards became the directives that must be followed by the ICAO members such as the National Aviation Authority (NAA).

3.3.3.2 The National Aviation Authority (NAA)

The National Aviation Authority (NAA) is a government statutory authority in each country that oversees the approval and regulation of civil aviation. As indicated earlier, the NAAs are responsible for the implementation of the ICAO international Standards and Recommended Practices (SARPs), as they are part of the ICAO Member States. The NAAs are responsible for issuing their own legislation within their territory by following the guidelines that were outlined by the ICAO.

As mentioned by the ICAO (2013) in their Airworthiness Manual (DOC 9760, p. 19):

> Article 12 of the Convention points out that each Contracting State undertakes to keep its own regulations in these respects uniform, to the greatest extent possible with those established from time to time under this Convention. Through national regulations, States are expected to implement and enforce the standards contained in the Annexes to the Convention.
>
> Article 37 of the Convention requires each Contracting State to collaborate in securing the highest practical degree of uniformity in regulations, standards, procedures and organisation in relation to aircraft. Contracting States have the responsibility for the safe operation and performance of maintenance in accordance with the SARP. Each state should develop its own airworthiness standards based on the framework provided in Annex 8, or adopt those already developed by another State.

In the ICAO manuals, the term "Contracting State" is used to refer to the NAA. To summarise, the ICAO outlines that the roles of the NAAs are to regulate critical aspects of aircraft airworthiness and their operations such as:

1. design of aircraft, engines, equipment and ground-based equipment affecting flight safety,

2. conditions of manufacture and test of aircraft and equipment,
3. operation and licensing of aircraft and its equipment,
4. licensing of personnel - pilots and maintenance engineers,
5. licensing of airports and navigational aids, and
6. standards for an aircraft.

The independent development of the NAAs resulted in differing regulations from country to country. However, according to the ICAO (2005), if they are unable to follow the regulations set by the body, the NAAs are obliged to file these differences and notify the ICAO (2005, p. xi):

> The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention by which Contracting States are required to notify the Organisation of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto.

To conclude, the regulations set by the ICAO are the minimum standards that must be adhered to by the NAAs. In addition, any amendments made by the NAAs on the differences in regulations, must be notified to the ICAO.

The NAA in Malaysia is known as Civil Aviation Authority Malaysia (CAAM). This division was formed under the Malaysian Ministry of Transport in 1969 and was formerly known as the Department of Civil Aviation (DCA), which was later changed to CAAM in 2018. The Airworthiness Unit which was established in 1972, under the Flight Operations Division, is responsible for the regulation of aircraft maintenance activities. As noted earlier, the NAA is required to develop its own airworthiness standards based on the framework stated in Annex 8 (airworthiness of aircraft) or adopt the standards which were already developed by another State (ICAO, 2013). As for the CAAM, the airworthiness standards adopted the British Airworthiness Standards, in which the unit was initially managed by the Civil Aviation Authority, United Kingdom (CAAUK) (CAAM, 2015). However, starting from 1992, the CAAUK officers were gradually replaced and fully managed by Malaysians.

The main function of the CAAM Airworthiness Unit is to carry out the regulatory of airworthiness through the establishment of SARPs following the Civil Aviation Act (CAA) 1969 (CAAM, 2015). The airworthiness activities are regulated through various processes such as approval of modification and repair, approval of aircraft maintenance and facilities. Other processes include continuous airworthiness maintenance and also developing and updating the standards, requirements and procedures (CAAM, 2015).

3.3.3.3 Original Equipment Manufacturer (OEM)

Original Equipment Manufacturer (OEM) is an organisation that designs and manufactures the original parts and equipment of an aircraft. This organisation is also required to follow the regulations set by the ICAO when designing and manufacturing the aircraft following ICAO Annex 8.

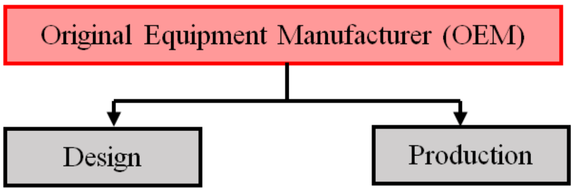


Figure 3.2 Two areas of OEM, Design and Production

ICAO Annex 8 (2005; 2013) outlines a framework of airworthiness standards for the “design and manufacture of large aeroplanes, helicopters, small aeroplanes, engines, and propellers” (p. 19).

ICAO (n.d.) summarises in its Annex 8 as:

> In the interest of safety, an aircraft must be designed, constructed and operated in compliance with the appropriate airworthiness requirements of the State of Registry of the aircraft. Consequently, the aircraft is issued with a Certificate of Airworthiness declaring that the aircraft is fit to fly (para.1).

The excerpt defines that the safety of the aircraft begins at the design stage. Hence, the OEM is responsible for the following:

1. controls type certification standards such as the design and the manufacture of an aircraft,
2. establishes airworthiness office to control certification procedures following the ICAO and the NAA,
3. controls the certificate of airworthiness or modification flight testing,
4. prepares and controls both initial and continuing airworthiness procedures,
5. prepares and controls documentation related to updates and modification such

as the Airworthiness Directives (ADs) and Service Bulletins (SBs),

6. issues and controls technical documentation such as Aircraft Maintenance Manual (AMM), Illustrated Parts Catalogue (IPC) and Wiring Diagram Manual (WDM).

In summary, the OEM is responsible for the design and manufacture of the aircraft and aircraft parts. It is also responsible for the production and issuance of documentation related to airworthiness that need to be obeyed by air operators and approved by maintenance and repair organisations such as Maintenance, Repair and Overhaul (MRO).

3.3.3.4 Air operator

Aircraft operator is an organisation that buys and uses the aircraft for commercial purposes. To be granted to fly the aircraft, an air operator is required to obtain Air Operator's Certificate (AOC) from the NAA, in this case, CAAM. Part 145 that is outlined by the CAAM (2016) states that the air operator is responsible for the tasks listed below:

1. provides facility for aircraft maintenance activities,
2. prepares personnel in various of areas to ensure the organisation complies with the regulations,
3. controls the competency of personnel who are involved in maintenance,
4. ensures that certifying staff have an adequate understanding of the relevant aircraft and/or components to be maintained,
5. prepares equipment, tools and materials to perform the approved scope of work,
6. complies with the regulations set for acceptance of components prior to the condition of the aircraft component,
7. holds and uses applicable current maintenance data in performance of maintenance, including modifications and repair, and
8. records all the details of maintenance work carried out.

ICAO (2013, p. 22) states that the minimum requirements of the responsibilities of the air operators:

> Annex 6 includes a requirement for the air operator to monitor and assess maintenance and operational experience with respect to continuing airworthiness and provide this information as prescribed by the State of Registry and report through a system as specified Annex 8, Part II, Chapter 4. The air operator should also obtain and assess continuing airworthiness information and

recommendation available from the organisation responsible for the type design and should implement any necessary actions in accordance with a procedure acceptable to the State of Registry.

Even though the air operators use the aircraft for commercial purposes, they are responsible for ensuring that the aircraft is airworthy. This is done by providing proper facilities and selecting certified personnel to conduct aircraft maintenance activities to control maintenance standards. The personnel referred to the AMP, who are responsible for aircraft airworthiness.

3.3.3.5 Maintenance, Repair and Overhaul (MRO) organisation

Unlike air operators, approved Maintenance, Repair and Overhaul (MRO) organisation only specialises in performing maintenance activities on aircraft and their components. However, there are MRO organisations that work with air operators, whereby these air operators send their aircraft to be maintained by the MRO organisations. Like air operators, the MRO organisations also have proper certifications that allow them to perform certain tasks on aircraft in accordance with its approval schedule (Swoboda, 2016). Not only that, the organisations must also be approved by the NAA or the CAAM (2016) following Part 145 – a regulation pertaining maintenance and repair of an aircraft. Generally, this organisation is responsible for the work listed below:

1. controls the standards of maintenance,
2. issues and controls of authorised personnel,
3. incorporates documents such as the Airworthiness Directives (ADs) and Service Bulletins (SBs),
4. approves aircraft modifications,
5. certifies maintenance or releases aircraft to service,
6. controls maintenance records, and
7. controls maintenance personnel training and records.

To conclude, MRO organisation’s responsibilities are almost similar to air operators, to ensure an aircraft is certified as airworthy. In order to ensure the maintenance activities are properly conducted, these organisations must comply with the rules and regulations set by the aviation authority: the ICAO and the CAAM, and at the same time perform the maintenance activities as suggested by aircraft makers.

3.3.3.6 Summary

My exploration of the research literature has revealed that there are three hierarchical groups that can be classified as the key members in the discourse community of aircraft maintenance (Figure 3.3). As can be seen, aviation authorities, which consist of the ICAO and the NAA (CAAM) are positioned as the highest rank. This is followed by the aircraft makers that comprise OEM at the second rank. Lastly, the end-users made up of air operators and MRO organisations are positioned at the lowest rank in the community.

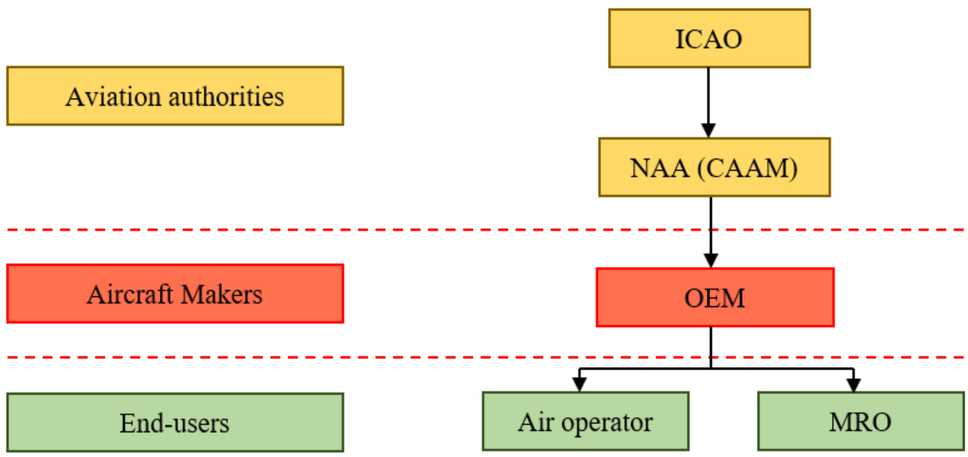


Figure 3.3 A hierarchical relationship of the key members of the discourse communities of aircraft maintenance

The communities of the aircraft maintenance are formed based on their roles and hierarchical positions. Since airworthiness involves five different organisations with their own roles and responsibilities, the communities can be divided into three major communities based on their hierarchy.

The first community at the highest position in the hierarchical ranking is the aviation authorities. This community can be assumed to be the most powerful group in the aircraft maintenance domain. This is because the aviation authority produces all documentation related to aviation regulations. The community in this group consists of the ICAO and the NAA. In this case, the NAA of Malaysia is CAAM.

The second community is aircraft makers that consist of the OEM. At the second position in the hierarchy of aircraft maintenance domain, aircraft makers must comply with the regulations set by the aviation authorities to manufacture and produce the aircraft maintenance documentation for the aircraft end-users to follow.

The lowest position in the community is the end-users, for whom the aircraft technical documentation is written. The term end-user is used to describe the readers of aircraft technical documentation. In aircraft maintenance, the end-users do not hold the same power as the aviation authorities or aircraft makers since their tasks, duties and place of work are to follow the instructions given in the aircraft maintenance documentation.

As noted in 3.2, the second part of data collection for the present chapter will be obtained through qualitative analysis of interviews conducted with a sample of discourse community. With reference to the discussion above, it is safe to say that the end-users are the most suitable participants to be selected as the sample of discourse community. In this case, they are the AMP. The AMP are the end-users in the community of aircraft maintenance domain which makes them the readers of aircraft technical documentation produced by all the three communities in the aircraft maintenance domain. The next section discusses the methodology used for the second part of the data collection of the present chapter.

3.4 Methodology

Biber, Connor and Upton (2007), as well as Bhatia (1993), suggest that analysis should first be conducted with the actual writers, the users of the texts or other academic specialists for discourse analysis. This approach can be used to understand the texts used in the discourse. They also posit that the technique is different from the qualitative studies of texts and writing, which requires the researcher to observe, interview, and work with the community. Since it is not possible to be in contact with the writers of all the documents related to aircraft maintenance domain, the present study is conducted with the users of the texts. As revealed in 3.3.3, the users of documents related to aircraft maintenance are the end-users in the hierarchy. Due to this, the participants selected for this study should be those working in air operators or the MRO organisations. The following discussion on the methodology is divided into participants, data collection and data analysis.

3.4.1 Participants

According to Davis (2015), there is no one-size-fits-all answer to the question of what constitutes a representative number of members in a sample. This is because there are many factors to consider when designing the research, including time given to complete a research project, finding and keeping in contact with participants, and the institutional demands of the ethics committees. As mentioned earlier, the participants for this study should be selected among those working in air operators and the MRO organisations. This is because they are the users of documents related to aircraft maintenance. Hence, the participants were selected based on these notions:

a. The participants were selected based on a degree of homogeneity. This includes participants' experience working in the aviation industry. The participants should have the experience working in aircraft maintenance domain, and they should be selected from the end-users group working in air operators or the MRO organisations. According to Onwuegbuzie and Leech (2007), homogeneous sampling possesses similar characteristics or attributes that reflect the purpose of the study. With regard to this study, a total of 23 participants were selected. They were classified as the sample of discourse community of aircraft maintenance.

b. These participants were selected from two domain experts:

   i. Specialists who are ex-aircraft maintenance personnel and currently work as academic staff at Universiti Kuala Lumpur Malaysian Institute of Aviation Technology (UniKL MIAT).
   ii. Aircraft maintenance personnel who currently work in the aviation industry.

   The participants from the first domain experts; the specialists from UniKL MIAT, were selected as I am familiar with them. I contacted the Head of Human Resource Department to provide me with the list of specialists and their contact numbers. Then, I contacted the specialists via telephone or Short Message Service (SMS) to seek their agreement to be interviewed.

   The second group of experts were selected from two sources: (1) from the contacts of the specialists, and (2) my former students who had graduated. As for the contacts of the specialists, I requested the specialists to recommend their former colleagues who are still working in the aviation industry. Most of the specialists contacted their former colleagues and asked personally whether former colleagues would agree to participate in this study. Once they agreed, the specialists gave me their contact numbers for me to approach the participants myself. Regarding my former students, I reached out to most of them via Linkedin. Through Linkedin I knew the types of their occupations so I only selected those who work as AMP in the aviation industry.

c. The participants were selected from two different groups of end-users namely: (1) air operators and (2) MRO organisations. As revealed in 3.3.3, these groups are the readers in the aircraft maintenance domain. They are also categorised as the lowest rank in the community, for whom the aircraft maintenance documents are written. Apart from that, the participants selected were not from the same company.

d. The participants were the licensed and unlicensed AMP. The AMP with license are called Licensed Aircraft Maintenance Engineer (LAME).

e. The participants were all Malaysians and they are familiar with the rules and regulations set by the CAAM.

By choosing participants from different organisations and from different line of work, I could maximise the variation of the sampling. According to Dǒrnyei (2007), different forms of experience among the sample will allow the researcher to explore the variations among the participants and will underscore any commonalities found. If there is a pattern across the sample diversity, it can be assumed that the data collected is reasonable.

These participants were divided into five different levels as can be seen in Table 3.2.

Table 3.2

Summary of the Participants' Line of Work

No.	Position titles	# of participants
1.	Licensed Aircraft Maintenance Engineer (LAME)	7
2.	Engineer	7
3.	Senior Technician	1
4.	Technician	3
5.	Junior Technician	5
	Total	**23**

It would have been ideal to have interviewed the technical writers of the AMM but it was not possible because the technical writers of the AMM are anonymous. Therefore, this study only focused on the readers of the text (Thompson, 2001).

3.4.2 Data collection

Data collection for this study involved semi-structured interviews to analyse the communicative activities that influence or complement the reading activity. The format of semi-structured interviews is open-ended where the researcher provides guidance and direction for the participants to elaborate further. It is said that opinions given by the participant would be honest and frank, if the context of the discussion is structured in line with the purpose of the interview, and the questions are properly worded (Carruthers, 1990). Dȍrnyei (2007) asserts that this type of interview is suitable for a researcher who has a good overview of the phenomenon or domain in question. This will allow the researcher to develop a broad range of questions on the topic. When using the semi-structured approach, Corbetta (2003) points out that the researchers are free to conduct the conversation based on what they think suit them best. This will result in the richness of the data since the participants are free to talk as openly as they wish (Harvey-Jordan & Long, 2001).

The process of data collection involved several stages. Firstly, the process began with the application of the research ethics from the University of Sheffield (UoS) in December 2014. According to Orb, Eisenhauer and Wynaden (2001), the intention of interviews in qualitative studies is to listen to the participants' points of view. Ethical dilemmas that might arise from the interviews are difficult to predict and therefore requires the researcher to be aware of any sensitive issues and potential conflicts of interest. With the approval of research ethics, issues like confidentiality, informed consent and privacy can be secured. The official approval was given by the university ethics reviewers on January 29, 2015 (see Appendix A).

After obtaining the approval, the interview questions were developed and reviewed. The interview questions however, were not reviewed as part of the ethics. The interview questions are as follows:

1. May I know where do you work and what is the nature of the organisation?
2. What is your position?
3. What is the nature of your position?
4. What types of reading materials that you read that you could relate to your position?
5. What are the main reasons of reading these materials?
6. On what occasion that required you to read these materials?
7. Which of these reading materials that you frequently read? Due to what reasons?
8. Are there any reading materials that you think difficult to understand?
9. May I know what the reasons are?
10. Do you have any experience dealing with misunderstanding or misinterpreting the content of the materials that you read?
11. What will happen if you misinterpreted or misunderstood the content?
12. How did you overcome the problems?

The interview questions were divided into three parts: the first part covers the participant’s personal background such as name and age; the second part includes the nature of the participant’s profession and the organisation, and lastly the nature of reading in the field of aircraft maintenance (see Appendix B). The questions aimed to elicit several types of information such as job responsibilities of the AMP, communicative activities of the AMP that involved reading activities and the problems that they might face when reading the related documents.

The second stage of data collection involved selecting the participants that are suitable with the criteria of the end-users as noted in 3.3.3.5. As discussed in 3.4.1, the participants were selected based on certain criteria such as: (1) homogeneity of the participants' working experience in the aviation industry, (2) two different groups from different organisations, (3) different line of work such as licensed and unlicensed AMP, and (4) the participants were all Malaysians.

In order to conduct face-to-face interviews, first, the participants were contacted via telephone or Short Message Service (SMS) to seek their agreement to be interviewed. This is because an interview usually begins with the researcher reaching out to a potential participant through a letter, telephone, or email (Roulston, 2010). Once the participant agrees, then the time and place of the interview will be arranged according to the convenience of both the participant and the researcher. The interviews were mostly conducted on a working day during lunch time outside of the participants' office where they felt more relaxed and comfortable.

The data were collected between December 2014 and March 2015. The interviews lasted 30 to 40 minutes for each participant. Interviews were fully conducted in English language. However, the participants were informed that the interviews could be conducted in our first language which is the Malay language if they were not comfortable with the English language. However, none of the participants used the Malay language. All interviews were tape recorded with the consent given by the participants with the tape recorder was placed between me and the participant (see Appendix C for the sample of consent form). The interviews were conducted following the standardised transcription protocol suggested by Harrell and Bradley (2009). They recommend that an interview session begins with an introduction, followed by laying the ground rules, and that the questions should be grouped by topics. For this study, the introduction session covers: (1) administering the consent form for the participants to sign, (2) explaining the purpose of the interview and (3) introducing the background of the study. The introduction session was then followed by questions pertaining to the participants' nature of work to gain information on their work experience. This is to ensure diversity in the participants' working experience. Once this part was completed, the participants were given the questions related to their reading activities in aircraft maintenance domain.

In order to assess the content validity of the interview questions, the experts' view can be used to evaluate the appropriateness and completeness of the contents in relation to its subject domain and purpose (Louise Barriball & While, 1994). Louise Barriball and While (1994) also assert that the experts could assess: (1) the level of difficulty of the questions, whether the participants could and would answer the questions, and (2) the organisation of the questions which can elicit true differences in the perceptions, attitudes and views towards the objectives of the study. As for this study, two participants were selected for the pilot draft to check the suitability of the contents, their understanding towards the questions and the appropriateness of the questions to fulfil the purpose of the interview. Both participants commented that they were satisfied with the overall questions given and the questions were easily understood and suitable for the interview. Their answers to the interviews were then taken as part of the data.

3.4.3 Data analysis

All the interviews were recorded and transcribed because the first step in data analysis is to transform the recordings into a textual form (Dȍrnyei, 2007). Qualitative data analysis pursues the relationship between categories and themes of data to increase the understanding of the phenomenon. Thus, rather than being strict and procedure-based, the procedure requires the researchers to be alert, flexible and interact positively with the data collected. Since the qualitative data are text-based, the corner stone of analysing these data are the coding process. Codes are tags or labels for assigning units of meaning to the descriptive inferential information compiled during a study. Codes often adhere to chunks of words, phrases, sentences or the entire paragraph. Coding involves pursuing related words or phrases mentioned by the participants or those found in the documents. These words or phrases are then combined to realise the connection between them. The researchers usually define 'coding' according to their own understanding. However, according to Dȍrnyei (2007), even though they have different meanings to different researchers, all the qualitative coding techniques are aimed at reducing or simplifying the data. Hence, it depends on the researchers' understanding to define the coding to make the data simpler and easy to understand.

As for this study, the process of coding the data was performed using the NVivo (Bazeley, 2007). NVivo is a Qualitative Data Analysis (QDA) computer software package that assists a researcher to discover tendencies, recognise themes and derive conclusions (Hilal & Alabri, 2013). Hence, NVivo helps the researcher to manage the data by organising and managing ideas to understand the conceptual and theoretical issues (Bringer, Johnston & Brackenridge, 2004). NVivo is used to analyse the data by creating and organising the nodes. The nodes in NVivo according to Wiltshier (2011), allow users to represent specific themes, places, people or other area of interest. The nodes in the present study were created and organised according to the themes and codes for data reduction purposes as presented below.

The data of semi-structured interviews were analysed qualitatively where they underwent the procedures of data reduction through the first and second level coding as well as pattern coding. This approach followed the method used by Chostelidou (2010) and Appleton (1995), based on the approach proposed by Miles and Huberman (1984). To begin with, the codes resulted in groups of categories, were 'labelled' with a specific name. Then, similar characteristics were clustered into themes, to reduce the number of categories (Table 3.3).

Table 3.3

Example of Coding

Themes/Categories	**Codes – Coding patterns**
1. Profile	LAME
	Engineer
	Senior Aircraft Technician
	Technician
	Junior Technician
2. Types of reading documentation	Manufacturer's documentation
	Regulatory documentation
	Organisation documentation
2. Purpose of reading the documentation	Types of documents
	Purposes of reading the documents
3. Difficult materials	Types of documents
	Causes of the difficulties

First, the raw information from each interview was reduced to a smaller unit or categories using NVivo coding. This is called data reduction. Then, the first level coding was applied where each line of the interviews was identified and labelled according to the categories. According to Braun and Clarke (2006), it is important to ensure that all actual data extracts were coded. This step was conducted for each transcript of the participants (Table 3.4).

Table 3.4

Example of the First Level Coding (Participant 15)

Utterances	Codes - Categories
First we need to read the aircraft manual, to understand the aircraft system and also to find the guidelines to work on the aircraft (1). As well as if you are doing repair you need to use those document as a reference in designing the repair because you should not be using your own design thinking because there are already document on how to design the repair (2). As well as I have to look at the IPC or IPR, Illustrated Part Catalogues or Illustrated Part Radar which explain the detail of the aircraft components (3).	1. "TYPES OF MATERIALS" 2. "PURPOSE"

After that, all the transcripts that had been labelled with the same categories were compiled. This step is known as second level coding. The purpose of this step was to identify and compare the categories from the various interviews. Open coding was used as an indicator to show the sub-category to compare the categories. For instance, the types of reading documentation were divided into: 1) manufacturer's documentation, 2) regulatory document, and 3) organisation document (Table 3.5).

Table 3.5

Example of the Second Level Coding (Participant 17)

Utterances	Codes – Sub-Categories
In aviation you have to read the manuals, because when you want to perform the task, you need to know what are the parts and what are the tools you required (1). So you have to know briefly the flow of the work that has to be carried out (2). And then you have to know all the documents from manufacturer such as the Service Bulletin, from the authority Airworthiness Directive (3).	1. "MANUFACTURER'S DOCUMENT" 2. "REGULATORY DOCUMENT"

The findings on the phenomenon being studied were written in a narrative to present the analysis. These were supported with the quotations to illustrate the discussions and conclusions (White & Marsh, 2006). This is important as the readers can better judge the confirmability, or public credibility, of a qualitative content analysis if the researcher submits the original set of data, and the justification for the particular codes.

3.5 Findings and Analysis

The results obtained from the data analysis mainly focuses on positioning the AMP in the community of end-users. My main concern in this chapter is to identify the readers and what makes them the readers in the aircraft maintenance. Identifying the readers will help me find the genre of AMM. This is important as only the members of the discourse community that utilise the genre can define the genre of that discourse community.

3.5.1 An overview of discourse community sample

To build the discourse community sample, I had to determine the key members of the discourse community of aircraft maintenance. As discussed previously in 3.3.3, there were three different communities of aircraft maintenance: 1) aviation authority, 2) aircraft makers, and 3) end-users. The following describes the background of the sample of discourse community that I interviewed.

As noted in 3.3.3, there are two different types of organisations under the community of end-users: (a) air operators, and (b) MRO organisations. The line of work in aircraft maintenance domain might be different for these two organisations. Not only that, each type of organisation might also have a different organisational chart. According to the participants, each organisation has different types of organisational charts depending on the scope of maintenance activities conducted in each aviation organisation. Since I could not find any sample of organisational charts for both types of aviation industry, I referred to my participants' years of experience working in the aviation industry, their positions in the aviation industry, as well as the background of their jobs, to divide them to the different levels of positions.

The demographic analysis (see Appendix E) of my participants revealed that the participants can be divided into two different groups of end-users as shown in Table 3.6.

Table 3.6

Summary of The Participants' Groups as End-Users

No.	**Position titles**	**Air operator**	**MRO***
		# of participants	
1.	Licensed Aircraft Maintenance Engineer (LAME)	4	3
2.	Engineer	3	4
3.	Senior Technician	--	1
4.	Technician	3	--
5.	Junior Technician	1	4

*MRO – Maintenance, Repair and Overhaul organisation

The findings also show that these participants can be placed in the third level community in the hierarchy of aircraft maintenance. These are the end-users of the technical documentation in aircraft maintenance domain.

Apart from demographic analysis, the participants' job scopes are varied based on the nature of the company, their positions and the area of work as illustrated in the following examples:

> P01: (…) maintaining the aircraft operation for Boeing 737 until Boeing 747.
>
> P02: (…) doing design for modification and rectification, if there were some defect on the line, my team and I needed to come up with a solution.
>
> P04: As senior technician, my duty is to sign out the aircraft after certain tasks had been carried out by the technicians under my supervision.
>
> P17: My main task is to look after an aircraft (…) to ensure the aircraft is airworthy (…) the maintenance has been carried out properly.
>
> P21: What I do basically is to maintain and overhaul CFF56-357 engines.

It can be summarised that the participants' nature of work mainly centres around maintaining the aircraft for airworthiness purposes.

The findings also revealed that the participants in the higher level position will be the readers of the documents produced by the aviation authority. At the same time, they are also the writers in their organisation as explained by Participant 8:

> 'Our department reviewed Airworthiness Directive and it will be cross-referenced with the corresponding Service Bulletin. We then produced inspection card for special inspection and if we have to repair the defect, we will produce an EO or Engineering Order' (P08:L2).

In terms of reading materials, the participants referred to different types of documents which relate to their work. Most of them referred to these documents for aircraft maintenance activities.

In conclusion, despite the differences in the job level, the common goal in reading various kinds of documents in the aviation industry is to perform aircraft maintenance activities to ensure its airworthiness.

3.5.2 Reading among the discourse community sample

The data analysis demonstrated that the community in the field of aircraft maintenance deal with various types of documents produced by the writers from different organisations. As discussed earlier, there are three different communities: aviation authorities, aircraft makers and end-users. The findings revealed that there are three different types of documents produced by these communities. The documents are then divided into three categories: 1) documents produced by the OEM, 2) documents produced by the NAA or the CAAM, and 3) documents produced by end-users. The aim of the following discussion is to find the types of documents that the participants often referred to that can be associated with aircraft maintenance activities.

3.5.2.1 Documents produced by the aviation authority - CAAM

When the participants were asked about other documents that they referred to, only a small number mentioned the documents produced by the aviation authority, the CAAM. The results revealed that the participants in the position of Engineer and Manager are mostly the ones who refer to this type of documents. Hence, it can be assumed that this type of documents is more important to those in the higher position above the Technicians and Junior Technicians as mentioned by Participants 8 and 12:

> 'Airworthiness Directive is a mandatory document given by the authority' (P08: L8).

> ‘(…) from the authority we may check on the Airworthiness Notices or AN’ (P12: L9).

Based on the analysis, there are only two types of documents prepared by the CAAM as mentioned by the participants:

1. Airworthiness Directive (AD)
2. Airworthiness Notice (AN)

These documents are categorised as regulatory documents because they are produced by the aviation authority.

As for the AD, the findings revealed that the writers of the AD are the NAA of the country of origin of the aircraft makers, as elaborated by Participant 8:

> ‘Airworthiness Directive is a mandatory document given by the authority, for example, our aircraft are Boeing aircraft so the authority is from the United States of America which is the FAA (…) so the FAA will produce Airworthiness Directives’.

Based on his elaboration, it can be summarised that, if the air operators used Boeing aircraft, the air operators would refer to the ADs that are published by the Federal Aviation Administration (FAA). This is because Boeing aircraft are manufactured in the United States and the FAA is the NAA of that country. Figure 3.4 below is a sample of the relationship between the OEM and the NAA.

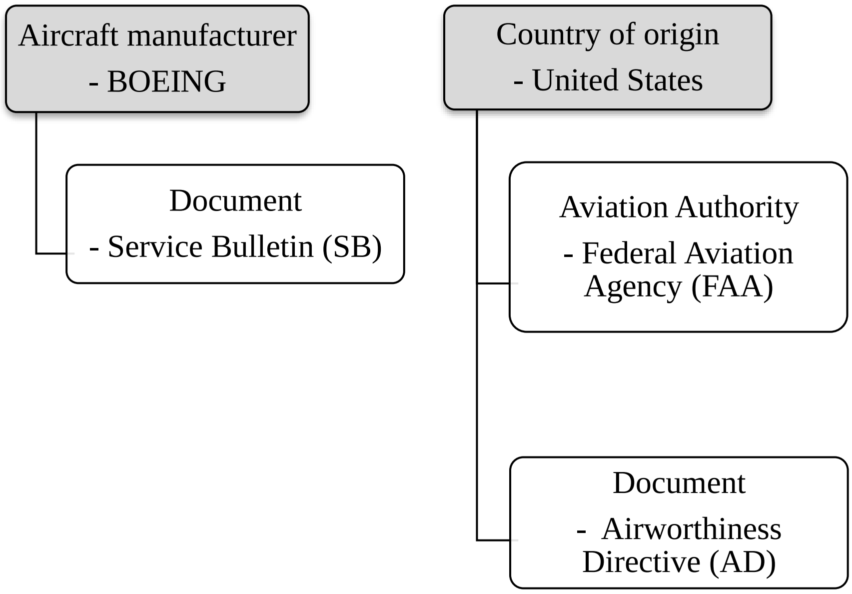


Figure 3.4 Types of texts produced by the OEM and its aviation authority

Furthermore, Participants 6 and 17 explained:

> 'Airworthiness Directive is the document that actually keeps you up-to-date on the particular aircraft types, particular aircraft engine types and particular components' (P06: L8).
>
> 'Airworthiness Directive will tell you the cause, they will tell you the objective of doing the job, and they will ask you to use the proper tools and parts from the manufacturer' (P17: L15).

The AD and AN in Malaysian context are published by the CAAM as summarised in Figure 3.5 below.

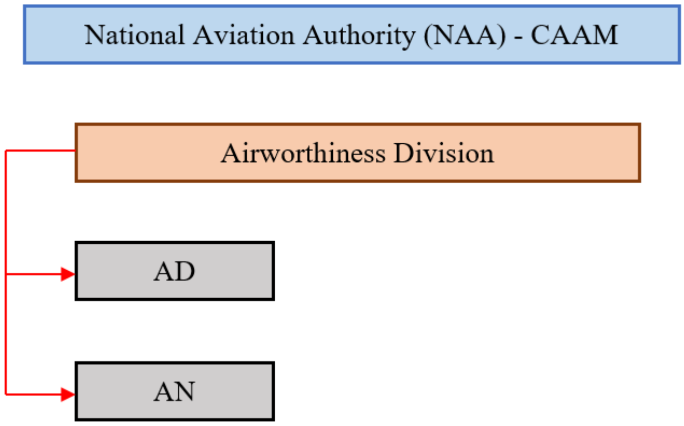


Figure 3.5 The AD and AN in Malaysian context

CAAM issued the AD with the purpose of communication with air operators and the MRO organisations pertaining to airworthiness information to address any unsafe conditions. The mandatory modifications and inspections cover three different categories (CAAM, 1997):

1. modifications and inspections of aircraft that were registered in Malaysia;
2. modifications and inspections of aircraft, engines, propellers or installed equipment for which Malaysia is the State of Design and the Certifying Authority; and
3. modifications and inspections of aircraft, engines, propellers or installed equipment for which Malaysia is the Validating Authority and the State of Registry.

As for the AN, the purpose of this document is to circulate information regarding the airworthiness requirements. The AN can be identified through a dedicated number that differentiates the content of the requirements. For instance, requirements for air operators of Malaysian registered aircraft with respect to certification of overhaul, replacement, repair, and modification are stated under 'AN12' (CAAM, 2002). Hence, the readers will refer to the AN12 to know how to obtain the certification of an aircraft from the CAAM.

In conclusion, documents from the CAAM are usually referred by the AMP in the higher position such as Engineers and Managers. On the other hand, the lower level AMP normally refer to the AD that the English language had been revised to a simpler version as mentioned by Participant 8:

> '(…) the department has to digest and produce in a simplified version of document so that the technicians can understand the instructions and able to carry out the task (…)' (P08: L3).

Hence, even though only a small number of participants claimed that they referred to the documents produced by the CAAM, it can be assumed that the AMP are still required to refer to these documents for any revision and modification of an aircraft. However, the documents referred to by the AMP such as technicians and novice AMP would be the documents that had been revised by their organisations.

3.5.2.2 Documents produced by aircraft makers – OEM

Most of the participants indicated that they often refer to the 'manuals' when performing aircraft maintenance tasks.

Some examples of the answers:

> '(…) for you to do the job you have to refer to the manual, (…) you have maintenance manual, the basic manual that you have to refer to, and then you have parts manual (…) wiring manual; as far as I'm concerned because I am from the avionics department, so I need to refer to wiring manual' (P02:L18).
>
> '(…) number one, you have to read the manuals, whether maintenance manual, engine overhaul manuals or component manuals. When you talk about the procedures for the company, you have to read the Engineering Procedures Manual' (P06: L16).

All 23 participants mentioned that they refer to various types of manuals. The findings revealed that there are 14 types of manuals. However, the types of manuals used depended on the background of their jobs. These manuals are listed below:

1. Aircraft Maintenance Manual (AMM)
2. Flight Manual
3. Engine Manual
4. Service Maintenance Manual
5. Service Repair Manual (SRM)
6. Structure Repair Manual
7. Wiring Manual
8. Components Maintenance Manual
9. Engine Overhaul Manual
10. Component Manual
11. Minimum Equipment List
12. Maintenance Planning Data
13. Maintenance Report 1 & 2
14. A-check sheet

Even though there is variety of manuals mentioned, interestingly, the AMM was the first manual mentioned by all the participants before mentioning the other manuals. This leads to the assumption that AMM is the main reference that an AMP will refer to for aircraft maintenance activities. Another outcome that I learned from the data analysis is that the participants also refer to other types of documents. A majority of the participants pointed out that they also referred to manuals with diagrams and figures of the aircraft system. They explained that these documents were the complementary documents to the manuals produced by the aircraft makers. Below are examples of the responses from the participants:

> 'It would be the AMM, Aircraft Maintenance Manual and the WDM wiring diagram manual since I'm from avionics section (…) WDM is basically equivalent to the AMM. It just that it is not in the form of wordings (…) it's all drawings. So, we would know how the system is connected by looking at the wiring diagram' (P05: L13).
>
> 'First, we need to read the aircraft manual to understand the aircraft system and also to find the guidelines to work on the aircraft (…) as well as I have to look at the IPC or IPR Illustrated Part Catalogues or Illustrated Part Radar which explain the detail of the aircraft components, the parts number, the serial number and descriptions' (P15: L8).

According to the participants, they refer to these documents to assist them in locating the system of the aircraft that they are not familiar with. These documents are labelled as *Illustration manuals*. There are eight types of documents in total that could be categorised as *Illustration manuals* under the manufacturer's documentation.

1. Illustrated Parts Catalogue (IPC)
2. Wiring Diagrams
3. Design Manual
4. Parts Manual
5. Illustrated Part Radar
6. Engineering Manual
7. Computer Aided Design (CAD) Manual
8. Component Manual

The third category of written documents that produced by the aircraft manufacturers are documents related to the updates and modification of an aircraft system. As Participant 4 mentioned:

> 'Service Bulletin will be provided when there is a new amendment to the requirement, or you have certain jobs or certain tasks that are just discovered, for example a defect on the aircraft system' (P04: L19).

From the findings, it can be summarised that there are three written documents labelled as *Updates and modifications*:

1. Service Bulletin (SB)
2. Service Letter
3. Service Information Letter

Taken altogether, the findings from the types of documents produced by the OEM can be summarised as below (Table 3.7).

Table 3.7

List of Documents Under Manufacturer's Documentation

Instruction manuals	**Illustration manuals**	**Updates and modifications**
• Aircraft Maintenance Manual • Flight Manual • Engine Manual • Service Maintenance Manual • Service Repair Manual • Structure Repair Manual • Wiring Manual • Components Maintenance Manual • Engine Overhaul Manual • Component Manual • Minimum Equipment List • Maintenance Planning Data • Maintenance Report 1 & 2 • A-check sheet	• Illustrated Parts Catalogue • Wiring Diagrams • Design Manual • Parts Manual • Illustrated Part Radar • Engineering Manual • CAD Manual • Component Manual	• Service Bulletin • Service Letter • Service Information Letter

Since the AMM was the first manual mentioned by all the participants, I asked them the purpose of reading this manual. The findings indicated that the AMM helps the readers:

1. to find specific information about the task,
2. to learn about the task,
3. to understand the aircraft system,

4. with the guidelines and the procedures of the tasks that they have to follow,
5. with the flow of work that must be carried out,
6. to see whether they have followed the step-by-step procedures on how to maintain the aircraft,
7. to install or remove certain components of the aircraft, and
8. to ensure that they have prudently followed the procedures and that nothing has been forgotten.

It can be concluded that, even though there are varieties of documents provided by the OEM, the AMM is still the main reference when the AMP perform aircraft maintenance tasks. The other types of references provided by the OEM, are basically complementary to the main reference. For example, Illustrated Part Catalogues (IPC) or Illustrated Part Radar (IPR) are the documents that illustrate the subsystem in a form of drawings, which might not be found in the AMM. As pointed out by Participant 15, these manuals (IPC and IPR) explain the details of the aircraft components, the parts number, the serial number and other descriptions. Hence, if the AMP are not familiar with the location and the description of a subsystem, these manuals would assist them in visualising the features of the subsystem and its components.

3.5.2.3 Documents produced by the end-users: air operators and the MRO organisations

The last type of documents is those produced by the end-users: air operators and the MRO organisations. Generally, these organisations produce this type of documents to simplify the language used in the original documents as Participant 8 explained:

> '(…) so this document has to be very simple if possible and it has to be written using technical language so that the technicians can carry out the task and at the same time they will be able to understand what they are doing' (P08: L2).

These documents are produced specifically for the AMP to ensure this group of personnel are able to understand every step written in the maintenance tasks. This is because the language used by CAAM in the AD and AN is difficult to be understood by the aircraft technicians. From the findings, there are found to be 12 types of documents produced by air operators and the MRO organisations pertaining to aircraft maintenance:

1. Engineering Order

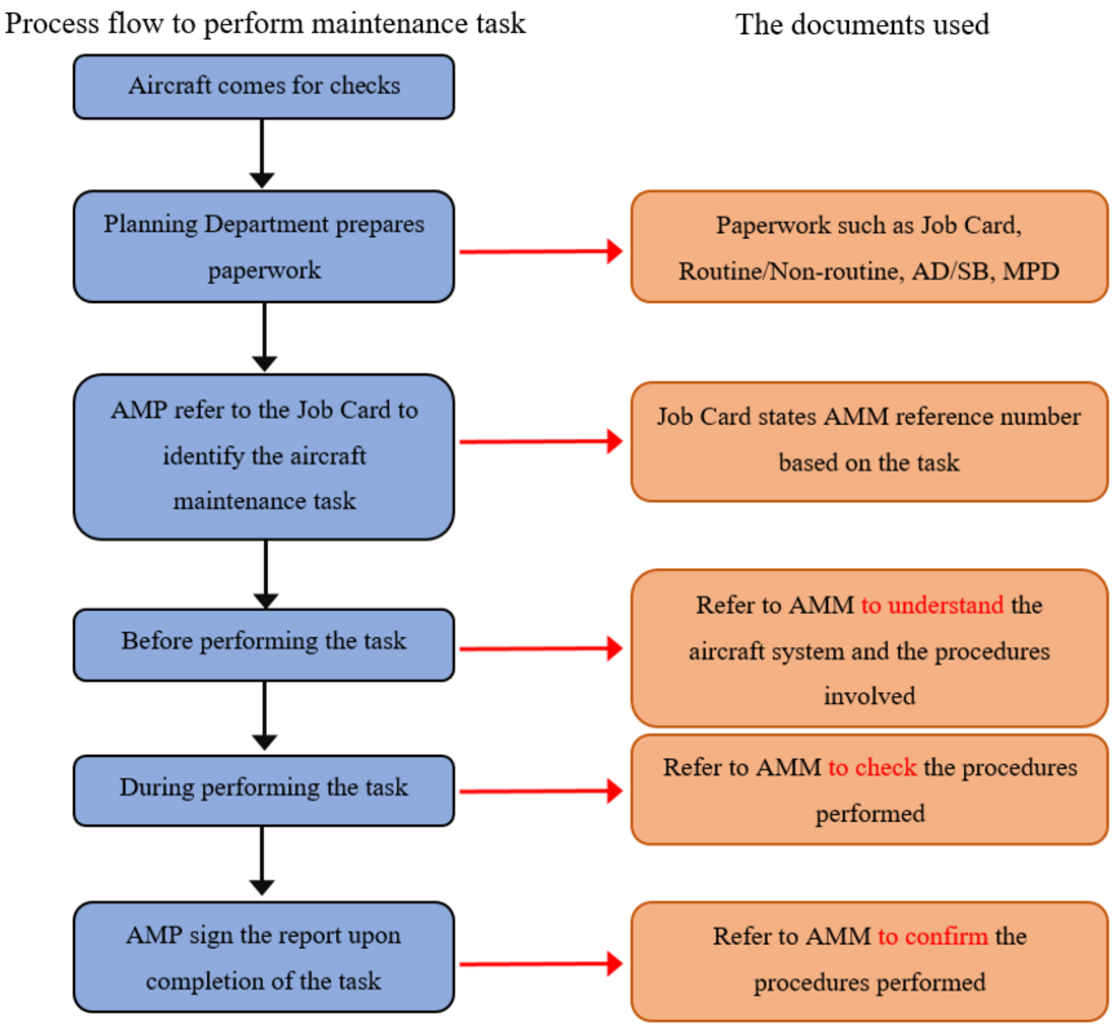
2. Engineering Notes
3. Repair Instruction
4. Standard Procedures
5. Standard Work Order
6. Work Instruction
7. Standard Operation Procedure
8. Task Card
9. Inspection Card
10. Engineering Procedures Manual
11. Maintenance Schedules
12. Modification Bulletin

In conclusion, these types of documents are written for the AMP that are positioned as technicians. In Malaysian context, technicians refer to the unlicensed AMP. These documents have been re-written using simple English language to ensure that these technicians can easily understand the content of the texts. However, there was no mentioned of whether the documents were written in Simplified Technical English (STE) following the outlines in the ASD-STE100 (ASD, 2013). Hence, the simple English language mentioned by the participants is considered subjective.

3.5.3 Participants' views on reading the AMM

According to Lassen (2003), readers who belong to the discourse community will be able to recognise the genre and therefore, will be motivated to consider the acceptability of the text from a generic point of view. The findings obtained from the interviews with 23 AMP revealed that the AMM is the main reference for aircraft maintenance activities. Hence, it is important to discuss the process of aircraft maintenance activities that require the AMP to refer to the AMM. The nature of the AMM that includes why and when it is used will be investigated.

To answer when the AMM is used; the responses received from the participants revealed that the AMM is used before, during and after performing the aircraft maintenance. Figure 3.6 shows the process of performing tasks (Gramopadhye & Drury, 2000) and related documents used. In order to confirm the mapping between the task and the text was correct, the following figure was shown to three of the participants and they verified that the mapping was correct.



Note: AD/SB – airworthiness directive, service bulletin, MPD – maintenance planning data

Figure 3.6 The mapping of performing maintenance task and the documents used

As can be seen, the task commences when the aircraft is sent to the hangar for aircraft checks. The Planning Department then prepares the paperwork. The purpose of this paperwork is to generate a job card, which acts as the communication tool between the personnel from Planning Department and the AMP. The personnel prepare the job card based on the Maintenance Planning Data (MPD) that recommends the flight hours and the flight cycles, and to carry out checks based on a routine or non-routine inspection. This was explained by Participant 8 that said:

> '(…) maintenance schedule is the routine check due to calendar date or due to flight cycle of the aircraft. So, our department will prepare the maintenance

schedule. This maintenance schedule is extracted from Boeing MPD or called the Maintenance Planning Data. The function of MPD is to advise the flight hours and also the flight cycles in order to carry out the checks; for example, the A check, the B check, the C check or the D check' (P08: L8).

The AMP then refer to the job card to identify the task to be performed as 'the job card is the first document' (Participant 3) that the AMP refer to. The function of job card is to inform the AMP of the AMM reference number based on the task. The details provided are the chapter, *Page block* and page number of the aircraft system. Before the AMP begin their work, they will refer to the AMM and learn more about the aircraft system as well as the procedures to perform the task. As mentioned by Participant 15:

> 'We have to read the manuals before we start our work. It has become a mandatory for the aviation personnel to read everything, to read about the equipment, or to read about the procedure before you start your work. It is a mandatory (…)' (P15: L15).

When the AMP perform the maintenance task, they will refer to the AMM to check the procedures involved, as explained by Participant 4:

> 'When we do our work we need to really see whether we follow the step-by-step procedures of how we maintain the aircraft or how we install or remove certain components' (P04: L10).

After completing the task, the AMP will then refer to the AMM to confirm that they have performed the task accordingly. This is to ensure that the procedures mentioned in the AMM have been strictly followed. This is important as after the AMP have completed the task, they are required to sign the document to confirm that the task has been done in accordance with the procedures outlined in the AMM. As Participant 4 put it:

> 'When we signed the documentation, it meant we had done the task as written in the AMM, we also had to report which page or which chapter that we referred to when doing our work. We need to be sure of our work because this involved critical stage of our maintenance work. If we did not follow the procedure and if something went wrong, they can always track down our mistake because we did not use the manual to do our work' (P04: L10).

Based on the use of the AMM, it can be summarised that the AMM is used as the main reference to perform aircraft maintenance activities. Hence, the AMP are responsible for the strict adherence to the procedures mentioned in the AMM. As mentioned by some of the participants, it is vital to refer to the AMM as they are not allowed to perform the maintenance activities based on their knowledge or personal instincts. As Participants 2 and 15 explained:

> 'If you are performing repair tasks, you need to use those documents as a reference in designing the repair because you should not be using your own thought' (P15: L8).
>
> 'You cannot use your instinct because everything must be governed by the manuals whenever you are working on the aircraft' (P02: L26).

It can be concluded that the AMM is the most important document in the field of aircraft maintenance. The AMP are required to refer to the AMM before, during and after performing aircraft maintenance activities. The answers given by the participants concur with Zafiharimalala, Robin and Tricot's (2014) findings from their observation, in which they also found that the AMP refer to the AMM before, during and after performing the task.

3.5.4 Difficulties in reading the documents in relation to aircraft maintenance

In terms of difficulties that the participants encountered when reading the documents in their daily routine, a variety of perspectives were expressed. Some participants felt that manuals were difficult to understand while a small number of participants indicated that the ADs were difficult to understand. Examples of the answers given by the participants are shown below:

> P08: The most difficult document will be the Airworthiness Directive.
>
> P17: It is from the authority, the Airworthiness Directive.
>
> P22: It is hard to understand the manual.

When asked about the reasons for the difficulty in understanding the documents mentioned, the participants stated that:

> P01: Over the years you will start to understand how to read the manual.
>
> P03: (…) who does not have a very good background in English they will have a problem in understanding the manuals.
>
> P21: I was not familiar on how to read the manual, the 'chapterisation', the titles, so it took me some time to understand the structure of the AMM.

From the examples given above, it can be deduced that the common view amongst the participants is that the difficulties were due to their background knowledge and their English language proficiency rather than the English language that is used in the manuals.

As for the participants who were novices in the aviation industry, they claimed that their lack of experience and knowledge were the reasons why they had difficulty understanding the manuals. When asked the main reason why readers might face difficulty understanding the manual, Participant 9 stated that his different background knowledge in the aviation affected the understanding, as he explained:

> ‘(…) not all parts of the helicopter that I know, such as swash plate. If I read the manual, I know what swash plate is, but in the real life, I do not know where the swash plate in the helicopter is located because I am majoring in avionics’ (P09: L32).

Participant 6 who shared his experience dealing with the issue of different background knowledge explained:

> ‘The way he interpreted the manual and the way I interpreted the manual was different when reading the manual. He thought that it was supposed to be done that way, but the problem was, he was not conversant with the engine and hence, his interpretation to whatever said in the manual was based on his background knowledge’ (P06: L41).

As for the manuals, the difficulty was mainly due to the translated version of the manuals. Participants 10 and 15 revealed that the manuals from the non-native English speaking countries were difficult to understand because the manuals were translated from other languages to the English language. They explained:

> ‘Confusion happened because the manuals were translated from French to the English language, so sometimes there maybe a little bit of confusion in understanding the content that had been translated (P10: L15).
>
> ‘They have been translating the manual that was written in Russian into the English language. When they translate the manual, they will translate it word by word and it affects the sentence structure’ (P15: L26 & L30).

The origin of the aircraft manufacturer also resulted in the varied type of sentences. For example, if the aircraft is manufactured by a non-native English speaking country, the manuals need to be translated to the English language because the writers are non-native speakers of the said language. On the other hand, if the manufacturer's company is from a native English speaking country, their manuals are written in the English language. Hence, the participants did not have any problems understanding the content of the manuals.

The issue of using different terms also occurred among the aircraft manufacturers from the same country. This is to show that the terms used are the trademark of the company. Participant 1 explained his rationale as follows:

> 'Even between two American companies, each company will be using two different terms for the same part of the engine. In other words, both companies prefer to use different terms. For example, the front part of the engine, one might call it spinner cone, the other company will call it nose cone' (P01: L38 & L40).

On the contrary, a minority of the participants mentioned that the manuals were easy to understand because the language is straightforward, simple, clearly stated and written in very simple sentences. Participant 13 stated:

> 'If the readers can understand Basic English, and they have knowledge on scientific terms, they should be able to understand the message conveyed in the manuals' (P13: L16).

Moreover, the steps on how to understand the structure of the manuals are also stated in the introduction section of the manual. As Participant 6 put it:

> 'I don't think it is a problem because the manual itself tells you how the manual is organised and it is usually written in the introduction part, so if you read the introduction, you can understand structure of the manual' (P06: L47).

As for the AD, the difficulties that the participants encountered were due to the terms and phrases used in the ADs. This is because the terms and phrases used were the aviation legal terms and phrases. This relates to their poor background knowledge as the participants were not familiar with the terms and phrases. As explained by Participants 16 and 17:

> '(…) because normally engineering and legal terms are totally different, we do a lot of readings on engineering books so engineering terms are not a problem for us" (P16: L14).
>
> 'I think because of the sentence structure used in the legal documents because in the aviation, the terms used were the air legislation terms, so the types of

> words can be said as the law terms. So, it is difficult for me to understand' (P17: L18).

On another note, the difficulties in understanding the documents were due to the country of origin of the documents. A small number of the participants expressed that the AD is hard to understand because the provider of the AD is the United States Federal Aviation Authority (FAA). For example, Participant 8 elaborated:

> 'The nature of the originator, for instance, the writers like to put things in a paragraph or in an essay form, so it is difficult when you have to extract the data from the essay, but if you refer to the EASA AD it is more simple and easy to understand' (P08: L6).

To sum up, there were various reasons which led to the difficulty in understanding the manuals and the AD rather than the language itself. This is because the language used in the manuals is mainly simple and straightforward. Compared to the regulatory document, the difficulty was mostly due to the terms, as these terms were legal terms and not the technical terms. It is interesting to note that for all the reasons revealed by the participants in the analysis, having a strong background knowledge of their work seems to be the most vital in understanding the documents.

As noted at the beginning of the chapter, the present chapter aimed to: (1) identify the community of aircraft maintenance domain, and (2) determine types of technical documentation and the main reference used in performing aircraft maintenance activities. The first part of the analysis attempted to determine the sample of discourse community in the aircraft maintenance domain in order to: (1) identify the members of the community to distinguish the roles of the readers and the writers, (2) identify the position of the AMP in the community and (3) investigate the relationships of the community members. The second part of the analysis focused on identifying the types of technical documentation and the main references used by the AMP when performing aircraft maintenance activities.

The following sections conclude both objectives which were set for the present chapter. The first conclusion focuses on positioning the roles of the community of aircraft maintenance domain to determine the position of the AMP in the community. This is followed by a discussion on the relationship between the documents used in the aircraft domain and the community members to govern the communicative activities that influence or complement reading activity of aircraft maintenance.

3.5.5 Positioning discourse communities of aircraft maintenance

Each community in the aircraft maintenance has its own goals and values. The need for these communities to communicate via written communication requires them to produce their own texts with one common goal in mind, for an aircraft to be airworthy. Table 3.8 below shows the summary of key features of the discourse communities of aircraft maintenance.

Table 3.8

Positioning The Communities in The Discourse of Aircraft Maintenance

	Values & goals of discourse community	**Communication modes & roles for texts**	**Norms for text**	**Writers & readers' roles & tasks**
Aviation authority (CAAM)	• The highest position in the hierarchical ranking, which can be assumed as the most powerful group in the discourse of aircraft maintenance. • The goal is to oversee the approval and regulation of civil aviation.	• AD - updates the end-users on the amendments on the aircraft system. • AN - guidelines for end-users for airworthiness.	• AD and AN are produced and circulated to end-users. • The texts contain specific legal terminology.	• Airworthiness Division of CAAM is the unit that writes the documentation in relation to aviation regulations. • Outline the rules and regulations related to airworthiness to be circulated to end-users (air operators and MRO organisations).
Aircraft makers	• The second rank in the hierarchy of aircraft maintenance. • In-charge of designing and manufacturing aircraft following ICAO Annex 8. • Aircraft design, construction and operation must comply with the appropriate airworthiness.	• Instruction manuals - to assist the readers with the procedures of the aircraft maintenance. • Illustration manuals - to illustrate parts and structure of the aircraft. • Updates and modifications - latest news related to the aircraft system that requires modification.	• Manuals are written for the end-users and not meant for the public. • Only the members in the department of aircraft maintenance in the organisation can access these manuals. • Strict guidelines in writing the manuals, in which the technical writers are advised to follow the guidelines outlined in the	• The writers of aircraft maintenance documentation or more specifically called technical writers as the documents are mainly on how to maintain, modify, repair and overhaul the aircraft.

			ASD-STE100 (ASD, 2013). • The manuals contain specific technical terminology as outlined in the ASD-STE100 (ASD, 2013). • The organisation of the manuals is in accordance with the guidelines in ATA Specification 100 (ATA, 1999)	
End-users (AMP of air operators and MRO organisations)	• The lowest rank in the community of aircraft maintenance. • Monitor and assess maintenance and operational experience with respect to continuing airworthiness. • Produce simplified documents such as AD and SB to ensure the language used in the original documents is easy to understand by the AMP.	• Task cards to inform the AMP about the maintenance tasks that they are required to perform. • Documents pertaining the updates and modifications of the aircraft system.	• Task cards only provide important details. • The documents are circulated for the members of the department only. • Short and simple language in writing the documents.	• AMP with the higher positions are the writers to produce documents for AMP in the lower position. • AMP are also the readers of the documents produced by the aviation authority and the aircraft makers. • AMP are required to refer to aircraft maintenance documentation to maintain the airworthiness.

The data from the review of the literature (section 3.3.3) and the data obtained from the interviews (section 3.5.2) revealed that these three groups have different values based on their background. For example:

(1) the aviation authority (CAAM) is responsible for monitoring the aviation rules and regulations in general,

(2) the aircraft manufacturer is responsible for designing and manufacturing an aircraft by following the guidelines set by the aviation authority, while

(3) the AMP of air operators and MRO organisations are classified as the end-users in the hierarchy and are responsible to operation and maintenance of the aircraft according to the guidelines given by both aircraft manufacturer and aviation authority.

Despite these differences, they shared one common goal, which is ensuring airworthiness. Table 3.9 illustrates the characteristics of discourse community of aircraft maintenance based on the Swales' characteristics of discourse community.

Table 3.9

Mapping Swales' Characteristics of a Discourse Community (1990, P.24-27) Onto The Technical Manuals in Aircraft Maintenance

Characteristics of Swales' discourse community	**Characteristics of the discourse community of readers and writers of technical manuals**
1. Broadly agreed set of common public goals	• This discourse community only involves the key members of aircraft maintenance since the public does not have the access to most of technical documentation produced by this community. • This discourse community is also determined by the roles of the writers and readers of technical documentation in the aircraft maintenance to achieve one common goal, airworthiness.
2. Mechanism of intercommunication among its members	• Intercommunication between the readers and the writers is achieved through written communication specifically technical documentation produced by each community and received by AMP. • The purpose of the communication is to ensure the airworthiness with AMM as the main document for references. • The AMM contains information, procedures and recommendation for AMP to follow.

3. Uses its participatory mechanism primarily to provide information and feedback	• The information provided for aircraft maintenance tasks is conveyed via written communication that involved various types of documents produced by different community. • These documents are usually linked with one to another, such as task card that informs the readers on the details of the tasks with the required reference, in this case, AMM. • The feedback is usually the report written by the readers as the evidence that tasks have been completed.
4. Has one or more genres in the communicative furtherance of its aims	• Besides AMM and other types of manuals, AMP are required to refer to other documents provided by other communities in aircraft maintenance such as documents provided by CAAM and the documents produced by aviation organisations.
5. Has acquired some specific lexis	• Most of the documents have their own specific lexis. • For instance, AMM contains specific technical terminology and AD contains specific legal terminology.
6. Has a threshold level of members with a suitable degree of relevant content and discourse expertise	• There are three levels of groups in aircraft maintenance: (1) aviation authorities, (2) aircraft makers and (3) end-users. • These three groups produced their documents and can be classified as the writers in aircraft maintenance domain. • Even though the AMP are classified as part of the end-users, they are positioned as the lowest level in the discourse community who use the documents for aircraft maintenance activities. • Hence, the members of this group are the core readers of the documents.

As can be seen in the table above, the communities in the discourse of aircraft maintenance can be distinguished based on their roles and characteristics, in this case, the writers and the readers. It is observed that all the three groups in the discourse community of aircraft maintenance are classified as the writers of the documents with the AMP as the readers.

The NAA, which produces the texts related to aviation rules and regulation, is responsible for the circulation of the outline on the rules and regulation related to airworthiness to the aircraft manufacturers and end-users (section 3.4.2.2). Hence, the aviation authorities are classified as the writers of the legal documentation. In Malaysian context, the writers of this kind of documents are the CAAM, specifically Airworthiness Division.

The aircraft makers are the writers of the aircraft maintenance documents. These writers can also be classified as technical writers. Generally, aircraft makers do not provide specific information regarding the author of their manuals. For instance, the technical writers for Boeing AMM are stated as Maintenance Engineering Technical Services Organisation of the Boeing Commercial Airplane Group (Boeing, 1998). As for Cessna AMM; the manual only mentioned that the AMM was prepared by Cessna Aircraft Company (Cessna, 1997). In other words, there is no detailed information given on who their technical writers are. However, according to Chapparo and Groff (2002), the selection of the technical writers depends on the aircraft makers. The technical writers for maintenance manuals, for instance, could be among the engineers who have both the knowledge of aircraft components and aircraft maintenance.

3.5.6 The relationships of aircraft maintenance documents with the discourse community of aircraft maintenance

A hierarchical relationship of technical documentation and their constituency in the field of aircraft maintenance can be summarised in Figure 3.7.

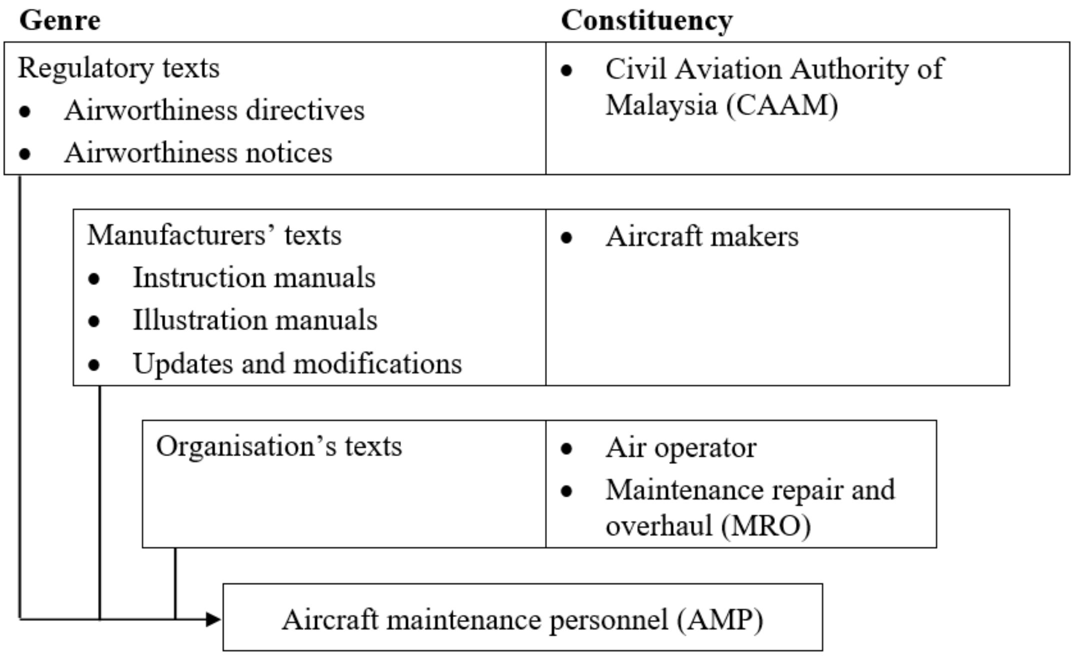


Figure 3.7 A hierarchical relationship of technical documentation

Figure 3.7 shows that the AMP are the readers of the documents produced by all the three groups. Due to this, it can be seen that the AMP is positioned at the lowest rank in the hierarchical relationship of the technical documentation, they are the potential readers of all the documents produced by these three groups. Hence, these personnel can be classified as the real and imagined readers or users who use aircraft technical documentation to do something in their own environment (Houser, 1997), in which they completely dependent on the writers of the technical documentation to perform maintenance activities (Lago & Lloret, 2012).

3.6 Conclusion

This chapter set out with the aim of analysing the members of the community of aircraft maintenance in order to distinguish the roles of the readers and the writers. It is also sought to identify the position of the AMP in the community and to investigate the relationships of the community members. This chapter also intended to identify the types of technical documentation used in aircraft maintenance activities particularly the main reference manual. The discussions of the findings and the analysis in 3.5 suggested several insights to the study of the discourse community of aircraft maintenance:

1. There are five organisations responsible for the regulations pertaining to the exercises of aircraft maintenance to ensure the continuing airworthiness of the aircraft. The five organisations are: (1) the International Civil Aviation Organization (ICAO), (2) the National Aviation Authority (NAA), (3) the Original Equipment Manufacturer (OEM), (4) the Air Operators, and (5) the Maintenance, Repair and Overhaul (MRO) organisations.
2. There are three hierarchical groups that can be classified as the key members as part of the discourse community of aircraft maintenance: (1) aviation authorities that comprised the ICAO and the CAAM which are positioned at the highest rank in aircraft maintenance domain, (2) aircraft makers consists of the OEM which are positioned at the second rank, and (3) end-users that include the air operators and the MRO organisations which are positioned at the lowest rank in the community.
3. These three communities hold different values, as the CAAM is responsible for monitoring the rules and regulation pertaining to aircraft maintenance activities. The aircraft manufacturer looks after the design and manufacture of the aircraft and are governed by guidelines. As for the AMP of air operators and MRO organisations, they are classified as the end-users in the hierarchy and are tasked to operate and maintain the aircraft according to the guidelines given by both aircraft manufacturer and the aviation authority.
4. As for the roles of these communities, it can be concluded that these three communities displayed two types of roles: the writers and the readers. The findings also suggested that the AMP, which are part of air operators and the MRO organisations, are the readers of the documents produced in relation to aircraft maintenance activities. The relationship between the writers and the readers in aircraft maintenance domain can be described as 'the readers read the manuals to act, while the writers of the manuals write to help the readers to act'.

In terms of documents used, even though there were a variety of documents mentioned by the participants, it is interesting to point out that there appeared to have been a consensus among the participants in which the AMM is the main reference when performing aircraft maintenance. Even though the participants had diverse background knowledge, they all agreed that the AMM is the most important reading material to be used. It might be due to the fact that the heart of the aircraft maintenance activities is the AMM. Without the AMM, aircraft maintenance activities would not be performed, and the aviation industry would no longer be airworthy. The analysis of discourse community of aircraft maintenance has extended the understanding towards the nature of AMM, in which:

1. The AMM is categorised as instruction manuals which are produced by aircraft manufacturers or OEM (section 3.5.2.2). Hence, these types of manuals can be claimed as the genres of the discourse community. The technical manual is seen by all three communities as the most rigid genre. This is because the purpose, the structure and the linguistic features used in the AMM are governed by a standardised rule (Sharpe, 2014).
2. The writers of the AMM are anonymous (section 3.5.4). The writers achieved their communicative purposes when constructing texts by employing suitable linguistic features as outlined in the ASD-STE100 (ASD, 2013), and standard structural forms of manuals as outlined in the ATA Specification 100 (ATA, 1999, GAMA, 1978). It is important for the writers to follow the guidelines to ensure standardisation in terms of the organisation, the physical appearance and the linguistic features used.
3. The purpose of reading the AMM is to assist the AMP in their maintenance activities. When reading technical manuals, according to Lago and Lloret (2012), technicians do not read these manuals to find the truth; but to perform an action the right way. Hence, with the help of the manual, the readers will be able to perform maintenance tasks using the correct tools and following the procedures accordingly. The actions performed by the readers can be considered as an accurate representation of the manual’s text if the readers follow the actions as instructed in the manual. Even though it was mentioned that the AMM is governed by the ATA Specification 100 (ATA, 1999) and ASD-STE100 (ASD, 2013), the participants pointed out that they would not be able to understand and interpret the manuals without adequate background experience. Hence, the background experience is really important in this context.

4. Although the participants explained how they used and read the AMM, I did not get the opportunity to look at the sample of the AMM due to issue of confidentiality. The participants generally work with live aircraft, and the AMMs that they refer to are not meant for public to retrieve. These AMMs are only read by the end-users such as air operators and the MRO organisations since they are responsible for the aircraft maintenance. The potential readers for these AMMs are strictly for the AMP, regardless the line of work or organisations that they are attached to.

The present study can be said as exploratory in orientation as I do not have any background knowledge of the AMM. The following chapter (Chapter 4) explores the structure of the AMM, the guidelines that governed the structure of the AMM and the contexts in which the AMM is used.

CHAPTER 4

CONSTRUCTING THE CORPUS

4.1 Overview

The previous chapter dealt with defining the discourse communities of aircraft maintenance through responses to interview questions. This was achieved by a sample of the members from the discourse community and the review of related literature. The findings from the semi-structured interviews with the discourse community sample in Chapter 3 established that:

1. the AMM is the main reference when performing aircraft maintenance activities,
2. the AMM is written by aircraft manufacturer or called Original Equipment Manufacturer (OEM),
3. the structure of the AMM is not common for non-aircraft specialist, reading AMM can be said as not easy for non-aircraft specialists,
4. lacking experience and knowledge are the reasons why the readers have difficulty to understand the AMM, and
5. understanding the structure of the AMM can only be gained with adequate experience dealing with the manuals.

As a non-specialist with little background knowledge on the structure of the AMM, I first needed to understand the structure of the AMM before designing the corpus.

This chapter explains the corpus that was used for this study. Firstly, the notion of designing a corpus is discussed. Following this, the structure and the guidelines that governed the organisation of the AMM are explored. Lastly the process by which the corpus was designed and compiled is discussed.

4.2 The Notion of Designing a Corpus

There are several important considerations to look into, such as the types of texts, the number of texts, the sampling procedure and the size of the corpus (Conrad, 2002; Biber, 1993) when designing the corpus to ensure the representativeness of the texts. Representativeness refers to the extent to which a sample includes the full range of variability in a population (Biber, 1993). According to Biber (1993), the sample of texts should include full range of variability in a population, which can be considered from situational and from linguistic perspectives. Biber (1993) also stresses that corpus representativeness depends on the definition of the 'population' that the sample is intended to represent, and the techniques used to select the sample from that population.

Biber (1993) also suggests the 'compilers' to define the population of texts when designing the corpus as this is the most important element to ensure the representativeness of the texts. The term 'sampling frames' was used by Biber (1993) as an operational definition of the population. It is an itemised listing of population members from which a representative sample can be chosen. The frame can be: (1) the field of the texts represented (Amnuai & Wannaruk, 2012; Kanoksilapatham, 2005), (2) the publication years of the texts (Muangsamai, 2018), (3) L1 and L2 English writers (Parkinson, 2017) and (4) a specific section of the texts such as Introduction Section or Methodology Section of research articles (Peacock, 2002; Ruiying & Allison, 2003).

Given an adequate sampling frame, it is possible to select probabilistic sample (Biber, 1993). The first type of probabilistic sample is random sampling, which can be achieved by numbering the texts sequentially and a random sample could be selected through a table of random numbers. By doing this, all texts in the population have an equal chance of being selected. Another type of probabilistic sample is stratified sampling, where subgroups are identified within the target population, and then each of those 'strata' are sampled using random techniques. This approach would guarantee that all strata are adequately represented.

For this study, the process of designing and compiling the corpus of the AMM is discussed in 4.4. In order to design and compile the AMM, the following sections cover the background of the AMM as an introduction, followed by the discussion on the organisation of the AMM.

4.3 Introduction to the Aircraft Maintenance Manual (AMM)

The genre used in this study belongs to the written communicative events occurring in the workplace within the engineering discourse used in the aviation industry, specifically in the field of aircraft maintenance. Unlike other studies in genre analysis, there has never been, to my knowledge, any genre analysis conducted with regard to the AMM. Hence, it is important to introduce the AMM for better understanding of its unique structure (section 4.3.2).

The importance of the AMM was highlighted when a Raytheon (Beechcraft) 1900 crashed during take-off at Charlotte Douglas International Airport in Charlotte, North Carolina, U.S. on January 8, 2003 (Giles, 2015). The crash killed two crewmembers and all 19 passengers. The investigation conducted by the National Transportation Safety Board (NTSB) found that an Aircraft Maintenance Technician (AMT) did not follow the procedures stated in the AMM and had bypassed the procedures. This shows that it is really important for the AMT to strictly follow the instructions stated in the AMM. The importance of following the instructions was also stressed earlier by Participant 4 in the previous chapter who said, "we need to really see whether we follow the step-by-step procedures' (P04: L10).

The AMM is a procedural document that assists the AMP to complete the aircraft maintenance activities (Zafiharimalala & Tricot, 2010). The aim is to guide the AMP through a list of instructions in the task execution. Due to this, the AMM is particularly important in a specific domain like technical documentation, where the content must be able to withstand the test of time, unlike the newspapers, in which the value is modest and may lose its relevance after a few days (Rinaldi, Hess, Dowdall, Aliod & Schwitter, 2004). The AMM is used for a longer period and contains important information that will be used in a specific domain.

Zafiharimalala and Tricot (2010) divide the functions of the AMM into three categories: 1) as a support of maintenance task, 2) as a legal document, and 3) as a support of training. The AMM is classified as a support because it is used to complete aircraft maintenance task. The aim is to guide the AMP through a list of instructions. Secondly, this manual is classified as a legal support because the instructions given are treated as evidence that maintenance operation has been executed in accordance with the instructions. Lastly, it is classified as a support for training because it is also used for training purposes.

Technical writers of the AMM achieved their communicative purposes by employing suitable linguistic features as outlined in the ASD-STE100, and standard structural forms of manuals which are governed by rules (Sharpe, 2014). These rules are governed by either the ATA Specification 100 or GAMA Specification No. 2 depending on the aircraft manufactured. The following section discusses the guidelines in writing the AMM.

4.3.1 Guidelines in writing the AMM

Aircraft maintenance is heavily reliant on documented procedures. The AMP spend between 25 and 40 percent of their time dealing with maintenance documentation (Hobbs, 2008). Hence, to guide them to perform aircraft maintenance tasks, the AMM is required to be well-written. This includes the documentation design, wordings, formatting and sentence structure of the documents (Chervak & Drury, 2002). When writing the documents regarding the continuation of airworthiness, the writers are advised to follow the guidelines specified by the Air Transport Association's Information Standards for Aviation Maintenance, which defines the organisational structure of the AMM and the subject matter to be covered in each chapter (Rogers, Hamblin & Chaparro, 2008). When preparing the structure of the manuals, aircraft makers can refer to GAMA Specification No. 2 (GAMA, 1978) or ATA Specification 100 (ATA, 1999) to ensure the organisation of manuals is standardised and following the ATA chapterisation 100 format which is further discussed in 4.3.2.1.

The GAMA Specification No. 2 was published in 1978 by the General Aviation Manufacturers Association (GAMA). It is an association that provides guidance to manufacturers to prepare technical publications, which include the AMM. ATA Specification 100 on the other hand, was first published in 1956 by the Air Transport Association (ATA). ATA is America's oldest and largest airline trade association that includes airlines, aerospace manufacturers, distributors, suppliers, repair agencies and software providers. The ATA is responsible for assisting the commercial aviation industry in creating standards to develop technical airline documentation that enable the airlines and suppliers to achieve exceptional levels of efficiency and cost saving measures. For this purpose, the ATA standards were developed to provide users with an international specification of technical airline documentation. Both the ATA Specification 100 and the GAMA Specification No. 2 provide the same guidelines, following the ATA chapterisation format, but they both focused on different types of aircraft. For example, the GAMA Specification No. 2 is used for general aircraft manufacturers such as Cessna and Piper, while the ATA Specification 100 is used for commercial aircraft manufacturers such as Boeing and Airbus.

Both GAMA Specification No. 2 and ATA Specification 100 focus on the organisation of technical manuals associated with aircraft maintenance. Both Specification manuals followed the ATA guidelines (ATA, 1999; GAMA, 1978). Due to that, all the AMMs regardless the types of aircraft manufactured, have similar organisation and language features.

The corpus for this study was compiled from the AMM of two aircraft focusing on the same *Page blocks*. Even though these AMMs represented different types of aircraft and were written by different aircraft manufacturers, I foresee the differences would be in the format, layout and font rather than the organisation and the linguistic features. This is due to the fact that these AMMs followed the structure outlined by the ATA Specification 100.

Besides chapterisation format, the aircraft makers are required to follow the guidelines called ASD-STE100 that focuses on the language use in technical documentation. As part of a technical document, the AMM is required to be written using restricted language or Simplified Technical English (STE) to ensure the reduction of the number of human errors made during the execution of maintenance tasks.

To conclude, the structure and the linguistic features of the AMMs have similar pattern and organisation as the technical writers are required to follow the rules and regulation outlined in the ATA Specification 100 or GAMA Specification No.2 and ASD-STE100. The structure of the AMM is in compliance with a standard design recommended by the Air Transport Association (ATA) of America to ensure that the manuals have a consistent "look and feel" (Chaparro, Groff, Chaparro & Scarlett, 2002).

4.3.2 Organisation of the Aircraft Maintenance Manual (AMM)

The organisation of the AMM is unique as it is organised according to "chapterisation". The following section discusses the meaning of "chapterisation".

4.3.2.1 Introduction to AMM Chapterisation

As stated earlier, the AMM has its own structure with a unique "chapterisation" (ATA, 1999; GAMA, 1978). One of the reasons for creating chapterisation is to avoid data redundancy where the AMM must be concise (Rinaldi, Hess, Dowdall, Aliod, & Schwitter, 2004). Chapterisation system will ensure that the readers will find the information in one specific part of the manual. This rigid structuring of such texts facilitates easy access to the specific information that the readers are looking for. Due to that, the original ATA specification and the new *i*spec 2200 (that replaces ATA specification) are developed to provide standardisation for the format and the layout of technical manuals (Chapparo, Groff, Chapparo & Scarlet, 2002).

As stated in the ATA Specification 100 and GAMA Specification 2, chapterisation of the AMM means that it is divided into chapters and each chapter is then divided into sections. ATA Specification 100 standardises the chapters and sections in which they are organised based on the numbering systems to make sure that the readers can easily locate the information in the AMM (ATA, 1999). These chapterisation systems are used in all aircraft manuals as all the writers come to an agreement to follow the format (GAMA, 1978). However, the ATA numbering system is more common as a referencing standard for commercial aircraft type.

The ATA Specification 100 manual details an outline for the organisation of materials within the manual including page formatting and text layout guidelines. According to Mavris, Phan and Garcia (2006), the manual divides the aircraft subsystems into numbered chapters and the index in the ATA chapters are designated by the term "subsystems". Figure 4.1 below illustrates the diagram of how AMM is organised.

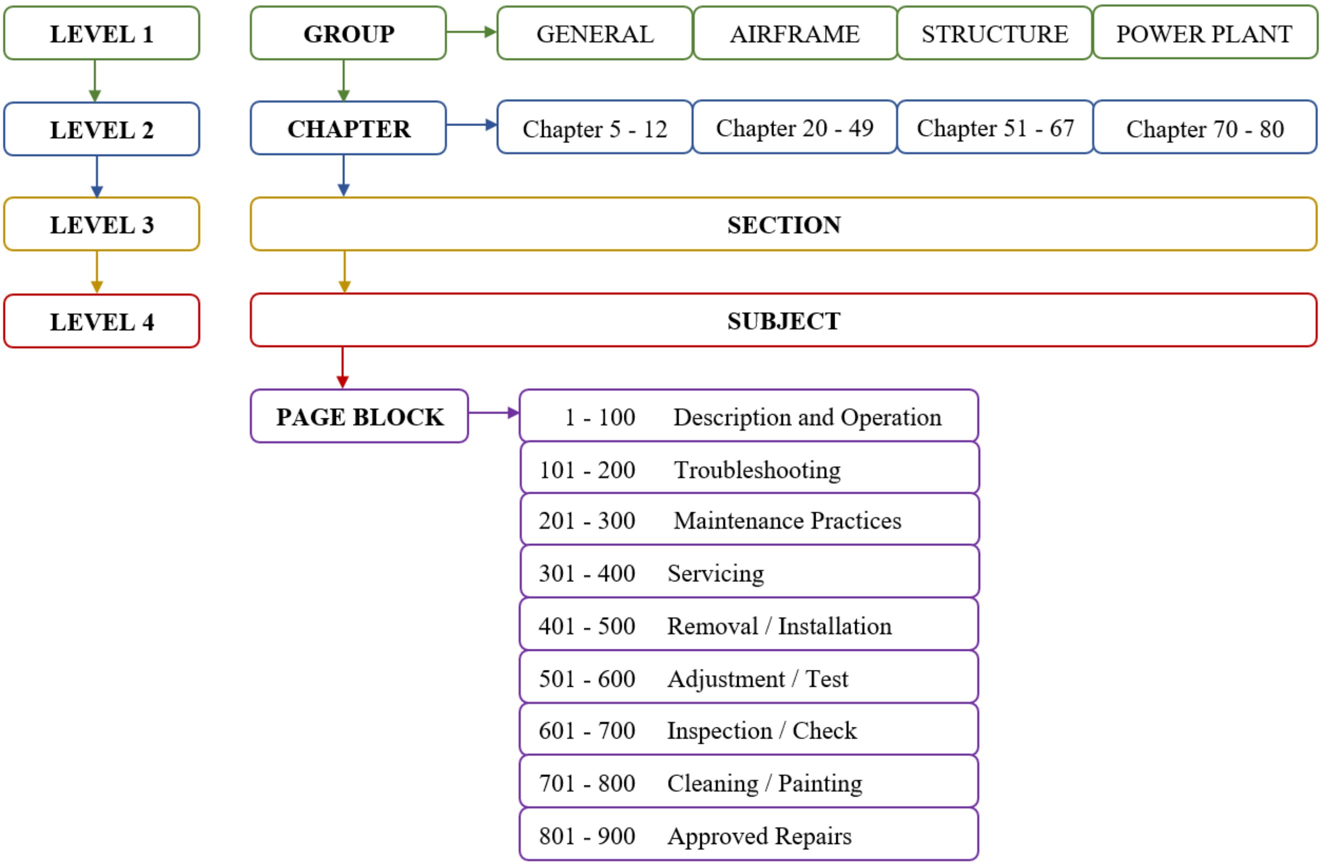


Figure 4.1 Summary of the organisation of the AMM

As illustrated above, the AMM is organised at four levels. The first level is called *Group* where it is the primary division of the manual that enables broad separation of the content (GAMA, 1978; ATA, 1999). There are four major groups in the AMM namely: Aircraft General Group, Airframe System Group, Structure Group and Power Plant Group (Figure 4.2).

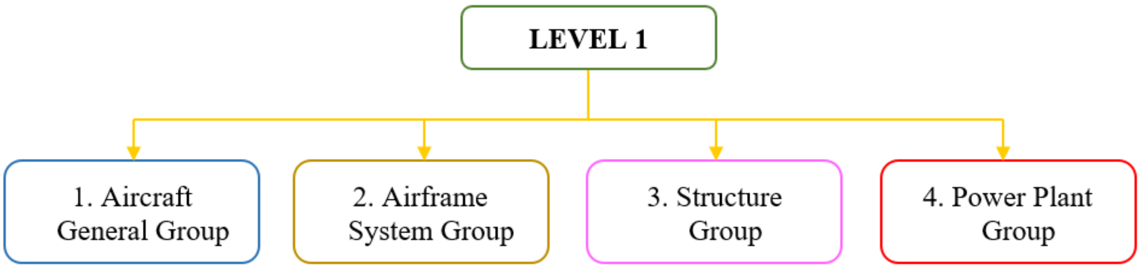


Figure 4.2 Four groups under the first level

Each group in Level 1 is broken down into *Chapters* also called *System*. *Chapters* or *System* is the second level of the organisation (Level 2). For this study, the term *Chapter* will be used to avoid confusion. The *Chapter* in each group represents the system of the aircraft. According to GAMA (1978), the system of the aircraft is a combination of interrelated components, which are arranged to perform a specific function. This includes the basic components and all instruments, mechanical controls, electrical and hydraulic units related to the system. The *Chapters* in the AMM are divided and clustered under four groups, namely *Aircraft General*, *Airframe System*, *Structure* and *Power plant* (Figure 4.2).

As mentioned earlier, the AMM is divided into chapterisation with its unique numbering system. The first group is called *Aircraft General Group*. The chapters under this group cover the information regarding the dimensions and the areas of the aircraft, the procedures of lifting and shoring, levelling and weighing, towing and taxiing, parking and mooring and period of servicing. The chapters under this group are numbered ranging from 05 to 18 (Table 4.1) as Chapter 01 until 04 are reserved for Airline use (ATA, 1999). Hence, they are not included in the ATA Chapter.

Table 4.1

Topics Covered Under Aircraft General Group

Chapter	
05	Periodic inspections
06	Dimensions and areas
07	Lifting and shoring
08	Leveling and weighing
09	Towing and taxiing
10	Parking, mooring, storage and return to service
11	Placards and markings
12	Servicing – routine maintenance
18	Vibration and noise analysis (Helicopter only)

The second group is known as *Airframe System Group* ranging from Chapters 21 to 49 as shown in Table 4.2.

Table 4.2

Topics Covered Under Airframe System Group

Chapter	
21	Air conditioning
22	Auto flight
23	Communications
24	Electrical power
25	Equipment / Furnishings
26	Fire protection
27	Flight controls
28	Fuel
29	Hydraulic power
30	Ice and rain protection
31	Indicating / Recording systems
32	Landing gear
33	Lights
34	Navigation
35	Oxygen
36	Pneumatic
37	Vacuum
38	Water / Waste
39	Electrical – Electronic panels and multipurpose components
41	Water ballast
45	Central maintenance system (CMS)
46	Information systems
49	Airborne auxiliary power

According to ATA (1999), the chapters under *Airframe System Group* cover the mechanical structure of an aircraft such as fuselage, wings and undercarriage. Airframe design combines aerodynamics, material technology and manufacturing methods to achieve balances of performance, reliability and cost.

The third group is called *Structure Group* and the assigned numbers range from 51 to 67 as illustrated in Table 4.3.

Table 4.3

Topics Covered Under Structure Group

Chapter	
51	Standard practices and structures - General
52	Doors
53	Fuselage
54	Nacelles / Pylons
55	Stabilizers
56	Windows
57	Wings
61	Propellers / Propulsors
62	Main rotor(s)
63	Main rotor drive(s)
64	Tail rotor
65	Tail rotor drive
66	Rotor blade and tail pylon folding
67	Rotors flight control

The topics in *Structure Group* are related to various structured sections along with interior and exterior parts of the aircraft. This group covers the main body of the aircraft such as doors, fuselage, nacelles/pylons, windows and wings (ATA, 1999).

The last group is the *Power Plant Group*. The *Chapters* of this group start from number 71 to 84 as shown in Table 4.4.

Table 4.4

Topics Covered Under Power Plant Group

ATA Chapter	
71	Power plant - General
72(T)	Engine - Turbine / Turboprop, ducted fan / unducted fan
72(R)	Engine - Reciprocating
73	Engine - Fuel and control
74	Ignition
75	Bleed air
76	Engine controls
77	Engine indicating
78	Exhaust
79	Oil
80	Starting
81	Turbines (Reciprocating engines)
82	Water injection
83	Accessory gear boxes (Engine driven)
84	Propulsion augmentation

The *Chapters* in this group cover engine parts made up of many components, such as cylinders, pistons and fans, which help produce the energy needed to propel an aircraft. However, readers usually refer to the AMM together with the Power Plant Manual for maintenance tasks after the engine is removed from the aircraft (ATA, 1999).

Numbering system in the AMM does not only involve *Chapters* and their Groups as it continues to the following level called *Section* or *Subsystem* (the term *Section* will be used throughout this study). This is the third level of the AMM organisation. The major systems of aircraft are then broken down into subsystems. The numbering system is assigned for each *Section* as shown in Table 4.5 below.

Table 4.5

Example of Numbering System in Chapter 28 - FUEL

Chapter	Section	Title
28		**FUEL**
	00	General
	10	Storage
	20	Distribution
	30	Dump
	40	Indicating

The last or the fourth level of the organisation of the AMM is called *Subject* or *Unit*. For this study, the term *Subject* will be used. This final division is the individual units in a system or subsystem.

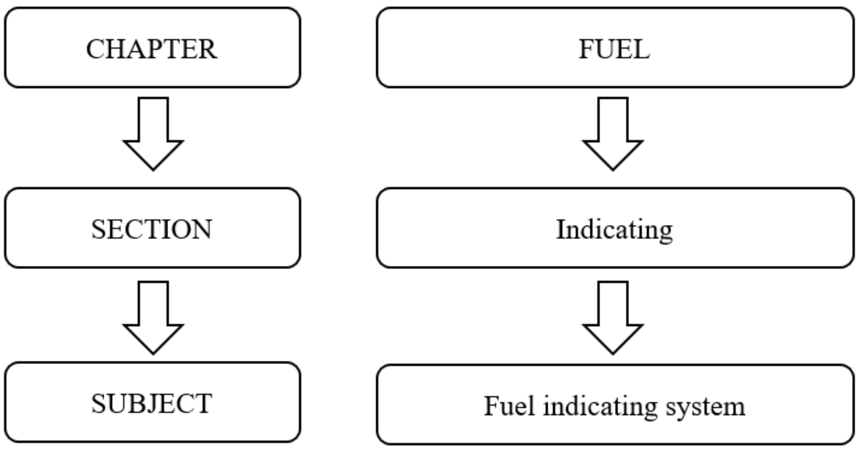


Figure 4.3 Example of the AMM organisation - Chapter 28: FUEL

According to the ATA (1999), the numbering system for *Subject* is not pre-assigned by the ATA specification, but by the aircraft manufacturers, and the numbering system depends on the coverage requirements of their publication.

As mentioned earlier, the AMM is organised based on the numbering system that is set by the ATA specification and it is written in a unique way. It is written by including all the three elements mentioned above, which are: *Chapter* → *Section* → *Subject* (Figure 4.4 below). The standardised numbering system can be found at the bottom of the page in the AMM.

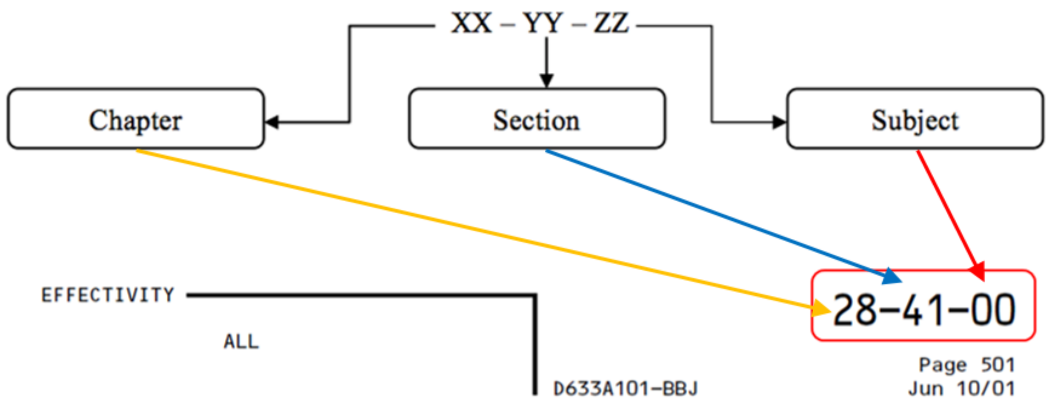


Figure 4.4 Page identification system according to the ATA Specification 100 (ATA, 1999) and its example

Since the first number represents a *Chapter*, the readers can easily recognise the *Chapter* that they refer to. For example, in Figure 4.5, number "**28**" is written first which indicates the chapter is about "**FUEL**". Hence, when the readers refer to this number, they recognise this *Chapter* as the *Chapter* that covers everything concerning the Fuel System.

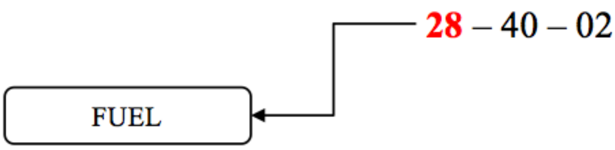


Figure 4.5 Example of the numbering system for Chapter

The second element of the standard numbering system represents a *Section* of the *Chapter*. For example, number "**40**" (Figure 4.6) indicates a subsystem of the FUEL system which is called "*Indicating*".

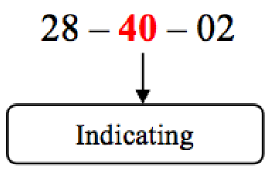


Figure 4.6 Example of the numbering system that represents Section

The last element of the standard numbering system represents the *Subject* that is covered in the *Section*, such as 28-41-**02** (Figure 4.7). This *Subject* number is not pre-assigned because they may be selected by the manufacturer to fit the coverage requirements of the publication.

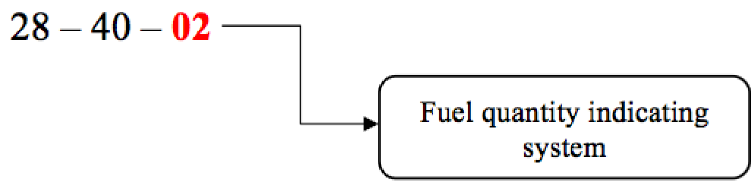


Figure 4.7 Example of the numbering system for Subject

The pages within a *Subject* are structured and numbered according to *Page block*. According to ATA (1999), the material for the AMM shall be divided into front matter such as title page, chapters and their *Page block*.

4.3.2.2 Introduction to the *Page block*

Page block is a numbering system that indicates the page number of the AMM. It represents specific types of information based on the task that need to be performed. The purpose is to make the AMM ready for reference and revision when performing aircraft maintenance activities. As stated in the ATA Specification 100 (ATA, 1999), *Page block* is designed due to the complexity and massive size of materials required for maintenance activities. Hence, there is a need to break down the subjects into smaller topics, by dividing them into *Page block*. There are nine *Page blocks* (ATA, 1999; GAMA 1978; Kinnison & Siddiqui, 2013) and the description of each *Page block* is summarised in Table 4.6.

Table 4.6

The Description of Nine Page Blocks (adapted from GAMA Specification No. 2, 1978, P. 15-21; Kinnison & Siddiqui, 2013, P. 72-74)

Block	**Title**	**Description**
001-100	Description and operation	This page block covers a general description of what the system does, identifies the various operational modes, describes in detail how the system and its essential components work and describes the location of the components.
101-200	Troubleshooting	This page includes fault trees to perform fault isolation procedures for various problems that might occur. Troubleshooting in a complex system consists of: a. Identifying sections that can cause specific types of trouble, b. Isolating the section that is causing the trouble, c. Identifying units in the faulty section that can cause the trouble, d. Isolating the unit that is at fault, and e. Correcting the cause of the trouble.
201-300	Maintenance practices	The maintenance practices are a combination of servicing, removal/installation, adjustment/test. Inspection/check, cleaning/painting, and approved repairs should follow the Troubleshooting Section. When the required maintenance procedure is not lengthy and is relatively simple, a combination of the above may be grouped under one heading and called Maintenance Practices.
301-400	Servicing	This page block includes all servicing tasks: fill and replacement of oil, hydraulic fluid water, and fuel; lubrication actions; and the handling of waste, etc. These procedures include step-by-step instructions as well as a list of required materials and their specifications where applicable.
401-500	Removal / Installation	This page block contains the step-by-step instructions on how to remove and reinstall a component or unit, along with the precautions to be observed.
501-600	Adjustment / Test	This page block contains procedures for accomplishment of a test or check to assure the component or system that has just been replaced by removal / installation procedures. This page block also contains the operational test procedures used to check out a system without test equipment. This is a relatively simple check to verify proper operation using only what is available in the aircraft.
601-700	Inspection / Check	This page block provides the information and procedure necessary to gain access to and inspection or check of a system, a unit, or an area.

701-800	Cleaning / Painting	This page block covers the procedures for washing, cleaning, and painting the aircraft. It includes specifications for materials to be used as safety precautions necessary to protect personnel and material.
801-900	Approved repairs	This page block covers the processes and techniques necessary for performing a repair. Special tools, equipment and materials are included. The page block also includes specifications and limitations as to when a repair is required for safe operation.

There are six *Page blocks* (*Page blocks* 301 – 900) that might be combined as a compilation to maintenance practices (GAMA, 1978; ATA, 1999). These *Page blocks* might be grouped under MAINTENANCE PRACTICES (*Page block 201-300*) if the required maintenance procedure is not lengthy and is relatively simple (ATA, 1999). Due to that, the AMM would have diversity of the number of *Page blocks* depending on the necessity.

The organisation and the format of writing the *Page blocks* is the same for all maintenance manuals, in which it is written and positioned at the bottom right side of each page. The advantage of this system is that if the readers are dealing with different types of aircraft in a single day, *Page blocks* will ease the process of finding the required information. The standardisation layout of the AMM minimises the time for the readers to learn how to use different types of aircraft manuals and hence, it is easier for them to switch from one manual to another (Chapparo, Groff, Chapparo & Scarlet, 2002).

4.4 The Design and Compilation Process of the AMM Corpus

In order to represent what the AMM corpus was intended for, the corpus that will be compiled had to accomplish the state of 'representativeness'. Hence, the 'sampling frames' that was used by Biber (1993) will be the guidelines for this study to fulfil the requirements in compiling the AMM corpus.

4.4.1 Defining the population of the AMM corpus

In order to design the AMM corpus, it is vital to define the population of selected texts as suggested by Biber (1993). The 'sampling frames' used by Biber (1993), is as an operational definition of the population, an itemised listing of population members from which a representative sample can be chosen. In addition to this, Amnuai and Wannaruk (2012), and Kanoksilapatham (2005) point out that the frame can be the field of the texts represented. The following discussion is on positioning the use of the AMM in aviation industry and at the university level to define the population of the AMM corpus.

4.4.1.1 Use of AMM in the aviation industry

When positioning the communities in aircraft maintenance domain, it was revealed that the second community is the aircraft makers otherwise known as the Original Equipment Manufacturer (OEM) (section 3.6.1). The values and goals of this community are to design and manufacture aircraft following the ICAO Annex 8 (Airworthiness of Aircraft). Not only that, the design, construction and operation of an aircraft must also comply with the appropriate standards of airworthiness. This community is also responsible for producing all related aircraft maintenance documentation with the AMM as the main document followed by illustration manuals and documents pertaining to updates and modifications. The norms of the manuals produced should follow strict guidelines and include specific technical terminology as outlined in the ASD-STE100 (ASD, 2013). The structure of the manuals, on the other hand, is in accordance with the guidelines of the ATA Specification 100 (ATA, 1999).

4.4.1.2 Use of the AMM at the university

At the university level, AMMs are used as references for students' practical trainings and practical assessments. Universiti Kuala Lumpur Malaysian Institute of Aviation Technology (UniKL MIAT) is a Maintenance Training Organisation (MTO) which has been approved by the CAAM and European Union Aviation Safety Agency (EASA).

One of the requirements stated in the CAAM Part 147 (CAAM, 2011, p. 6) includes;

> The basic training workshops and/or maintenance facilities provided by the MTO must have an appropriate selection of aircraft, engines, aircraft parts and avionics equipment.

Apart from that, the CAAM Part 147 (CAAM, 2011, p.6) also added that:

> Maintenance training course material shall be provided to the student and cover the following, as applicable:
>
> i. The basic knowledge syllabus specified in Airworthiness Notice No. 1101 for the relevant aircraft maintenance licence category or subcategory and,
>
> ii. The type course content required by Airworthiness Notice No. 1101 for the relevant aircraft type and aircraft maintenance licence category or subcategory.

In relation to the AMM, CAAM (2011, 2020) stresses in CAAM Part 66 that:

> The experience shall be practical and involve a representative cross section of maintenance tasks on operating aircraft, covering elements of maintenance, inspections and routine work according to the maintenance manual and other relevant instructions and tasks as appropriate for the aircraft, for example troubleshooting, repairs, servicing, adjustments, replacements, rigging and functional checks.

While the European Aviation Safety Agency (EASA) (2008, p.19) states:

> (…) the practical training element shall cover the practical use of common tooling/equipment, the disassembly/assemble of a representative selection of aircraft parts and the participation in representative maintenance activities being carried out relevant to the particular Part-66 (Aircraft Maintenance Licence, AML). Practical assessment element shall cover the practical training and determine whether the student is competent at using tools and equipment and working in accordance with maintenance manuals.

In order to comply with these requirements, UniKL MIAT has provided training facilities such as actual aircraft component training aids, actual aircraft, hangars and workshops. Hence, the university must ensure that these training facilities are equipped with the correct documentation as outlined by both the CAAM and EASA. Among the documents that the university provides are the AMM, Illustrated Parts Catalogue (IPC), Component Maintenance Manual (CMM), Service Repair Manual (SRM), Schematic Diagram manual (SDM), Wiring Diagram Manual (WDM) (see Appendix G for a list of manuals) and task cards. Parallel with the results obtained in 3.5.2, these documents were also mentioned by the participants as references for aircraft maintenance activities.

Even though there are various types of manuals, the AMM is the main reference during practical lessons as it is in the aviation industry, as revealed in 3.5.2.1. However, the process flow of performing maintenance task at UniKL MIAT is slightly different from that in the aviation industry. The process flow of performing practical trainings and assessments is shown in Figure 4.8.

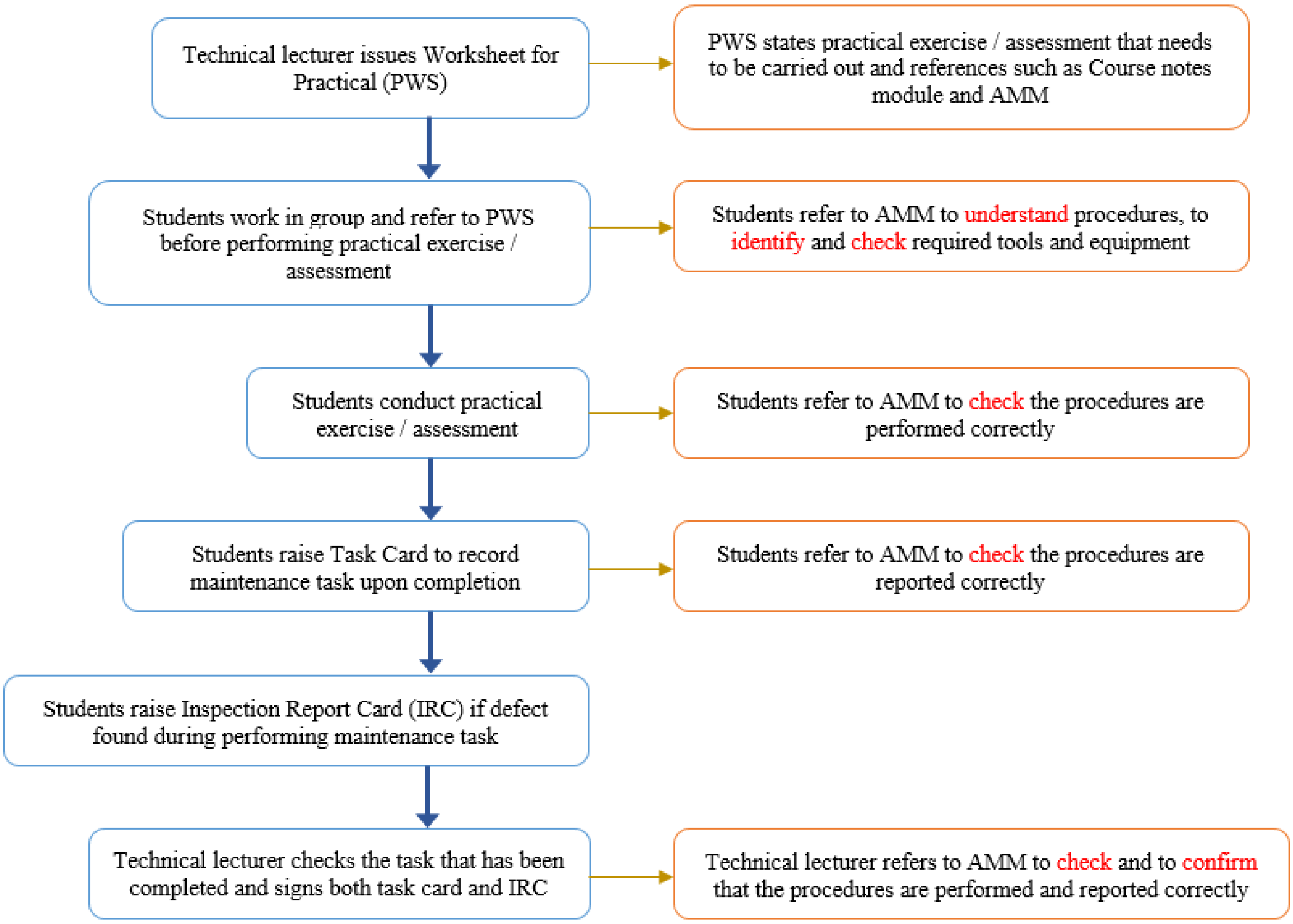


Figure 4.8 The process flow of how the AMM is used at the university

As an aviation training organisation, technical subjects taught at the university involve theoretical and practical lessons. Practical lessons mean students are exposed to performing maintenance tasks that they learned in technical subjects, which cover all the topics in the four groups in the AMM (section 4.3.2). At the university, the maintenance task usually begins with an instruction given in a form called Worksheet for Practical (PWS), which is issued by a technical lecturer. The PWS consists of types of maintenance task, types of references and a list of tools and equipment needed when performing the maintenance task. As shown in Figure 4.8, students will work in a group to perform the maintenance tasks. Before performing the tasks, they are required to refer to the PWS to find specific *Chapters* and *Page block* in the AMM. They need to understand the procedures and follow up by identifying and checking the tools and equipment needed. This is similar to the practices by the AMP in the aviation industry as discussed in 3.5.3.

At the university, the Head of Hangar is responsible for keeping all the AMMs and he has to ensure that all of them are available in every workshop, in the hangar and also in the library. There are various types of AMMs that are available in the university (Appendix G). However, for the present study, only two types are selected as the AMM corpus, which is discussed in the following section.

4.4.2 Design stage

In the context of designing the specialised corpus, the process involved was multi-faceted. First, I went through all types of manuals that are used at the university. I referred to the Head of Hangar, Mr. Abdul Aziz Bin Ahmad, for the list of manuals that are used at the university (Appendix G). Since there are various types of manuals for different types of aircraft, I decided to select the manuals from two different types of aircraft, namely Boeing and Cessna. The selection made was based upon these considerations:

1. these manuals represent different types of aircraft,
2. these manuals were produced by two different manufacturers, Boeing and Cessna,
3. publication years of both AMMs (Muangsamai, 2018),
4. different technical writers with L1 English writers (Parkinson, 2017), and
5. these manuals might comprise different *Chapters*, *Sections* and *Page blocks*.

Second, I analysed the criteria of the aircraft and their manuals as shown in Table 4.7. The purpose is to ensure that the AMMs selected were varied in the form of aircraft manufacturers and the aircraft types. Different manuals, different aircraft types and different manufacturers would make it possible to determine whether all manuals shared the same moves and the same linguistic characteristics, irrespective of the company which produced them. Below is the information gathered on the characteristics of each aircraft.

Table 4.7

Background Information of B737 and C182 Aircraft

Aircraft	**Types of Aircraft**	**National of Origin**	**Published by**	**Year of manufacture**
Boeing 737	Narrow-body aircraft	United States	Boeing Commercial Airplanes Group	1998
Cessna 182	Light aircraft	United States	Cessna Aircraft Company	1997

Based on the background information given above, it could be summarised that:

1. Types of aircraft are characterised by their size. As shown in Table 4.7, Boeing 737 is classified as a narrow-body aircraft type, which means this aircraft is an aircraft with only one aisle in the cabin with passenger seats divided into two axial groups. Cessna 182, on the other hand, is classified as light aircraft type, which means an aircraft with a Maximum Take-Off Weight (MTOW) is less than 5700kg. According to Chapparo and Groff (2001), for smaller aircraft, or those with fewer customisation options, it may be acceptable to include all information into every manual and give the readers the necessary data to determine what applies to their aircraft. For more complex aircraft, or those with many customisation options, it becomes necessary for the manufacturer to tailor a customer's manual based on the configuration of their aircraft. Based on the size of these aircraft, it could be expected that the larger the aircraft, the more number of *Chapters*, *Sections* and *Page blocks* would be provided in its AMM. These would affect the number of *Chapters*, *Sections* and *Page blocks* in each manual.

2. The aircraft were manufactured by the companies from native English speaking countries. Hence, these manuals were written in the English language, and needed no translation. As the findings in Chapter 3 (section 3.5.4) revealed, some manuals were translated from other languages to the English language. The situation occurred because the aircraft were manufactured by the company from non-native English-speaking countries. This is not the case for the AMMs selected.

3. Both AMMs were published by two different aircraft manufacturers, namely Boeing Commercial Airplanes Group (Boeing, 1998) and Cessna Aircraft

Company (Cessna, 1997). However, the identities of the writers were unknown as no information about the writers were given in both AMMs.

4. The years of manufacture of these two aircraft are almost the same. Both AMMs were also prepared according to the rules outlined in ATA Specification 100 and GAMA Specification No. 2. Hence, both AMMs could be said as having similar structure in terms of its organisation and chapterisation.

Apart from the three *Page blocks*, the corpus of AMM are compiled from three groups: (1) Airframe System Group, (2) Structure Group, and (3) Power Plant Group. The first group, Aircraft General Group was not included as this group only covers the information regarding the dimensions and areas of the aircraft, the procedures of lifting and shoring, levelling and weighing, towing and taxiing, parking and mooring and period of servicing as mentioned in 4.3.2.1.

Third, the occurrence of *Chapters*, *Sections* and *Subjects* for each group of both AMMs was analysed (Table 4.8). The purpose is to find the similarities and differences in a total number of *Chapters*, *Sections* and *Subjects* for each group of both AMMs. The similarities and differences would help me to decide which level of AMM is the most suitable to be compiled as the corpus for analysis. The analysis could not be conducted for the whole AMM as large corpus of texts would not necessarily provide the most relevant answers to the objectives of the study. According to Bowker and Pearson (2002), in Language for Specific Purpose (LSP) studies, the concepts, terms, patterns and contexts that interest the data analysts might appear in any section of a text. In fact, the location in a text may be highly relevant even though full texts are generally preferable because important information can be found anywhere in a text. On another note, Biber, Connor and Upton (2007) also claim that top-down approaches for move analysis have not been applied to an entire corpus of texts. This is because, according to them, to conduct the top-down analytical framework to a large corpus of texts is highly labour-intensive.

Table 4.8

Data Analysis of Chapter, Sections and Subjects

Group	# of Chapters	# of Sections	# of Subjects
General	7	31	109
Airframe	19	197	1, 277
Structure	7	75	286
Power Plant	9	28	229

The findings show that the total number of *Subjects* is not determined by the number of *Chapters* nor *Sections*. As discussed in 4.3.2.2, the complexity and the volume of material required for maintenance of the modern airplane dictates the need to break down the *Subjects* into smaller topics. These smaller topics are divided according to nine *Page blocks* that represent different types of information. Since all *Chapters* provided in the AMM are organised following *Page blocks* system, and the number of *Subjects* could not determine the number of the AMM corpus size, it is necessary to conduct an analysis to determine the occurrence of *Page blocks* to see whether these two types of AMMs that represented two different aircraft types have the similarities. The analysis is considered as the fourth step in determining the AMM corpus.

The analysis of the occurrence revealed that the existence of these three *Page blocks* are independent as shown in Tables 4.9 and 4.10.

Table 4.9

Example of Occurrence of Page Blocks in B737 Manual

Chapter	Section	Subject	Page Blocks		
			1-100	101-200	201-300
21	00	00	x	--	x
		01	--	x	x
		05		x	x
	20	00	x	--	--
	21	00	x	--	--

Table 4.10

Example of Occurrence of Page Blocks in C182 Manual

Chapter	Section	Subject	Page Blocks		
			1-100	101-200	201-300
21	00	00	x	--	--
	20	00	x	x	x
	21	00	--	--	x
	40	00	--	x	x
22	00	00	x	--	--

As shown in the above examples, the occurrence of these three *Page blocks* is not fixed; its presence depends on the information of the subsystem and its units for that *Chapter*. The ATA Specification 100 and GAMA Specification No. 2 also did not mention that the AMM must provide all the *Page blocks* according to its sequence.

The findings of the frequency of *Page blocks* revealed that Cessna 182 manual only covered the first three *Page blocks*: Description and Operation (*Page block 0-100*), Troubleshooting (*Page block 101-200*) and Maintenance Practices (*Page block 201-300*). On the other hand, Boeing 737 manual provided more than three *Page blocks*. This is because the other *Page blocks* are included in the Maintenance Practices for Cessna 182 manual as they might not be lengthy and relatively simple (GAMA, 1978). To conclude, both Boeing AMM and Cessna AMMs have similar three *Page blocks*: (1) Description and operation, (2) Troubleshooting and (3) Maintenance Practices.

Even though it is desirable to collect the entire AMM, it is necessary to select only the first three *Page blocks* in order to control the variables as much as possible. Hence, this study will analyse the moves at the level of *Page blocks,* focusing on only three *Page blocks*.

4.4.3 Corpus size

The size of the corpus contains a massive amount of *Page blocks* that covered a variety of subsystem. Due to that, I am not able to cover all the chapters and systems on each *Page block* to be compiled as corpus. Therefore, there is a need to ensure the ‘text’ chosen will be representative of the sample from the basic population of all the three *Page blocks*. Losey-León (2015, p. 296) claims that:

> (…) specialised corpus (…) seems to be a general consensus as the final corpus size depends on the corpus aim and no minimum or maximum extension is particularly required. (…) a vast amount of texts do not necessarily correspond to a substantial and significant body of expertise.

Table 4.11 summarises the total number of texts that were selected from two AMMs for each *Page block*. The justification on how the number of the texts was gained is discussed below.

Table 4.11

Summary of Total Number of Texts Selected for Each Page Block

Group	**1-100**		**101-200**		**201-300**	
	B737	**C182**	**B737**	**C182**	**B737**	**C182**
General	--	--	--	--	--	--
Airframe	24	4	15	8	16	9
Structure	7	1	1	--	2	2
Power Plant	5	1	--	1	3	1
Total texts	**36**	**6**	**16**	**9**	**21**	**12**
	42		**25**		**33**	

The number of texts for each *Page block* was initially made based on approximately 10% from the total number of texts in each *Page block* (Appendix H). However, it was found that some of the texts were typically shorter, such one or half a page. Hence, more texts were added. For example, for the second *Page block*, Troubleshooting, the total texts for this *Page block* was relatively small. Therefore, the number of texts for this *Page block* was increased to more than 50% from the total number of texts. As the last resort to determine the number of texts, I obtained the following calculated size of the corpus for the AMMs based on the total number of words for each *Page block* as shown in Table 4.12 below. The total number of words is targeted to be more than 100,000 words.

Table 4.12

Summary of Number of Texts, Word Token and Word Types

Page block		Number of texts	Word tokens	Word types
001-101	Description and operation	42 texts	57,023	
101-200	Troubleshooting	25 texts	39,664	5,057
201-300	Maintenance Practices	33 texts	32,991	
	Total	**100 texts**	**129,678**	**5,057**

According to Biber (1993), smaller corpora are capable of covering all linguistic features, if they are well-balanced. Biber (1993) also added that 10 texts per register with a length of 1,000 words serve as an orientation for the size of the core corpus. Hence, his calculations served as an orientation for the size of the AMM corpus for this study. As shown in Table 4.12, the total number of word tokens for 100 texts is 129,678 while the total number of word types is 5,057.

4.4.4 Sample of text

As elaborated earlier in 4.3.2, the AMM is organised in the form of chapterisation, in which the number written on each page indicates the chapter and the subject. Maintenance Practices *Page block*, for instance, is indicated by the number 201 to 300. The total number of pages, in addition to that, is dependent on the content for each subsystem. For example, if the page number is written as ‘page 201’ until ‘page 205’, this indicates that there are five pages for one subsystem under Maintenance Practices.

The term ‘text’ used in the present study refers to a complete discussion of one subsystem which is covered in each *Page block*. As for the format of the content presented in the text, most of the texts comprise linear and non-linear texts. Non-linear texts might be in a form of diagrams, tables or figures. For the present study, the non-linear texts are included as part of the analysis of moves and steps that are discussed in Chapter 5. However, for linguistic analysis in Chapters 5 and 6, non-linear texts are not included as discussed in 4.4.5.

4.4.5 Copyright issues

As noted earlier, the AMMs are not meant for the public, hence they are not retrievable unlike any other types of documents. The participants that I interviewed mentioned that they referred to the AMM but did not provide me with the copies. Access to the AMM is only limited to the AMP. Apart from that, I have also contacted Cessna and Boeing through their websites, as suggested by one of the participants, however, I did not get any response from them. Due to these conditions, the AMMs selected for this study were retrieved from the university (UniKL MIAT).

As the AMM corpus are compiled from the AMMs used in the university, the copyright to use the AMMs was granted from the university. The permission was requested from UniKL MIAT Deputy Dean of Academic, Mr. Mohammad Iqmal Bin Mod Ali (Appendix F). I had a short discussion with Mr. Mohammad Iqmal, in which I informed him that two AMMs used in the university, namely Boeing 737 and Cessna 182 manuals will be used as the main corpus in this study. I also showed a sample on how the corpus will be used in my study.

4.4.6 Processing the AMM corpus

The last stage of building the corpus was the processing stage. The process began with identifying the chapters and subjects from each *Page block*. Then the texts were extracted from various *Chapters* and *Sections* from each *Page block* and compiled into raw corpus. All the texts were then organised according to *Page block*. Each file was then systematically coded to organise the data such as **B737#D&O-T1-21-50-00**. The meaning of the code is shown in Table 4.13.

Table 4.13

Meaning of the Code System

B737	#	D&O	-	T1	-	21	-	50	-	00
Manual		Description and Operation		Text 1		Chapter 21		Section		Subject

As can be seen in Table 4.13, this study uses representative codes such as **B737** for Boeing Manual and **D&O** for Description and Operation. **T** in the code indicated the text number, which was organised in sequence to represent number of texts collected.

Lastly, the number of chapterisation (**21-50-00**) written in the AMM was included as part of the coding system. This is to avoid extracting the text from the same *Chapter* and *Section*.

The collected corpus was first saved in the Portable Document Format (PDF) because the original document was in a form of PDF. After that, each text was converted into Microsoft Word (.doc) format using Nuance PDF Converter Professional 8. Since the texts were extracted from the original document, the texts could not be converted directly to a plain text (.txt). Due to that, the texts needed to be converted to word format first before it could be converted to plain text.

Before the texts were converted into plain text (.txt) format, the texts were "cleaned" (Wagler, Lesser, González & Leal, 2015), also called data cleansing (Sadjirin, Aziz, Nordin, Ismail & Baharum, 2018). Data cleansing involves the process of removing or eliminating noise from the data, which includes tables, images and special characters. For this study, the process of converting the texts from PDF to word format resulted in the haphazard order of the information. Apart from that, some of the information were missing, the texts contained a lot of spelling errors and also unidentified characters. This happened because most of the texts contained non-linear texts such as tables, charts and figures. Hence, in order to clean the data, each text was checked and revised word-by-word to ensure the information was correct, all the words and sentences were in order and they were spelled correctly.

After the information was organised, and all the spelling errors had been corrected, all the tables, charts, figures, figure and table references and caption titles were removed from the data. This is due to the fact that the non-linear texts for the present study would affect the overall statistical findings of wordlists and concordance. Lastly, the texts that had been cleaned were then converted into plain text (.txt) before the data could be processed for linguistic analysis in Chapters 5 and 6.

4.5 Conclusion

In this chapter, the notion in designing the corpus, the structure and the guidelines that governed the structure of the AMM, and the procedures involved in designing and building a corpus of the AMM were described. It can be concluded that the selection of the corpus sample of the AMM is based on the notion that:

1. The readers of the AMMs were the end-users in aircraft maintenance domain. That includes the AMP who work in air operators and the MRO organisations as revealed in 3.3.3.4 and 3.3.3.5. The findings from the semi-structured interviews with the discourse community sample (Chapter 3) revealed that the AMM is the main reference to assist the AMP to perform aircraft maintenance activities. At the university level, it was found that the AMM is also one of the main references for students' practical trainings and assessments (section 4.4.1.2). In other words, the AMM has clear target-users which explains why the readers read the AMM and what are its functions in aircraft maintenance domain.
2. The AMM is categorised as a specialised corpus and both of the AMMs selected, Boeing 737 and Cessna 182 manuals, fulfil these criteria:
    a. the AMMs were manufactured by two different aircraft manufacturers that specialised in different types of aircraft,
    b. the AMMs were published in English as the manufacturers were the companies from the native English speaking countries, in which the technical writers did not need to translate the AMMs from other languages, and
    c. the years of manufacturing for both AMMs were between 1997 and 1998, which means the time period coverage was relatively similar.
3. With regards to the sample size of the corpus, it was discussed that the total number of texts selected were 100 texts, the total number of word tokens of these 100 texts was 129,678 and the total number of word types was 5,057.
4. The analysis of rhetorical moves will be performed at the level of *Page block*. The decision was made due to the features of the AMM having a massive number of *Chapters* and *Sections*. Not only that, the occurrence of *Page blocks* for each AMM also revealed that both AMMs show similar occurrence of three *Page blocks*. Hence, it is hoped that by choosing only three *Page blocks*, the

similarities and differences of the move structure for both manuals could be identified.

5. As discussed in 4.4.1.2, the AMMs in the university are available in every workshop, hangar and also library. Since the AMMs used in the aviation are not retrievable by the public, the AMMs used for this study will be retrieved from the university.

Having established the process by which the corpus was created and developed, the following chapter (Chapter 5) presents the most central part of the thesis, the move analysis of three *Page blocks* of the AMM.

CHAPTER 5

MOVE ANALYSIS OF THREE PAGE BLOCKS OF AIRCRAFT MAINTENANCE MANUAL (AMM)

5.1 Overview

As discovered in previous chapters (Chapters 3 and 4), the AMM is the main reference when performing aircraft maintenance in the aviation industry (section 3.5.3). It is also the main reference during practical trainings and practical assessments at the university level (section 4.4.1.2). In addition to that, the ability to read, understand and interpret the AMM among UniKL MIAT students is vital as the skills are beneficial when the students start their work in the aviation industry. This leads to the needs to study and analyse the AMM as the knowledge is valuable to assist the students to understand better the AMM. Motivated by these notions, the current chapter attempts to study the move structure of three *Page blocks* of the AMM of two aircraft.

The selection of three *Page blocks* was due to the findings in Chapter 4. The findings revealed that the occurrence of *Page blocks* for each AMM showed the stipulation to select only the first three *Page blocks* in order to control the variables as much as possible. The three *Page blocks* comprised 100 texts: 42 texts from Description and Operation *Page block*, 25 texts from Troubleshooting *Page block* and 33 texts from Maintenance Practices *Page block*. The corpus also has 129,678 and 5,057 word types.

To develop the move model for these three *Page blocks*, the present chapter utilises Lassen's (1998) and Lago and Lloret's (2012) move model in scaffolding the move structure from these authors in the genre of technical manual. The main focus of this study is the move structure of three *Page blocks* that include the move ordering patterns and the frequency of move occurrence. The linguistic structures to realise the moves and the steps are closely examined and considered in this chapter. However, further discussion on the verb form tenses and modals is covered in a later chapter.

This chapter begins by describing the purpose of the study (section 5.2). This is followed by the discussion on the related literature of move analysis (section 5.3). In 5.4, a methodology for genre analysis is discussed, while the examples of the move structure for three *Page blocks* are detailed in 5.5. Lastly, the final section (section 5.6) presents the conclusion.

5.2 Purpose of the Study

The main objective of this chapter is to identify the move structure of three *Page blocks* of the AMM through the use of Lassen's (1998) and Lago and Lloret's (2012) move models. This entire chapter will be directed at finding the answers to the research questions below:

1. What is the structure of moves and steps of three *Page blocks* of the AMMs, and how are the steps illustrated to achieve the purpose of each move?
    a) What are the moves and steps that realised the three *Page blocks* of the AMM?
    b) What are the frequencies of the occurrence of the moves and steps in the three *Page blocks* of the AMM?
    c) What are the obligatory and optional moves and steps in the three *Page blocks* of the AMM?
    d) What are the linguistic features used to realise the three *Page blocks* of the AMM?

The research questions will be answered by discussing the previous studies of Lassen's (1998) and Lago and Lloret's (2012) model to move analysis in technical manuals to identify a suitable model of moves as a foundation to the present study. The quantitative analysis of the frequency of occurrence in each move and its steps will be used to determine which of these steps show higher frequency of occurrence and at the same time the obligatory steps in each move can be identified. The linguistic features focusing on transitivity and mood system that realise each move and its steps will be observed and discussed.

The present study is of significance as there has never been, to my knowledge, any move analysis conducted with regard to the AMM. It is hoped that this study reveals how the three *Page blocks* are constructed, why the members of this community write the AMM the way they do, and how the communicative purposes are conveyed.

5.3 Review of Related Literature

The following discussion deals with the review of related literature as the foundation for the analysis of my data. Since research or studies on similar genre of technical manuals in similar context and similar professional setting was unavailable when this study was conducted, the present study relied on the available literature. It is hoped that the existing literature in related research context would support the genre analysis conducted in this study.

5.3.1 Review on move analysis

The concept of move in genre analysis has been discussed in Chapter 2 (section 2.4). Based on the discussion, it was noted that there were two important methods needed to be focused on when categorising various discourse units within the text. Firstly, when doing move analysis, defining a boundary is important as moves organise the flow of information within a text. As mentioned previously, setting the boundary can be subjective if the researchers set their own rules since the reliability and empirical validity of the analysis can be questioned (Bhatia, 1993; Kanoksilapatham, 2005). In order to overcome this, Kanoksilapatham (2005) and Holmes (1997) combined the content that demarcated the communicative function with the linguistic cues to set the boundaries in their studies. As for Holmes (1997), his segmentation of text was shaped and constrained by a specific communicative function. He also mentioned that "the unit of analysis for his study was the sentence, however, there was also a case for adopting a unit of analysis below the level of the sentence such as the clause, phrase or T-unit" (p. 325).

According to Lassen (1998), not all genres belong to a fixed move structure. This is because the structure may change depending on the communicative purposes which were developed in the text (Lassen, 1998). This "move-step-structure" of genres may be subject to flexibility due to the 'obligatory' versus 'optional' status of the steps. The status of moves and steps can be achieved through the frequency of occurrence of each move. Kanoksilapatham (2005) recorded the frequency of a particular move in order to classify the status of the move to be either obligatory or conventional, by setting the 'cut-off frequency of 60 per cent of occurrence' as the potential measure of move stability for any move posited in her study. For Kanoksilapatham (2005), a move must occur in 60 per cent of the appropriate sections before it can be classified as conventional move. If the frequency of occurrence is below 60 per cent, then it is considered as optional.

Another feature besides obligatory and optional moves is a move called a 'cyclicity' move, which refers to the situation of moves that recur within a single element in a text. Holmes (1997) for instance, found the moves in his study had shown the features of recursion. He reported that the results for Sociology research articles showed seven sections had a cyclical structure with the mean number of cycles of 2.7. Muangsamai (2018), who studied move patterns in health and medical science reports, also found some of the moves recurred in her study.

5.3.2 Previous studies on move analysis in technical manuals

This section focuses on the related literature review on genre analysis of technical manuals. To the best of my knowledge, there are very few studies on genre of technical manuals that I could relate to my study. This chapter attempts to build a model for three *Page blocks* based on the work of Lassen (1998) and Lago and Lloret (2012).

5.3.2.1 Lassen's (1998) genre analysis of technical manual

One prominent figure in the genre analysis of technical manuals is Lassen (1998), who developed a 4-move framework for Booster Manual by determining their communicative purpose. Lassen (1998) selected Booster Manual as her corpus, which was the handbook of electric scooters owned by the British company Booster. This manual was written for the owners of the scooters, hence, she categorised the communication of this manual as from specialist to non-specialist communication. She also identified four communicative purposes in the Booster Manual, namely:

1. to instruct,
2. to hedge,
3. to inform, and
4. to sell.

According to Lassen (1998), these communicative purposes answered the question: *Why has this manual been written?* She also added that the moves were realised by description, definition, specification, instruction, evaluation, explanation and recommendation, but they were not equally dominant in each of the four moves. Lassen (1998) combined linguistic features with its communicative purpose to show the structure of the moves through their steps as the boundaries. The rhetorical structure of the 4-move framework as proposed by Lassen (1998) can be illustrated in Table 5.1.

Table 5.1

Lassen's (1998, P. 25-32) Move Model for Booster Manual

MOVE 1 (O)	**MOVE 2 (O)**	**MOVE 3 (O)**	**MOVE 4 (NO)**
Establishing contact and orienting the reader towards the text and the product	**Inducing action**	**Anticipating and solving problems**	**Continuing Contact**
STEPS	**STEPS**	**STEPS**	**STEPS**
S1: Introduction (SO) Evaluation Recommendation Definition Explanation	**S1: Preview (SO)** Explanation	**S1: Problem (SO)**	**S1: Action (NO)** (how to contact the dealers)
S2: Warnings (SO)	**S2: Headline (SO)**	**S2: Symptom / Cause (SO)**	**S2: Reference to dealers (NO)**
S3: Description (NO) Definitions Specifications	**S3: Action (SO)** Installation Operation	**S3: Action (SO)** Maintenance Lubrication Correct handling Repair	
	S4: Result (NO)	**S4: Corrective action (SO)**	
	S5: Explanation (NO)		

Note:
O – Obligatory Step
SO – Semi-obligatory Step
NO – Non-obligatory Step
Aside – Additional information (contact number, address, etc.)

Lassen (1998) asserted that her Moves 1, 2 and 3 were labelled as obligatory and its occurrence can be said as recursive and these moves were in fixed order. Only for Move 4, Lassen (1998) classified it as optional and 'unordered' (p. 25).

5.3.2.2 Lago and Lloret's (2012) genre analysis of technical manual

Adopting Lassen's (1998) 4-move framework, Lago and Lloret (2012) analysed Silestone Manuals, which was also categorised as technical manual. Based on their analysis on Silestone manuals, they summarised that the move structure of their texts followed to some extent Lassen's model, but not in the same move-step order. According to Lago and Lloret (2012), Lassen's (1998) model could be applied to all the manuals that they examined. This is because, most obligatory and semi-obligatory steps participated in the structure depending on the main communicative purposes which dominated the text. Hence, Lassen's (1998) model is perfectly applicable to any technical manual and it is necessary to undertake some changes and variations in the move-step model. The examples of changes made are as follows: move-step order, inclusion of new moves, role changing of steps and/or sub-steps, and omission of certain moves and steps. Table 5.2 below shows the move structure of Lago and Lloret's (2012) 4-move model.

Table 5.2

Lago and Lloret's (2012) Move Model for Silestone Manuals

MOVE 1 (O)	MOVE 2 (O)	MOVE 3 (SO)	MOVE 4 (NO)
Establishing contact and orienting the reader towards the text and the product	**Inducing action**	**Anticipating and solving problems**	**Continuing contact**
STEPS	**STEPS**	**STEPS**	**STEPS**
S1: Cues (SO) Headings (SO) Preview Metatext Index Table of contents (Include one or all of the components above)	**S1: Cues (SO)** Headings (SO) Preview Metatext Index Table of contents (Include one or all of the components above)	**S1: Cues (SO)** Headings (SO) Preview Metatext Index Table of contents (Include one or all of the components above)	**S1: Cues (SO)** Headings (SO) Preview Metatext Index Table of contents (Include one or all of the components above)
S2: Introduction (SO)	**S2: Action (SO)** (Installation, operation, etc.)	**S2: Action (SO)** (maintenance, lubrication, correct handling, repair, etc.)	**S2: Action (SO)** (how to order spare parts, etc.)
S3: Description (Definitions and/or specifications)	**S3: Result (NO)**	**S3: Result (NO)**	**S3: Reference to dealers (NO)**
S4: Warnings	**S4: Explanation**	**S4: Explanation**	
S5: Safety (NO)	**S5: Aside**	**S5: Aside**	
S6: Evaluation (NO)	**S6: Warnings (SO)**	**S6: Warnings (SO)**	
		S7: Warranty (NO)	
		S8: Trouble-shooting (SO) Problem Cause Action	

Note:
O – Obligatory Step
SO – Semi-obligatory Step
NO – Non-obligatory Step
Aside – Additional information (contact number, address, etc.)

They found the corpus that they analysed consist of all the moves, namely M1, M2, M3 and M4. However, some moves occurred at different parts of the text. They also noted that the steps might be found at diverse places or might be present in a different move.

They summed up that Part 1 of the manual which is called CHARACTERISTICS would correspond to Move 1 which they named as *Establishing contact and directing the reader* *towards the text and the product*. Part 2 of the manual, INSTALLATION GUIDE could be matched to *Move 2: Inducing action*. While Part 3, that is CARE AND MAINTENANCE would be *Move 3: Anticipating and solving problem*. Below is the summary of the moves categorisation and their Parts of the Silestone manuals.

Table 5.3

Parts of The Silestone Manuals and Their Moves Categorisation (Lago & Lloret, 2012)

Silestone Manual		**Move**
Part 1: Characteristics	→	Move 1: Establishing contact and directing the reader towards the text and the product.
Part 2: Installation Guide	→	Move 2: Inducing action
Part 3: Care and Maintenance	→	Move 3: Anticipating and solving problem

Lago and Lloret (2012) justified that different parts that they analysed were treated as separate technical texts due to changes in steps and sub-steps according to the purposes of the analyses.

5.3.3 Review on Systemic Functional Grammar (SFG)

As noted in Chapter 2 (section 2.5.1.1), this study only focused on the analysis of ideational and interpersonal meanings, specifically, the system of transitivity and mood system. To define the context of the steps in each move, six types of processes and their sentence pattern in experiential metafunction will be analysed and Table 5.4 below will be taken as the main reference to determine the types of the processes used in each step.

Table 5.4

Summary of Halliday's Process Types, Definition, Participant Roles and Examples

Process	Definition	Category	Participants	Examples
Material	• Process of *doing* and *happening*. • It describes the process of 'doing', usually concrete, tangible actions or in semantic definition. • It may also represent abstract doings and happenings.	doing happening	Actor Goal Beneficiary Scope	The two check valves[Actor] prevent[Pr:material] loss of air[Goal] from the distribution system. A reading of more than 2[Actor] indicates[Pr:material] a faulty antenna circuit[Scope].
Mental	• Process of *sensing*. • The process is realised through the verbs of mental process that indicates perception, cognition and affection.	sensing seeing thinking wanting feeling	Senser Phenomenon	*Michael [Senser] likes Amelia [Phenomenon]
Relational	• Process that involves state of *being*. • Shows relation among entities through attribution and identification. • The process is about what things are, what they are like, and what they possess.			
	1. Attributive	intensive	Carrier Attribute	The inlet cowl anti-icing system[Carrier] is[Intensive] a thermal system[Attribute]
		circumstantial		VHF No. 1 antenna[Carrier] is[Pr:circumstantial] at station 710, top of the fuselage[Attribute].

		possessive		The water separator[Carrier/possessor] also has[Pr:possession] a bag condition indicator[Attribute:possessed].
	2. Identifying	intensive	Token Value	The left and right wing tips[Token] are[Intensive] similar in structure[Value].
		circumstantial		The fixed wingtip structure[Token] begins[Pr:circumstantial] at WS 760.5 with the surge tank end rib[Value].
		possessive		The horizontal stabilizer[Token] consists of[Pr:possession] one complete dual spar box structure[Value].
Behavioural	• Process of *physiological* and *psychological* behaviour. • Examples of process are breathing, dreaming, snoring, smiling and pondering.	behaving	Behaver	*Jack[Behaver] is laughing.
Verbal	• Process of *saying*, *asking*, *commanding*, and *offering*. • The process involves clauses of saying, as in '*What did you say*?	saying	Sayer Receiver Verbiage	*Rosy[Sayer] told me[Receiver] a story[Verbiage]
Existential	• Process that represents something *existing* or *happening*. • The process is preceded by '**there'** as in 'there was/is something'.	existing	Existent	There are[Pr:existential] two types of pressure seals[Existent] used on (…) There are[Pr:existential] two air cycle systems[Existent] on each airplane.

*The examples were adapted from Halliday & Matthiessen (2004) as these types of processes were not found in the texts of the present study

The purpose of analysing mood system is to find the relation between 'what sentences mean, and their uses' (Davidson, 2001). When analysing a clause in mood system, the clause will be classified according to Mood and Residue (Halliday, 1994). Figure 5.1 below illustrates that there are two major mood types in the English language. As the basic interpersonal meanings refer to the function of language itself, language is used to exchange information or goods and services. This is achieved by either demanding or giving through lexicogrammatical analysis. For example, a writer or speaker will use a statement in the declarative mood that fulfils the purpose of giving information. On the other hand, if the writer or speaker wants to ask questions, the language used will be in the interrogative mood, either through *wh*-questions or *yes/no* questions, depending on the purpose of asking the questions. In a procedural text like manuals for instance, the imperative mood is used to give command to anticipate and solve problem (Lassen, 1998).

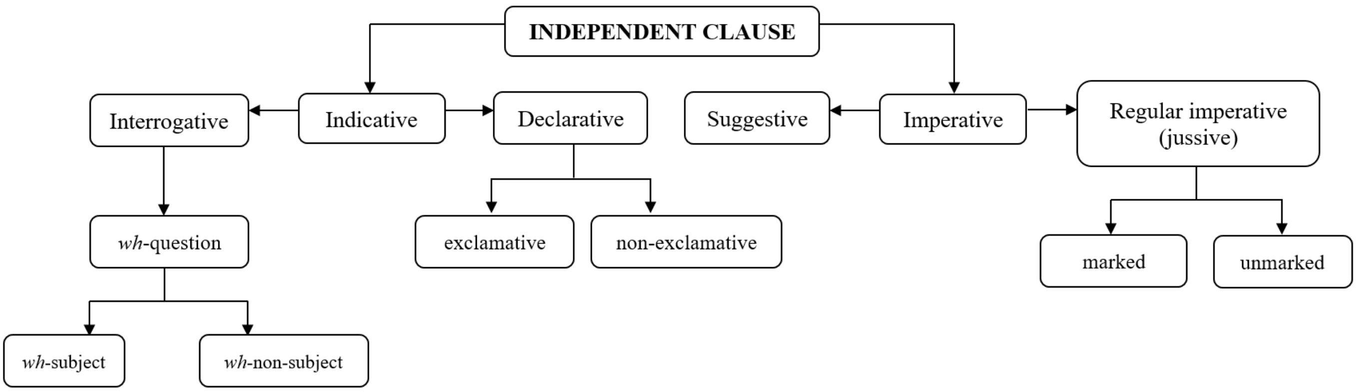


Figure 5.1 The mood system (adapted from Fontaine, 2013, p. 135)

There are a lot of studies that have been conducted to explore transitivity and mood system used in various genres. However, scant studies focused on the genre of technical manuals. The following section discusses previous research that carried out SFG analysis on technical manuals.

5.3.4 Previous studies on Systematic Functional Grammar (SFG)

As discussed previously in 5.3.2.1, Lassen (1998) developed 4-move framework for Booster Manual, the handbook of electric scooters owned by the British company called Booster. When analysing linguistic realisations of the Booster manual, Lassen (1998) focused on the communicative purpose to identify the boundaries between stages. Her analysis revealed that

Move 1 of her model, which is called *Orienting the reader towards the text and the product*, used lexis with positive connotation, such as '*quality product*' and '*emphasis on safety, comfort and reliability*', to realise the communicative function of 'to sell'. At the same time, the verbs *be* or *have* fulfilled the function of 'to inform'. As for her Move 2, which is called *Inducing action*, the imperative mood seemed to be the most significant feature. This is parallel with the communicative purpose of this move, that is 'to instruct' the user on how to do a task. Apart from the imperative, the result and explanation which are part of this move were written in future tense with the modal '*will*' as in '*will illuminate*' and '*will go*'. The future tense used for result and explanation fulfilled the communicative purpose of 'to inform'. Move 3 (*Anticipating and solving problems*) in Lassen's (1998) model was realised by the imperatives for actions and descriptive with the simple present used to describe. The last Move – *Continuing contact* in Lassen's (1998) study was described by Lassen as hedging as the purpose was to keep the customer satisfied. The approach used would have been different in a promotional discourse. To conclude, Lassen's (1998) analysis on Booster manual revealed that the four moves were realised by the structure of description, instruction, explanation, specification, definition and recommendation.

Adopting Lassen's (1998) 4-move framework, Lago and Lloret (2012) analysed Silestone Manuals, which was categorised as a technical manual. Based on their analysis, they summarised that the move structure in their texts followed to some extent Lassen's model, but not in the same move-step order. As for the linguistic features of Silestone manuals, Lago and Lloret (2012) claimed that the manuals were usually written in the imperative. Sometimes it was addressed to 'you' (the reader). Hence, the present tense can be said as dominating the texts. They also claimed that a manual must create the impression of a profoundly present reality to make the audience more involved in the action performance. They are designed to help the readers to solve problems in the present. They further explained that, if 'the story' is about the product's development, it would be written in the past. If the manual's 'story' is about the product's use in sequentially presented and explained steps, it will happen in the present, to involve the readers directly. In summary, manuals deal with events unfolding in the present, using verbs in the active voice. Therefore, shifts in the verb tenses would indicate a change in the temporal context of the event.

An example of linguistic analysis that focused on metafunctions that worth noting is a study by Oktay (2011). Oktay (2011) conducted a research on ten operation manuals of the Turkish brands which were written in Turkish language. The main objective of his research was to study three contextual parameters: field, tenor and mode variables to determine the register of the operation manuals. The research aimed to define the discursive features of operation manual in accordance with the Halliday's SFG. Oktay (2011) focused on three meanings, which were proposed by Halliday: ideational, interpersonal and textual meaning as shown below.

Ideational	-	Processes: Material, Mental, Existential, Relational, Behavioural and Verbal.
Interpersonal	-	Modals: Possibility, Necessity, Imperative, Prediction and Declarative
Textual	-	Voice Active, Passive, Causative
	-	Possessive reference
	-	Ellipsis

The results obtained from this study revealed that direct address form "*you*" is significantly employed in operation manuals. This is related to the fact that consumers wanted to be addressed individually. Thus, the technical communicator employs personalised "*you*" to establish direct contact with the product user. In terms of the use of suffix, according to Oktay (2011), the technical writer preferred formal and polite forms in addressing the product user. Due to this, the suffix *–InIz* in Turkish language showed higher frequency in the operation manuals. Furthermore, the verbs that indicated material process such as *keep*, *connect* and *unplug* showed that the technical communicator tried to direct the product user into action. This denotes that the technical operation manual texts are highly instructional. In terms of textual meaning, Oktay (2011) found that active voice connotes the technical communicator's desire to establish direct contact with the product user. Oktay (2011) also concluded that technical communication in operation manual was highly instructive. She also added that operation manuals help the product users to establish contact easily by reading through the manual.

Xiong (2019) carried out a research on the manual of household electric appliances. The study focused on experiential meaning to study the content of a message conveyed in the manuals. This study adopted the SFL approach by Halliday (1994). The study elaborated on what process types were mainly used in the manuals. The study found that the material process was the most dominant process type used in the manuals and this process characterised the genre of the manuals. Since the communicative purpose of the manuals was to guide the user on what to do and how to do, a large number of actions through action verbs were involved in the guidance. Imperative clauses, on the other hand, were found as the most active clauses used in the manuals. The use of imperative clauses in this study implied that the user was required to strictly follow the instructions and if the user failed to comply, he or she would encounter malfunction of the appliance or a dangerous mishap.

In sum, this study aims at identifying the transitivity and mood types that realised the three *Page blocks* of two AMMs in order to fill the gap of the previous studies. The system of transitivity and mood system were used to analyse a variety of clauses in different types of manuals, but there were no analyses carried out on the AMM.

5.4 Methodology

Davis (2015) incorporated several issues to identify the moves and steps in his corpus that could influence the validity of the findings. These include: the time frame of the selected corpus, the field that the corpus specialised in, the size of the corpus, subjectivity such as providing linguistic and content-based examples for each move and steps, and lastly the outliers or random position of the moves and steps (Davis, 2015). These issues are discussed below.

5.4.1 The corpus

The data for this study comprised three *Page blocks* of two AMMs. The choice of texts was motivated by the results found in the analysis of *Page blocks* in the previous chapter (section 4.4.3). As discussed in 3.3.2.3, the AMMs were produced by the aircraft makers and were written by the technical writers. It was also concluded that the aircraft makers were positioned at a higher rank compared to the readers of the AMM, in this case the AMP. The purpose of the AMM was to provide information as well as to instruct the AMP to perform aircraft maintenance activities.

It was also discussed earlier that the AMMs for the present study were produced in 1997 and 1998. Specialised corpus of 100 texts from two AMMs was selected through random sampling. Specifically, the texts comprised 42 texts from the Description and Operation *Page block,* 25 texts from Troubleshooting *Page block* and 33 texts from Maintenance Practices *Page block*. To make sure this study is valid in overcoming the issue of subjectivity, clear linguistic and content-based examples for each step are included. Lastly, the position of the moves and steps will also be observed. The framework that will be developed might have the possibility of being flexible. This is due to the fact that this is the first time this framework is developed and tested. Hence, I had to make sure that the framework would not impose any rigid structure.

The following section discusses the process of move identification that I used in this study.

5.4.2 Identification of moves

The development of moves in the present study drew on several sources. Following Biber, Connor and Upton's (2007) framework in doing move analysis, the identification of moves in this study began with understanding a 'big-picture' of the overall communicative purpose of the texts in the genre. This was achieved by understanding the discourse community in the field of aircraft maintenance (Chapter 3), the functions and organisation of the AMM (Chapter 4).

According to Lassen (1998), communicative functions of technical manuals are to instruct and to inform. Chapparo and Groff (2002), noted another communicative purpose that could be added to technical manual, which is to caution. Generally, the communicative functions for the AMM paralleled with the communicative functions established by Lassen (1998) and Chapparo and Groff (2002), which are to inform, to instruct and to caution. The main purpose of these communicative functions is to ensure the readers to be able to inspect, troubleshoot, test, and repair or replace all systems and units considered by the manufacturer to be repairable or replaceable as part of the normal maintenance procedures. This is for flight safety for continuing airworthiness (GAMA, 1978).

With these communication functions in mind, I then referred to the ATA Specification 100 and GAMA Specification No. 2 manuals that provided guidelines to write the technical manuals. The purpose of studying these guidelines is to understand the organisation of the AMM, to understand the requirements of writing the AMM and lastly to study the contents of the AMM. The study revealed that the AMM has a unique structure called 'chapterisation'. The organisation of the AMM has been discussed in the previous chapter (section 4.3.2). Table 5.5 below describes the three *Page blocks* which is the corpus of the AMM of this study.

Table 5.5

The Description of Three Page Blocks (adapted from GAMA Specification No. 2, 1978, P. 15-21; Kinnison & Siddiqui, 2013, P. 72-74)

Block	Title	Description
001-100	Description and Operation	This page block covers a general description of what the system does, identifies the various operational modes, describes in detail how the system and its essential components work and describes the location of the components.
101-200	Troubleshooting	This page includes fault trees to perform fault isolation procedures for various problems that might occur. Troubleshooting in a complex system consists of: a. Identifying sections that can cause specific types of trouble, b. Isolating the section that is causing the trouble, c. Identifying units in the faulty section that can cause the trouble, d. Isolating the unit that is at fault, and e. Correcting the cause of the trouble.
201-300	Maintenance Practices	The maintenance practices are a combination of servicing, removal/installation, adjustment/test. Inspection/check, cleaning/painting, and approved repairs should follow the Troubleshooting Section. When the required maintenance procedure is not lengthy and is relatively simple, a combination of the above may be grouped under one heading and called Maintenance Practices.

The descriptions of the three *Page blocks* above helped me in terms of developing the move structure for my corpus. For example, the procedures of Troubleshooting as mentioned in Table 5.5 were used to develop the steps for Move 2 in this study.

Lassen's (1998) and Lago and Lloret's (2012) 4-move framework and communicative purposes of technical manuals are echoed in my study, albeit with some differences. These similarities and the gaps found form the basis of comparison for my prototypical framework. Taking Lassen's and Lago and Lloret's models as my exploration into my corpus of technical manual, I am creating my own framework.

In order to conduct move analysis, the communicative purpose for each move is rather straightforward since each move is represented by the *Page block* following the description given in the ATA Specification 100 and GAMA Specification No. 2 manuals (section 4.3.3).

The segmentation of texts in this study is more important in order to define the boundaries for the steps in each move. The step for each move is defined as a segment of text which is shaped and controlled by a specific communicative function as stated by Holmes (1997). However, the unit of analysis for the current study begins with a clause, phrase and sentence to determine types of communicative function. This is due to lack of previous research that I could refer to as guidelines. Hence, to look at the function of each text segment and evaluate what its local purpose can be the most difficult step in doing move analysis (Biber, Connor & Upton, 2007). Due to this, I decided to include Titles to determine the boundaries. This is because the structure of the AMM is systematic as its organisation follows the guidelines given in the ATA Specification 100 and GAMA Specification No. 2 manuals. It is hoped that by combining the Titles, the communicative purpose of each segment and language cues, I will be able to look for any common functional represented by these segments together with the semantic themes. Linguistic criteria denote the use of tenses as the features of each step will be discussed in further detail in Chapter 6. Below is the example of how the text was segmented and coded.

AUTO THROTTLE SYSTEM – DESCRIPTION AND OPERATION (H)

1. General (T^1)
   A. The auto throttle system is an electromechanical servosystem that controls the airspeed of the airplane by automatically positioning the throttles to maintain a selected airspeed. (1a)
   B. The auto throttle system consists of an autopower amplifier, the captain's mach/airspeed indicator, a system engage switch, a servo-motor-tach generator assembly, disengage switches, disengage warning lights, clutch assemblies, and limiting switches mounted on the clutch assemblies (Fig. 1 for component location diagram) (1b). The auto throttle system uses throttle command signals along with the fast/slow indication signals (1c). For information on the generation of these signals, refer to Chapter 34, Speed Command System. (A^{ref})

Figure 5.2 Example of classifying the steps in Move 1 (Text 2)

As can be seen in Figure 5.2, the segmentation for each step was coded according to the communicative purpose found in each sentence. Step 1a (*Introducing the subsystem*) began with the definition of the subsystem with the purpose of introducing the subsystem. Table 5.6 below shows the example of the outline structure of move after each segment was coded.

Table 5.6

Example of Outline Structure of Move 1 (Text 2)

Title	Paragraph	Sentence(s)	Step	Excerpt
1	1	1	1a	The auto throttle system is an electromechanical servo system that controls the airspeed of the airplane by automatically positioning the throttles to maintain a selected airspeed.
	2	1	1b	The auto throttle system consists of an auto power amplifier, the captain's Mach/airspeed indicator, a system engage switch, a servo-motor-tach generator assembly, disengage switches, disengage warning lights, clutch assemblies, and limiting switches mounted on the clutch assemblies (Fig. 1 for component location diagram).
		2	1c	The auto throttle system uses throttle command signals along with the fast/slow indication signals.
		3	A^{ref}	For information on the generation of these signals, refer to Chapter 34, Speed Command System.

Hence, the structure of the steps for this text can be coded as below:

$$\mathbf{H \rightarrow T^{1} \rightarrow 1a \rightarrow 1b \rightarrow 1c \rightarrow A^{ref}}$$

As stated earlier, genre analysis has never been conducted with regard to the AMM. Due to that, the present study follows both Kanoksilapatham's (2005) and Holmes' (1997) method in defining the boundaries. The boundary indicators, in addition to that, was based on two Halliday's SFG which are ideational and interpersonal metafunctions and used as move and steps identifier.

To conclude, the analysis of the move structure for this study involved four steps as follows:

1. Firstly, the texts from each *Page block* were analysed for general patterns of organisation (Holmes, 1997) to determine communicative purpose of each text segment and to identify the possible move types (Biber, Connor and Upton, 2007). The guidelines in the ATA Specification 100 and GAMA Specification No. 2 manuals, combined with the move-model proposed by Lassen (1998) and Lago and Lloret (2012) were followed to determine the communicative purpose.
2. Secondly, move and steps recognition using text division mechanism, such as clause, sentence and paragraph was conducted. Two Halliday's SFG, which are ideational and interpersonal metafunctions analyses were used as move and steps identifier.
3. Thirdly, a move structure model in the corpus was designed according to the results obtained from the second step.
4. Lastly, the move structure model was conducted on all the sample corpus to determine the common patterns of steps in each move. This was also to determine the frequency of occurrence.

5.4.3 Problematic labels and categorisation

The criteria for identification of moves and steps in the texts proved to be difficult at times. Identifying and categorising the communicative purpose of steps in each move were almost never straightforward. Some problems were acknowledged when analysing the steps. I encountered several problems for which I had to find the solutions for resourceful analysis of the data. Different manual consists of different patterns of the steps. Even though both manuals followed the guidelines in the ATA Specification 100 and GAMA Specification No. 2 in organising their AMM, there were no guidelines given on how the information should be arranged.

As noted earlier, setting the boundary can be subjective (Kanoksilapatham, 2005) and the identification of move boundaries and their realising steps in achieving the communicative purposes is not unassailable (Khalid, 2013, p. 126). The rhetorical unit can be a sentence or below the level of the sentence such as the clause, phrase or T-unit (Swales, 2004; Holmes, 1997). According to Dudley-Evans (1994), sometimes linguistic evidence is less obvious and difficult to classify the moves and steps. Due to this, the analyst is recommended to make use of his or her understanding of the text and the way the genre is generally expressed (Dudley-Evans, 1994).

For this study, I decided to depend entirely on the structure of the texts to assist my analysis. However, in terms of linguistic features to identify the boundaries, according to Khalid (2013, p. 126), all analysts faced the problem of inconsistency in terminology. To overcome this problem, the analysis of the present study depends heavily on the placement of meaningful chunks to interpret salient steps. For instance, I faced an uncertainty in identifying the correct function when given one stretch of sentence containing more than one function. For the most parts, the texts that I analysed covered the subsystem of the aircraft and its sub-subsystem. Without prior knowledge about the technical system of the aircraft, I had difficulty in understanding the purpose of the message at the beginning. This usually happened in Move 1 in which the confusion occurred when I wanted to differentiate between Steps 1c - *Describing the features of the subsystem* and 1d - *Stating the functions of the subsystem* as shown in the example given below.

Table 5.7

Example of Embedded Steps

T-B737 (T2)	**Step**
Pressurization relief valves include two safety relief valves,	*1c - Features of the subsystem*
which prevent over pressurizing the airplane, and a vacuum relief valve which prevents pressure inside the airplane becoming appreciably less than ambient.	*1d - Functions of the subsystem*

In order to overcome this problem, I divided the sentence into a meaningful chunks and then defined the purpose of each chunk of the sentence before they were classified into the steps. Apart from that, I also relied on the words used in each chunk, for instance, ‘which prevent’ in the example above was observed as conveying different function, in this case, it indicated the function of the subsystem. Hence, when analysing the frequency of occurrence of the embedded steps, the step that seemed to be more salient will be assigned as the main step (Holmes, 1997). In a case like the example shown in Table 5.7 above, Step 1d seemed more salient, hence, I indicated it as Step 1d when analysing the occurrence. However, in the very few cases where it was difficult or impossible to decide which of the steps was more salient, I coded it as two steps (Steps 1c/1d) (Holmes, 1997).

5.4.4 Data analysis

Moreno and Swales (2018) assert that move analysis needs to be done manually since the interpretation of communicative functions is classified as a cognitive task which is difficult to access and operationalise. For the present study, the existence of the steps in each move was identified, coded, and then, manually counted to determine the existence of any variations in the occurrence of the steps in each move.

In terms of occurrence of the steps in each move, the frequencies of individual step in each move were recorded to determine whether a particular step occurred frequently enough to be considered as ‘obligatory’. Furthermore, this study also analysed the step ordering patterns or step cycle. The cut-off point for move classification was based on Kanoksilapatham (2005)’s criterion, which uses frequency of occurrence to classify each step in terms of obligatory, semi-obligatory, or optional. This means that they occur in 100 percent, 60-99 percent, and in less than 60 percent of the corpus, respectively. The analysis of occurrence was conducted, and the results were discussed in 5.5.

AMM is unlike any other technical manuals such as the technical manuals studied by Lassen (1998) and Lago and Lloret (2012). The status of the obligatory moves in this model is rather ambiguous as they do not appear in all texts, the number of occurrences of the steps varies, and the segmentation of the texts are unpredictable as it can be a sentence, a clause or phrase or a list. The analysis will be made in order to analyse the total number of occurrences of the steps found in each move. The findings will help me in identifying which step is considered as important and preferred. Hence, the obligatory steps in my model are determined by the steps that appear in all the texts. Biber, Conrad and Reppen (1998) point out that there are a lot of software programs or corpus analysis tools available to facilitate the investigation of lexicographic issues. Generally, corpus analysis tools are used to analyse lexical components such as lemma (head of word), node (the word being examined within a specific number of words to the left and the right of the word), and collocation (two or more words that co-occur more frequently than chance) (Davis, 2015, p. 37).

The SFG principles of transitivity and type of mood system were applied for this study in order to determine the function of the clauses on each step. Transitivity that concerns with the processes were identified through participants and their categories. In order to identify the process types used to realise each step, first, the sentences were divided into clauses. Then, the process types were identified based on the ideational meaning. This was followed by analysing the process types from each clause to identify the dominant process which was employed in each step.

Mood system, on the other hand, indicates the types of mood. The mood system can be classified as declarative, interrogative, exclamation, or imperative. To determine the mood type of every single clause, the structure of the declarative, interrogative and imperative moods was analysed by the presence or absence of subject and the order in which the subject and the finite occur in relation to each other (Fontaine, 2013).

Below are the examples of how the data was analysed for transitivity and mood system.

Table 5.8

Example Analysis of Transitivity and Mood System in Step 1d (Move 1)

No.	Clauses	Transitivity	Mood
1	The power supply monitor **is** an AND gate (…)	Relational (ATT)	Declarative (IND)
2	The water separator 35°F control system **regulates** (…)	Material	Declarative (IND)
3	This valve **controls** the mass flow (…)	Material	Declarative (IND)

Table 5.9

Example Analysis of Transitivity and Mood System in Step 2e (Move 2)

No.	Clauses	Transitivity	Mood
1	**Push** the "trip reset" switch on the P5 panel.	Material	Imperative
2	**Is** the ram door full open light ON?	Material	Declarative (INT)
3	**Replace** the turbo fan valve.	Material	Imperative

Table 5.10

Example Analysis of Transitivity and Mood System in sub-Step 3c.3 (Move 3)

No.	Clauses	Transitivity	Mood
1	**Set** the FLT/GRD switch to GRD.	Material	Imperative
2	**Peel** off the attach release liner on (…)	Material	Imperative
3	**Tighten** screws.	Material	Imperative

A Web-based tool, *Wmatrix3* (Rayson, 2008) was used to analyse the transitivity and mood. According to Rayson (2009), there are three tools available in *Wmatrix3* include CLAWS (part-of-speech tagger), SEMTAG (Word-Sense Tagger) and LEMMINGS (lemmatiser). *Wmatrix3* serves three different functions which are: (1) analysing words which includes word frequency, dictionary builder, (2) analysing Part of Speech (POS) that enables the researcher to analyse types POS and their frequencies using CLAWS (Constituent Likelihood Automatic Word-tagging System), and (3) analysing semantic using UCREL Semantic Annotation System (USAS). Archer and Malory (2017) stated that *Wmatrix3* tool enables the users to automatically annotate data in a plain text format with 137 CLAWS (the Constituent Likelihood Automatic Word-tagging System) Part-of-Speech (POS) categories and 232 UCREL Semantic Annotation System (USAS). They also added that *Wmatrix3* can be used to investigate pragmatic as well as semantic phenomena.

For this study, only CLAWS (the Constituent Likelihood Automatic Word-tagging System) part-of-speech (POS) was used to classify the verb forms tenses and modal verbs as the CLAWS (POS) made the categorisation of tenses and modals possible. Word-tagging System was used to retrieve the tags referent to each transitivity element. It allows the researcher to make a systematic comparison among all the occurrences of a process, participant or circumstance, also observe which tags collocate more commonly. Not only that, I was already familiar with the user interface for *Wmatrix3* and the web-based environment of the *Wmatrix3* enabled me to access the tool easily.

5.4.5 Reliability of move identification

Inter-coder reliability was conducted following Kanoksilapatham (2005) to demonstrate that a unit of text can be defined in such a way that different individuals can demarcate the boundary of units at a sufficiently high level of agreement. Biber, Connor and Upton (2007) recommend inter-coder reliability as one of the approaches to move analysis. The purpose of inter-coder reliability is to determine whether coders can achieve high inter-coder reliability when the coders apply the coding scheme. There were two previous studies that conducted inter-coder reliability to move analysis: Crookes (1986) and Kanoksilapatham (2005).

Crookes (1986) applied inter-coder reliability to analyse the moves of article introductions. One quarter of the corpus was selected using stratified random sampling from the original corpus and rated. Crookes selected graduate students in ESL as his coders to code the research articles in the hard Sciences, Biosciences, and Social Sciences. Crookes (1986) also mentioned that the coders should be individuals with some linguistic sophistication instead of specialists due to the logistical problems envisaged. Crookes (1986), however, cautioned that these graduate students might not be appropriate as the coders, as they lack understanding of the topics of scientific research articles. To overcome this issue, Crookes (1986) selected the coders with expertise in the focused discipline, in which the coder was a PhD candidate in Biochemistry.

For this study, a PhD candidate in the English Language was selected as a coder. She was trained for two hours to ensure that she was familiar with the corpus and the coding system formulated for this study. The coder was given 15 texts: five texts of *Description and operation* page block, five texts of *Troubleshooting* page block and five texts of *Maintenance practices* page block. Before the coder was asked to analyse these texts on her own, the analysis was conducted together as training. In comparison, the agreement rate was 94.41 per cent for Move 1 (Appendix I), 96.85 per cent for Move 2 (Appendix J) and 96.00 per cent for Move 3 (Appendix K).

5.5 Results of Move Analysis

As noted previously, the corpus selected was from Boeing 737 and Cessna 182 manuals. Since the manual was separated and divided into nine *Page blocks* (section 4.3.3), only the first three *Page blocks* were selected for this study which are: *Description and Operation*, *Troubleshooting*, and *Maintenance Practices*.

The analysis revealed that the moves in these three *Page blocks* echoed the structure of the moves found in Silestone manuals analysed by Lago and Lloret (2012), albeit with some differences in terms of steps for each move. Furthermore, these three *Page blocks* were divided according to the headings like Silestone manuals since each *Page block* fulfilled different communicative purposes. It was also found that these three *Page blocks* stand on its own similar to Lago and Lloret's (2012) Silestone Manuals as shown in Table 5.11 below.

Table 5.11

Page Blocks of The AMM and Their Moves Classification

Page block		**Move**
Page block 1-100: Description and operation	→	Move 1: Orienting reader's understanding towards the aircraft subsystem and its operation
Page block 101-200: Troubleshooting	→	Move 2: Anticipating and solving problem
Page block 201-300: Maintenance Practices	→	Move 3: Outlining steps and procedures for maintenance exercises

There were three moves represented the three *Page blocks* as seen in Table 5.11. The following discussion begins with the five common steps which were found across the three moves. This is because these five common steps had similar communicative purpose in all the three moves. However, the existence of these five common steps were included in the respective move as it was observed that these steps occurrences were varied from one move to another.

5.5.1 Five common steps used across the three moves

When analysing the texts, it was found that all the three moves had five common steps as listed below:

- Heading
- Title
- Precautionary Note
- Cues
- Aside

These five common steps are similar to Lago and Lloret's (2012) steps. However, the function and the features of these steps might be different when compared to their step structure. The examples and the features of these steps will be compared to Lago and Lloret (2012) to determine the similarities and differences.

5.5.1.1 Heading

Heading is classified as the first step in all the three moves. The following are the examples of *Headings*:

(1) PITOT STATIC SYSTEM – DESCRIPTION AND OPERATION (D&O, Text 6)

(2) IGNITION SYSTEM – TROUBLESHOOTING (T, Text 25)

(3) ELECTRONIC FLIGHT INSTRUMENT SYSTEM (EFIS) – MAINTENANCE PRACTICES (MP, Text 6)

The communicative purpose of *Heading* is to prepare the readers with the main subject matter with regard to the heading indicated. This step is easy to be identified due to its features, such as it is positioned at the top of the first page. This step is significant in every move as its purpose is to provide hints to the readers on the information that they will refer to. Besides its position, the *Heading* also is written in capital letters as can be seen in the examples above. The title of the *Page block*, such as Description and Operation, Troubleshooting or Maintenance Practices, is written to ensure the readers are referring to the correct *Page block*.

In their analysis of technical manuals, Lago and Lloret (2012) explained that the *Heading* indicates that the readers refer to the different sections of the manual. They also classified their

Heading as a sub-step under the step '*Cue*' (section 4.3.2.2). As for this study, the *Heading* indicates a topic on a new subsystem, and it is treated as a step on its own. Despite the differences between my study and Lago and Lloret (2012), there is a similarity, the function of the *Heading* in our studies signifies a boundary between the information.

5.5.1.2 Title

Title is the second common step found in all the three moves. The following extracts exemplify the *Title* used in the text:

(4) **1. General** (*Title-1*)

A. This section provides servicing procedures for the fuel engine oil system. It is subdivided as follows:

(1) The fuel system section includes procedures for adding fuel, defueling the airplane and mixing anti-icing (…)

2. Fuel Precautions (*Title-2*)

A. Safety precautions.

(1) The safety precautions on fuelling (…)

(D&O, Text 37)

The *Title* is used to separate the information according to its major subdivisions, unlike *Heading* that separates the new subsystem. When referring to the *Title*, the readers could forecast the information given. There are two *Titles* in the example (4). Similar to the *Heading*, the *Title* can be easily identified by its structure, in which it is numbered. It is also written in bold font. This step occurs 231 times and it appears in all 42 texts in the corpus.

This step is different from the step proposed by Lago and Lloret (2012). In Lago and Lloret's (2012) model, the steps in all their four moves only stated *Heading*. This step is added to the move structure as all the three moves use the *Title* to separate the information.

5.5.1.3 Precautionary Note (PN)

Precautionary Note (PN) functions as an alert to inform, remind, advice and caution the readers about possible hazards that might happen due to human errors. By including PN in the AMM, the undesirable consequences could be avoided or minimised (Wogalter, 2006). This is done by highlighting or emphasising the important points regarding the handling of the subsystems or the components as a precaution when necessary. There are three different types of PN, namely *Note*, *Caution* and *Warning* (ATA, 1999). These three types of PNs in the AMM have different functions and degree of importance.

Note is an additional information that appears in a procedure to help the readers to follow the instructions written in the work steps. The function of *Note* is to provide extra information such as the specifications of the subsystem and its function (ATA, 1999). It is to attract the readers' attention towards the procedures given in order to make the tasks easier. Some examples of *Note* are shown below:

(5) NOTE: The high flow schedule will occur in flight when a PACK TRIP OFF light comes on or a pack is manually turned off. (D&O, Text 34)

(6) NOTE: The circuit breakers are found in the lad control centre (P6-4) on the right side of the airplane. (T, Text 3)

(7) NOTE: If index marks on sensor are difficult to identify, refer to Fig. 202 or 203 for positioning sensor to electrical zero position. (MP, Text 2)

(8) **NOTE**: During operation at outside air temperatures below International Standard Atmosphere (ISA) Standard, the engine can develop more than its rated power at normal-rated RPM. This occurs more at lower altitudes. (MP, Text 30)

As can be seen in the examples given above, it is easy to identify *Note* as it is indicated by the label '*Note'*. The label is written to ensure that the readers are aware on the types of the PN.

In relation to the types of processes, the analysis revealed that the relational and material processes are used to describe the PN1 *Note*. Material process shows the most dominant process used in *Note* and the following are the examples of clauses that represent this process:

(9) **Make sure** that the compass needle does not turn when (…)

(10) **Make sure** the spring section (…)

(11) **Refer** to Wiring Diagram Manual (WDM).

(12) If this happens, **replace** GCB and transfer relay.

It is also noticed that the presence of material process in *Note* is described through the verbs *make sure*, *refer* and *replace,* which are frequently used. Apart from that, it is observed that the material process for *Note* is written in the imperative mood to instruct the readers to "do" something. As material process emphasises the significance between "subject" and "goal", the material process in *Note* is classified based on the notion that the readers are given a command to "do" something. In this case, the readers are required to take note on following the instructions given when performing maintenance activities.

Relational process describes the state of "being" which denotes the relationship between two entities. Attributive relational process used in *Note* is realised with the use of verb *be*. The function of this verb is to describe the relationship between subsystem and its functions or conditions. For example:

(13) The polarity of the wires **is** important to the correct installation.
(14) The numbers in parenthesis **are** for the right pack light.
(15) The slot **is** in the limit switch bracket.
(16) This step **is** necessary to identify fairings to be removed.
(17) Lockbar **is** only applicable to thrust reversers with double piston actuators.

The attributive relational process that shows the category of possessive describes the *Note* with the verb *have* as in:

(18) The sensor ring **has** one tooth thicker than the 29 others (…)
(19) If one of the overheat switches **has** a short to ground, (…)
(20) The airplane **has** dual NAV/COM units installed.

In terms of types of mood observed in *Note*, the analysis shows that the sentence mood is influenced by the types of processes used. For instance, the material process found is written in the imperative mood, while the relational process is written in the indicative declarative mood. It is worth noting that the imperative mood is used even though the ASD (2013) states that the writer is reminded not to use the imperative as this will confuse the *Note* with a work step.

Caution, the second type of PN, advises the readers to pay attention to the methods and procedures stated in the AMM (ATA, 1999). It is a must for the readers to strictly follow the methods and procedures to avoid damage to the equipment. If the operating procedure, inspection, repair or maintenance practice is not strictly observed, this could result in damage or destruction of the equipment. Some examples of *Caution*:

(21) CAUTION: DO NOT DEFLATE THE SHOCK STRUTS IF YOU DO A GEAR RETRACTION TEST. THE SHOCK STRUTS MUST BE FILLED

CORRECTLY AND NOT INFLATED ABOVE THE CORRECT PRESSURE. DAMAGE TO THE WHEEL WELL AND THE SHOCK STRUT WILL OCCUR (MP, Text 1).

(22) **CAUTION:** Do not adjust the bonded door flange or the airplane structure with force. The bonded areas and the structural components can be damaged (MP, Text 28).

Based on the examples given above, both the AMMs have different style of presenting this PN. The first example (21), that was taken from the B737 manual, capitalises all the words. On the other hand, the second example (22), which was found in the C182 manual, only uses bold font for the title. Both the ATA (1999) and GAMA (1978), however, did not highlight the style of writing their PN. How it is written depends on the technical writers of the manuals. In this case, both AMMs use capital letters for the titles as a hint of the importance of the message. Similar to the PN1 *Note*, this PN2 is also easy to notice since it is indicated by the label '*Caution*', apart from the characteristics mentioned above.

As for the types of processes used in *Caution*, it is found that the material process is the most frequent process used, which is mostly written in the imperative mood. However, the verbs to indicate material process are written in different forms to highlight the function of *Caution*. For instance, in order to advise the readers to pay attention to the methods and procedures, it is observed that the auxiliary *do* is mostly used to express the importance as in:

(23) **Do** not **operate** nose wheel steering with (…)

(24) **Do** not **install** lens and lamp housing assembly (…)

(25) **Do** not **use** abrasive materials or solvents when (…)

It also noted that the verb *make sure* is frequently used in *Caution*. Some examples include:

(26) **Make sure** the maintenance personnel and the table are electrically grounded.

(27) **Make sure** the airstair touches the ground.

(28) **Make sure** that you operate the equipment cooling system before (…)

Other examples of verbs to indicate material process which are mostly written in the imperative mood found in *Caution* are as below:

(29) **Install** case drain filter such that direction (…)

(30) **Operate** the emergency locator transmitter (ELT) system only during (…)

(31) **Disconnect** the negative battery cable first, then (…)

It can be summarised that the PN2 *Caution* is mostly written in the imperative mood as to instruct the readers to follow the important methods and procedures in order to avoid any damage to the equipment. Due to this, the verbs serving as material process such as *make sure* and auxiliary *do* are used to indicate the level of importance of the message.

The last type of PN is known as *Warning*. The difference between *Warning* and *Caution* is, *Caution* is an alert to avoid damage to the equipment while the message conveyed in *Warning* is to ensure the safety of the AMP from any injury. Hence, the purpose of *Warning* is to alert the readers to strictly and precisely follow the instruction or the information given. This involves the tools, procedures, methods, or the limits stated to avoid injury to persons (ATA, 1999). This is because if these are not correctly followed, it could result in personal injury, or loss of life. Below are examples of *Warning* notices:

(32) WARNING: YOU MUST MAKE SURE THAT ALL PERSONS ARE AWAY FROM THE LEADING-EDGE SLATS. THEY CAN MOVE AUTOMATICALLY (UNLESS OTHERWISE INHIBITED) DURING MAINTENANCE WHEN THESE CONDITIONS OCCUR: EITHER HYDRAULIC SYSTEM HAS PRESSURE AND THE TRAILING EDGE FLAPS ARE IN POSITION 1, 2, OR 5, AND THE NOSE OR THE MAIN LANDING GEAR AIR/GROUND RELAYS GIVE AN IN FLIGHT CONDITION (MP, Text 1).

(33) **WARNING**: During all fuelling procedures, firefighting equipment must be available. In case of an accidental disconnect of a ground wire. Two ground wires must be used from different points on the airplane which are attached to separate ground stakes. Make sure to ground the fuel nozzle the airplane (MP, Text 22).

Based on the above examples, both *Warning* messages are intended for the readers to follow the instruction precisely to avoid injury. It can be seen that both AMMs show different features in presenting their *Warning* messages. For B737 manual (32), *Warning* is written in a form that is similar as its *Caution* messages, in which the messages are all written in capital letters. On the other hand, the second example from C182 manual (33) uses bold font for the word *Warning* as a signal that the message is more serious as compared to *Caution*.

As for the communicative purpose for this type of PN, it is observed that the information for *Warning* is separated by two different communicative purposes: to inform and to warn. These two communicative purposes are divided into two parts: (1) command (imperative mood) and (2) information (indicative declarative mood). The first part of *Warning* consists of a simple and clear command as outlined in the ASD-STE100 (ASD, 2013). Another part is a brief explanation to give a clear idea of the possible risk if the readers do not obey the instructions given (ASD, 2013). The ASD-STE100 (ASD, 2013) however, did not mention how these two parts should be organised. The following examples show two different types of organisations of *Warning*:

(34)	During all fuelling procedures, firefighting equipment must be available. In case of an accidental disconnect of a ground wire. Two ground wires must be used from different points on the airplane which are attached to separate ground stakes.	*Background information*
	Make sure to ground the fuel nozzle the airplane	*Command*

(35)	You must make sure that all persons are away from the leading-edge slats.	*Command*
	They can move automatically (unless otherwise inhibited) during maintenance when these conditions occur: either hydraulic system has pressure and the trailing edge flaps are in position 1, 2, or 5, and the nose or the main landing gear air/ground relays give an in-flight condition.	*Supporting information*

By looking at the process types that construct the PN3 in the AMM, a certain number of trends is noticeable. Firstly, the most dominant process types that occurs in *Warning* is the material process. Secondly, the most frequent verb used is the verb *cause* that indicates the consequence of action if the readers fail to follow. This is consistent with the purpose of *Warning* that is to alert the readers to strictly and precisely follow the instruction or the information given. Lastly, it is found that there is a correlation between modality and the material process. This is because modal verbs are frequently used with the verb *cause* as shown in the examples below:

(36) Leading edge flaps are fast acting and **can cause** serious injury to personnel.

(37) An electrical shock **can cause** injuries.

(38) Prolonged contact with CSD oil **can cause** dermatitis.

(39) A fire or an explosion **can cause** injuries to personnel and damage (…)

Apart from that, it is also worth noting that the material process is written in the imperative and indicative declarative moods as shown below:

(40) **Make sure** the seat stops **are set** correctly.

(41) **Reduce** the charge rate if the temperature **increases** more than 1157 (46t).

(42) The battery **makes** hydrogen and oxygen gases when (…)

(43) **Hold** the top ladder inboard of the mechanism that (…)

The imperative and indicative declarative moods used in PN3 *Warning* fulfil two communicative purposes: to inform and to warn. Hence, it can be concluded that the material process is seen to be the main type of process used in PN3 *Warning*. While the sentence mood, is determined by the communicative purpose of *Warning*: to instruct (imperative mood) and to inform (indicative declarative mood).

In terms of the occurrence of all the three PNs, it is noticed that there is variation in the occurrence of each PN as shown in Table 5.12.

Table 5.12

Number of Occurrences of Precautionary Note in Three Moves

Precautionary Note	**# of occurrence**		
	Move 1	**Move 2**	**Move 3**
Note	11	44	141
Caution	3	9	61
Warning	3	9	27

As a conclusion, the position of PN in each move is not fixed as it depends on its necessity. As seen in Table 5.12, PN1 *Note* shows the highest frequency of occurrence for all the three moves with Move 3 showing the highest occurrence (141 occurrences). Move 1, on the other hand, shows the lowest number of occurrences (11 occurrences). As for *Caution* and *Warning*, Move 3 shows the highest number of occurrences compared to *Note*. This might be due to the fact that the communicative purpose of Move 3 is to instruct the readers to perform the maintenance activities. Hence, the readers need to be warned and cautioned when handling the aircraft components or the equipment to avoid any damage and injury to both personnel and equipment.

In their study, Lago and Lloret (2012) named their PN as “Warning” following Lassen (1998). The findings from their move analysis concluded that the ‘Warning’ could be considered as a new move: ‘Move 5 - Warnings’. This is because this move occurred independently and did not coincide with any other moves in the manual. Unlike their findings, the PN in this study is written according to its necessity. As stated in the ATA Specification 100 (ATA, 1999) and GAMA Specification No. 2 (GAMA, 1978), PN “may be used to highlight or emphasise important points when necessary” (ATA, 1999, para 1; GAMA, 1978, P. 7). The ATA

Specification 100 and GAMA Specification No. 2 have set the rules that *Warning* and *Caution* should be located before the text to which it applies, whereas *Note* should precede the applicable text. Hence, the PN in this study is not similar with Lago and Lloret's (2012) 'Warning'. The PN in this study depends on its necessity and the degree of necessity is determined by the titles used which are: *Note*, *Caution* and *Warning*. Each of these PNs has its own functions and differentiated by the title and linguistic features.

5.5.1.4 Cue

Cue refers to non-linear texts such as diagrams, tables, pictures or metatext. In the AMM, illustrations are provided when the text given requires more information as a guideline to help the readers to better understand the information (ATA, 1990). This is because the system and the subsystem in the aircraft are complex and for the AMP who are not familiar with the system or subsystem, the illustrations help them to visualise the subsystem and its position in the aircraft. Figure 5.3 below shows the example of *Cue*:

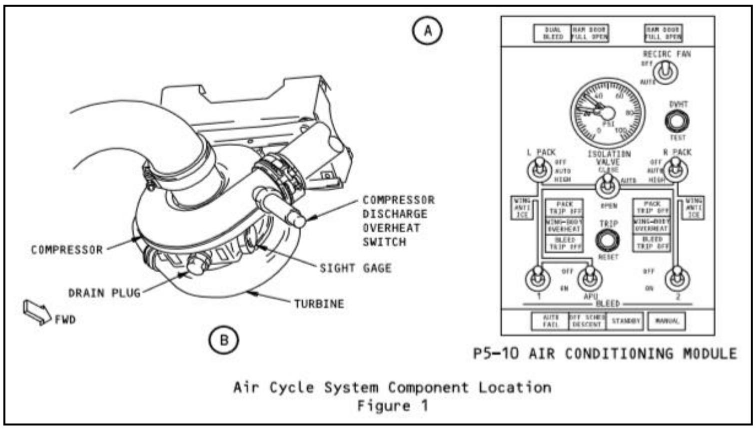


Figure 5.3 Example of *Cue* (D&O, Text 1, p. 3)

In their move structure, Lago and Lloret (2012) classified *Cue* as Step 1 and the components included *Headings*, *Preview*, *Metatext*, *Index* and *Table of contents*. Lago and Lloret (2012) also mentioned that this step might be realised by one or all the components. In contrast, *Cue* in this study refers to visual representation that complements the text in the corpus (ATA, 1999; GAMA, 1978). Since its occurrence is independent, it is classified as a step on its own.

5.5.1.5 Aside

Aside is another common step that occurs across the three moves. This step refers to an additional information given in the AMM following Lago and Lloret's (2012) move model. Here are the examples:

(44) Lifting a damaged airplane is covered in Airplane Recovery Document D6-40146. (B737-T1)

(45) Refer to Chapter 30, Pitot Static Tubes, Alpha Vane and Temperature Probe Anti-Icing System. (B737-T6)

(46) For a list of recommended lubricants, refer to Recommended Lubricants Table. (C182-T2)

(47) For a list of required tools, equipment and materials, refer to Windows – General. (C182-T9)

This step is used to provide the readers with additional information that the readers might refer to for extra information. In their study, Lago and Lloret (2012) positioned this step in Moves 2 and 3. Conversely, for this study, this step was found in all the three moves.

5.5.2 Page block 1-100: Description and Operation → Move 1: Orienting reader's understanding towards the aircraft subsystem and its operation

The first *Page block* of the AMM is DESCRIPTION AND OPERATION (*Page block 1-100*). This *Page block* is labelled as **Move 1: Orienting reader's understanding towards the aircraft subsystem and its operation**. The communicative purpose of this move is to introduce the structure and the functions of the subsystem. This *Page block* is important for new AMP as they are still not familiar with the subsystem of the aircraft. Not only that, this *Page block* can be taken as individual or isolated parts of the manual. Move 1 in this corpus can be realised through the six steps:

Step 1a. Introducing the subsystem
Step 1b. Describing major assemblies of the subsystem
Step 1c. Describing the features of the subsystem
Step 1d. Stating the functions of the subsystem
Step 1e. Illustrating the location of the subsystem
Step 1f. Explaining how the subsystem works

5.5.2.1 Step 1a. Introducing the subsystem

This is the first step that realises Move 1. The function of this step is to introduce the subsystem by defining the subsystem. This step is important for the AMP who do not have background knowledge of the subsystem. The following extracts exemplify the first step of Move 1:

(48) The auto throttle system is an electromechanical servo system that controls the airspeed of the airplane by automatically positioning the throttles to maintain a selected airspeed. (D&O, Text 1)

(49) The detection system is an electrical heat sensing system that responds to a general overheats condition or localized fire condition by activating warning lights and an alarm bell. (D&O, Text 7)

(50) The system is of an electro thermal type. (D&O, Text 38)

This step occurs in 40 texts with 82 times of occurrences. In terms of the process types, it is observed that this step is presented by the use of three types of processes, namely (1) relational, (2) existential, and (3) material processes. There are two different types of verbs used that represent the relational process. The first relational process occurs with the use of verb *be* which was found in step 1a, as shown in the following examples:

(51) The fuel dump system **is** a combination of fuel lines (…)

(52) The CSD limit governor **is** a flyweight-operated control (…)

(53) The inlet cowl anti-icing system **is** a thermal system using engine (…)

The relational process with the use of verb *be* in this step instantiates identifying, in which the process serves to define the identity of the subject. This is expressed by identifying intensive relational process in which "*x* serves to identify the identity of *y*". As shown in the examples given above, *y* represents the subsystem and *x* represents the components related to the subsystem. In addition to that, it is observed that this process is written in the indicative declarative mood and it is in accordance with the purpose of this step, that is to inform.

Apart from the use of verb *be*, the relational process is also identified by the use of the verb *consist of*, as shown in the following extracts:

(54) The fuel flow transmitter **consists of** a housing containing two (…)

(55) The horizontal stabilizer **consists of** one complete dual spar box (…)

(56) The auxiliary structure **consists of** those structural wing component (…)

(57) The fuel flow transmitter **consists of** a housing containing two (…)

The relational process with the use of verb *consist of* serves to identify through the identifying possessive relational process. It is also observed that this process is written in the indicative declarative mood, similar to the relational process with the use of the verb *be*.

Another process type found in this step is the material process. The material process indicates 'doing' and 'happening'. As for this step, the material process expresses the notion of 'doing' in which some 'entity' does something to 'some other entity'. In this case, it describes what subsystem does to its components. It is also noticed that this process is written in the indicative declarative mood using active and passive voice as shown in the examples below:

(58) Folding side guides are **used** in the door sill area (…)

(59) Hydraulic power system B **supplies** fluid under pressure of 3000 psi (…)

(60) The pitot static system **provides** dynamic (pitot) and ambient (…)

(61) The main gear **provides** the means for supporting the (…)

The last process type used in this step is existential process. This process only occurs two times which indicates the existence of the subsystem and its components. Similar to the types of mood used in the relational and material processes, these two clauses demonstrate the use of the indicative declarative mood to introduce the subsystem. The following clauses show the existential process:

(62) There **are** two types of pressure seals used on (…)
(63) There **are** two types of fuel flow power (…)

In sum, there are three processes used in this step with the relational and material processes being the most dominant in this step. These three processes signify the communicative function of the step which is to introduce the readers to the subsystem. The mood system, on the other hand, fulfils the communicative purpose of this step, which is to inform.

5.5.2.2 Step 1b. Describing major assemblies of the subsystem

This particular step occurs in 32 texts with a total of 124 occurrences. The following are the examples of excerpts from Step 1b:

(64) The air conditioning systems provide conditioned air to the control cabin, passenger cabin, electronic equipment compartment, forward cargo compartment, air conditioning distribution bay and aft cargo compartment (D&O, Text 2).

(65) The Aertex ME 406 Emergency Locator Transmitter (ELT) system includes an ELT unit, an integral battery pack, warning buzzer, internal G-switch, antenna, remote switch, cable assembly, and antenna coaxial cable (D&O, Text 41).

The communicative purpose of this step is to inform the readers the components connected to the subsystem. It describes the components of the subsystem by providing a list of the components as in "*ELT unit, an integral battery pack, warning buzzer, internal G-switch, antenna*".

In terms of process types used in this step, it is observed that this step is presented by the use of two types of processes: (1) relational, and (2) material processes. The relational process in this step signifies the description of the subsystem. The following clauses illustrate the relational process in this step:

(66) The variable displacement pump **consists** essentially **of** a piston and cylinder (…)

(67) ELT system **includes** and ELT unit (…)

(68) The water separator also **has** a bag condition indicator.

(44) The service panel **has** both inlet and outlet (…)

(45) This system **has** three fuel flow transmitters, three fuel flow indicators, and (…)

As shown in the examples above, the verbs such as *consist of*, *contain* and *have* are mostly used in this step and are written in the indicative declarative mood. These verbs indicate the relationship between one subsystem to other related subsystems. For instance, the verb *consist of* is categorised as identifying possessive relational process. In this case, the subsystem is identified by its components. As for the verbs *include* and *have*, these verbs signify attributive possessive relational process. These verbs describe the relationship between the subsystem and other related subsystems.

Another type of relational process with the use of verb *be* in this step can be classified as attributive which are expressed by a noun or noun group. It is observed that this process is written in the indicative declarative mood as shown in the following examples:

(46) There **are** two monitoring circuits in each control unit (…)

(47) The water separator **is** a cylindrical chamber consisting of an inlet and outlet shell assembly (…)

(48) (…) the auxiliary structures **are** the leading edge, the trailing edge (…)

The material process, on the other hand, is the least frequently used in this step. This process which is mostly found in the second clause of a sentence functions as an additional information. This process, which is illustrated through the use of the indicative declarative mood, is written in the active and passive voice. Below are the examples of material process:

(49) (…) each control unit that **provide** a separate monitoring (…)

(50) (…) outer skins which **provide** smooth airflow.

(51) All switches and indicator lights are **located** on the third (…)

(52) (…) POWER and OVERHEAT positions and is **located** between the (…)

It can be concluded that the relational and material processes used to realise this step describe the components that are connected to the subsystem. Due to this, the verbs used in this step help the readers to understand the types of the components that are connected to the subsystem. It is also observed that these processes are written in the indicative declarative mood in the active and passive voice. The mood system used is in accordance with the purpose of this step, that is to inform.

5.5.2.3 Step 1c. Describing the features of the subsystem

The third step in Move 1, *Step 1c. Describing the features of the subsystem* describes the characteristics of the subsystem and/or its components. This step occurs in all 42 texts with 322 occurrences, which is the highest number of occurrences. The examples are shown below:

(53) The primary heat exchanger is the first unit of the air cycle system through which engine bleed air passes to be cooled. (D&O, Text 1)

(54) The access panels are made of honeycomb sandwiched between two sheets of fiberglass. (D&O, Text 5)

(55) The windows have laminated transparent layers, a metal insert, and weigh approximately 30 pounds (14 kg). (D&O, Text 27)

(56) Each door has an outer sheet skin that is chemically bonded to an inner pan assembly. (D&O, Text 41)

This step provides information on the physical appearance of the subsystem that the readers should notice. This is to ensure that the readers understand the features of the subsystem before performing maintenance activities on this subsystem.

In terms of process types used in this step, it is observed that this step is presented by three types of processes: (1) relational, (2) existential, and (3) material processes. The relational process is realised through the verb *be* is written in the indicative declarative mood. The function of this verb is to identify the components that are linked to the subsystem in a form of definition as shown in the examples below:

(57) The lower part **is** a bayonet cap that may be removed, turned (…)

(58) The heat exchanger **is** a counterflow plate x97 fin type.

(59) The latches **are** accessible only from inside the equipment (…)

Another verb that represents identifying possessive relational process is the verb *consist of* that shows high frequency of occurrence in this step. The verb *consist of* describes the connection between the components of the subsystem. It is also noticed that this process is written in the indicative declarative mood. Below are the examples of clauses with the verb *consist of*:

(60) Each valve **consists of** a housing containing an inlet a (…)

(61) The butterfly valve **consists of** a butterfly disk located within (…)

The verb *have* is another verb that indicates attributive possessive relational process. This verb shows the relationship between the possessor and the possessed. It is observed that the possessor in this step indicates the subsystem, while the possessed represents the components of the subsystem. It is also observed that these clauses are written in the indicative declarative mood. The examples of the clauses with the verb *have* are shown below:

(62) The 45973-102 guides **have** a base which has mounting provisions for (…)
(63) The No.1 and 2 windows **have** a conductive coating between the outer (…)
(64) The water separator also **has** a bag condition indicator
(65) The ULB **has** a detection range of 2,000 to 4,000 yards (…)

Apart from the relational process, the verb *be* in this step indicates the existential process. This process is represented by: a participant, the word *there* and the verb *be*. As the function of this step is to describe the features of the subsystem, the participant in the clauses illustrates the existence of the components of the subsystem. Below are the examples of clauses of existential process:

(66) There **are** three control units, one for each fire (…)
(67) There **is** a discharge line to each engine (…)

The third type of process found in this step is the material process. It is observed that the verbs such as *shape*, *provide* and *supply* are used frequently to illustrate the features of the subsystem. It is also noted that this process is written in the indicative declarative mood in both active and passive voice as shown in the clauses below:

(68) The coalescer bag and its support are conically **shaped** with (…)
(69) The manual control mechanism **extends** from the stabilizer (…)
(70) Protection of the air cycle machine is **provided** by two thermal switches
(71) A coupling **joins** the inlet and outlet shell assemblies and **secures** (…)
(72) Each VHF communication system **uses** an all metal VHF (…)
(73) The energizing voltage for the holding solenoid is **supplied** from (…)

As informed earlier, this step describes the characteristics of the subsystem and/or its components. It can be concluded that the relational process constitutes the highest process type used in this step. This might be due to its function to describe the characteristics of the subsystem and its components. Relational process is used to relate the subsystem with its characteristics. Existential process, on the other hand, shows the existence of the components of the subsystem. As for the material process, it is used to describe the features of the subsystem by illustrating how the subsystem and its components operate. These processes are all written in the indicative declarative mood as the communicative purpose of this step is to inform.

5.5.2.4 Step 1d. Stating the functions of the subsystem

The fourth step to realise this move is known as *Step 1d. Stating the functions of the subsystem*. This step occurs in 40 texts with 277 occurrences. Here are some of the examples on how this step is presented:

(74) The conditioned air distribution system routes temperature controlled air to the passenger and control cabins. One duct system supplies the control cabin (21-22-00/001) and a separate duct system supplies the passenger cabin (21-21-00/001).

Passing bleed air through a primary heat exchanger, and air cycle machine, and a secondary heat exchanger cools the air sufficiently to handle any cooling situation required. A ram air system provides coolant air for the heat exchangers. (D&O, Text 2)

(75) An Artex ME406 Emergency Locator Transmitter (ELT) System is installed to help rescue teams find the airplane in the event of a crash. It is made to operate in a wide range of environmental conditions as is resistant to the forces caused by many types of accidents.

The ELT activates a buzzer that is installed near the ELT assembly. The buzzer makes a loud noise to let people know that the ELT is on. (D&O, Text 41)

This step provides the information on what the subsystem and/or its components do and it is typically written in the declarative mood. This step is basically indicated by the phrases like "*secondary heat exchanger cools the air sufficiently*", "*ram air system provides coolant air*" and "*ELT activates a buzzer*". Furthermore, it is also noticed that '*to + infinitive*' verb phrase such as "*to handle any cooling situation*", "*to help rescue teams*", "*to operate in a wide range*" and "*to let people know*" are used to signify the function of the subsystem.

It is observed that this step is realised by two types of processes: (1) relational, and (2) material processes. The relational process through the verb *be* with the determiners of *that* and *which* are used to realise this step. The determiners used in the examples below link the first clause that defines the subsystem with the second clause that describes the function of the subsystem. Even though Step 1a has developed the definition of the subsystem at the early stage, Step 1d extents the description of the subsystem by connecting the definition with the function of the subsystem. Not only that, the relational process in this step is written in the indicative declarative mood. The following clauses display the relational process used in this step:

(76) The N1 speed sensor **is** a pulse counter that <u>senses</u> N1 rotor speed and <u>provides</u> signals to the N1 tachometer indicator and PMC.

(77) The pressure regulator **is** a variable output regulator which <u>controls</u> the pressure of the 13th-stage modulating and shutoff valve.

It is also noted that the relational process in this step is represented by the verb *have* that indicates the attributive possessive. The verb *have* in this step links the characteristic of the subsystem with its function. This process is written in the indication declarative mood as shown below:

(78) The engine and strut **have** outer skins which <u>provide</u> (…)

(79) The indicator **has** two scales, one <u>showing</u> (…)

As seen in example (78), the first clause as in "*The engine and strut* ***have*** *outer skins*" describes the characteristic of the subsystem. This clause is then linked to the second clause "*which <u>provide</u> (...)*" that indicates the function of the characteristic using the verb that indicates material process. Due to this, the first clause expresses the attribute of the characteristic of the subsystem and followed by the second clause that describes the functions of the subsystem.

As material process is said to involve 'doing', the application of this type of process highlights what the subsystem does. Among the verbs that indicate the material process are: *provide, prevent* and *control*. The function of these verbs are to describe the functions of the subsystem(s). Similar to the relational process, this process is also written in the indicative declarative mood. For example:

(80) The switch **provides** a ground for the power test input (…)

(81) The manual override handle **provides** a method of positioning the valve (…)

(82) A filter in the return line **prevents** possible contamination (…)

(83) A flapper check valve **prevents** reverse fuel flow through (…)

(84) The engine logic circuit **controls** operation of the flasher (…)

(85) The drain valve **controls** potable water drainage and (…)

To summarise the discussion in this section, the relational and material processes constitute the main process types to describe this step. As noted previously, this step describes the function of the subsystem and/or its components in the aircraft. The relational process with the verbs *be* and *have* are used to define and describe the features of the subsystem in relation to its functions. On the other hand, the material process describes the functions of the subsystem by using the verbs *provide*, *prevent* and *control*. The indicative declarative mood that is in this step describes the specific functions of the subsystem. Not only that, this mood is only written in the active voice.

5.5.2.5 Step 1e. Illustrating the location of the subsystem

Step 1e. Illustrating the location of the subsystem informs the readers on the location of the subsystem and its components as shown in the examples below:

(86) The air cycle machine is located in the equipment bay between the duct leading from the primary heat exchanger and the duct to the water separator.

The turbine inlet overheat switch is located in the transition at the secondary heat exchanger and senses the temperature of air passing from the heat exchanger to the turbine of the air cycle machine. (D&O, Text 3)

(87) Fresh air enters the cabin from one of three sources. Two of those sources are located on the leading edge of the wing (one left and one right) and the other source is located on the right and left sides of the fuselage, between the firewall and the forward door post. (D&O, Text 40)

This step occurs 189 times in 39 texts. The communicative purpose of this step is to describe the exact position of the subsystem and its components in the aircraft. This is important as this step explains the location of the subsystem to ensure that the readers refer to the correct subsystem before performing maintenance activities. As stated earlier, the aircraft system is complex, and it is important for the readers to know the location of the subsystem so that they can easily identify the subsystem. Due to this, the description of other components related to the subsystem will be added when describing the location of the subsystem.

It is observed that the description of the location is realised through two types of processes: (1) relational, and (2) material processes. The relational process in this step is presented through the verb *be*. This process construes attributive circumstantial to show the relationship between the subsystem and its components by using circumstance of location. Hence, the prepositions like *on*, *at* and *in* are used with the verb *be* to describe the location of the subsystem. It is also noted that this process is written in the indicative declarative mood as shown in the examples below:

(88) The alarm bell **is** <u>in</u> the aural warning devices box in (…)

(89) VHF No. 2 antenna **is** <u>at</u> station 720C+10, bottom of the fuselage.

(90) (…) system A and system B test switches and bell reset switch **are** <u>on</u> third (…)

(91) Warning lights in the engine fire switch handles, **are** <u>on</u> pilots' overhead panel (…)

Similar function as relational process, the material process used in this step also describes the location of the subsystem. It is noted that the verbs such as *locate, mount, install* and *attach* are frequently used to illustrate the location of the subsystem in the main system. These verbs are usually followed by the preposition of place, similar to the relational process. Even though the process is written in the indicative declarative mood, it is mainly written in the passive voice to focus on the location of the subsystem. Following are the examples of clauses that represent material process in this step:

(92) The air cycle machine is **located** <u>in</u> the equipment bay between (…)

(93) The valves are **located** <u>at</u> a predetermined height above (…)

(94) The actuators are **mounted** <u>on</u> support fittings which (…)

(95) A nose dome is **mounted** <u>on</u> each engine to provide (…)

(96) The switch is **installed** <u>on</u> the compressor scroll.

(97) Stops are **installed** <u>at</u> the forward and aft ends (…)

(98) The lower hinge arm is **attached** <u>to</u> the radius link and stop (…)

(99) The drag strut is **attached** <u>at</u> the upper end to a lug (…)

Apart from the relational and material processes, existential process is also found in this step even though the occurrence of this process is relatively low. The function of the existential process in this step is to indicate the existence of the subsystem and its components before providing its location. This is important as the features of a single subsystem is complex. By indicating these features, the readers will know the location of the subsystem. This process is also written in the indicative declarative mood. The examples are:

(44) There **are** three indicating discs on the lower right aft fuselage.

(45) There **is** one fire switch for each engine (…)

(46) There **are** three control units, one for each fire area, located (…)

To conclude, among the three processes, the material process shows the highest process type used to describe this step. This is followed by the relational process. These processes describe the location of the subsystem with the use of prepositions of place. It is also worth noting that these processes are written in the indicative declarative mood in both passive and active voice. The choice of voice, however, is determined by the process: the relational and existential processes are written in the active voice, while the material process is written mostly in the passive voice.

5.5.2.6 Step 1f. Explaining how the subsystem works

This step informs the readers on the operations of the subsystem and its components. The information for this step explains how the operation works and the steps are arranged chronologically. The information is arranged in a chronological order because the subsystem is connected to the other parts of the subsystem. Thus, the information has to be organised to ensure that the readers can easily understand the description. The following are the examples of this step:

(47) On 737-400 airplanes, a high pressure water separator system removes excess moisture before the air enters the turbine of the air cycle machine. The water is then passed through a water injector and sprayed on the secondary heat exchanger core to aid in cooling bleed air. (D&O, Text 2)

(48) During an accident, the ELT will activate automatically and transmit a standard swept tone on 121.5 MHz (emergency frequency). The 121.5 MHz signal will continue until the ELT battery has expired. Every 50 seconds for 440 milliseconds, the 406.028 MHz transmitter will activate and send a message to the satellite. The 406.028 MHz transmission will continue for 24 hours and then stop. During operation, the ELT will receive electrical power from the ELT battery pack only. (D&O, T40)

This step recurs 317 times in 38 texts. This step mainly involves a process to show the operation of the subsystem and its components. As can be seen in the examples above, the information for this step is arranged in a chronological sequence based on how the subsystem operates. Hence, the prepositions of time such as "*before*", "*then*", "*during*" and "*until*" are among the prepositions used as a signal of sequence.

Apart from the signal words, the relational and material processes are also used to realise this step. Similar to other steps in Move 1, the relational process with the verb *be* is used which instantiates the relationship between subsystem and its components. Three examples are given below:

(49) The heat exchangers **are** of the air-to-air type, (…)

(50) The AND gate inputs **are** the output of a power supply monitor (…)

(51) If the throttles **are** in a low limit condition (…)

It was also found that this step is realised by the attributive possessive relational process with the verb *have*. This verb describes the features of the subsystem related to its operation. It is also noted that the relational process is written in the indicative declarative mood. The examples of the verb *have* that occur in this step are shown below:

(52) The speed brake control lever **has** a compression spring (…)

(53) The switch **has** a test position that will check the (…)

Another type of process found in this step is the material process with the verbs like *supply*, *open* and *provide*. These verbs are mostly used in this step as can be seen in the examples below:

(54) As high pressure oxygen is **supplied** to the filler valve, (…)

(55) The air cycle system **supplies** the cold air needed for mixture (…)

(56) The bypass valve **opens** only when the coalesce bag becomes (…)

(57) Over limit indication is **provided** by a red warning light in the (…)

(58) A built-in blower **provides** air cooling of the transceiver when (…)

(59) Hot air **enters** one plenum chamber from the pneumatic (…)

(60) Air from the air cycle machine compressor outlet **enters** the forward inboard connection (…)

(61) Cold air leaving the air cycle machine **passes** through a muff.

As for the mood, it is noted that the clauses are written in the active and passive voice when elaborating on how the subsystem operates. The passive voice used in both examples (62 and 63) indicates how the subsystem works. This is followed by the active voice that points out the effect towards its components. This is shown in the following examples:

(62) When the solenoid A **opens**, pressure **is applied** to (…) which **tends** to close the servo and (…). This **opens** the valve and **increases** the airflow.

(63) When the bridge **is balanced** (…) and it **maintains** the position.

As informed earlier, this step involves a description of a process on how the subsystem and its components operate. The relational and material processes used in this step constitute high frequency. These processes are written in the indicative declarative mood in the form of active and passive voice. This is significant to the communication purpose of this step, which is to inform.

5.5.2.7 Summary

In order to illustrate Move 1, the following is the example of move structure of Move 1 taken from Text 40.

Heading **FRESH AIR DISTRIBUTION – DESCRIPTION AND OPERATION**

Title[1] 1. General

Step 1a A. The cockpit/cabin area is ventilated with fresh air by means of external wing root openings, an adjustable air scoop, and internal ducting.

Title[2] 2. Description

Step 1e A. Fresh air enters the cabin from one of three sources. Two of those sources are located on the leading edge of the wing (one left and one right) and the other source is located on the right and left sides of the fuselage, between the firewall and the forward door post.

Step 1c (1) Fresh air from the leading edge inlets is distributed through a series of ducts to adjustable air outlet valves (Wemacs).

Step 1d Each wing feeds three Wemacs, with a total of six Wemacs located throughout the cabin.

Step 1e Wemacs are located at the upper corner of the windshield, between the instrument panel and forward doorpost, and overhead in the rear passenger area.

Step 1c (2) Fresh air entering from the right side of the fuselage is controlled by an infinitely positionable scoop (door).

Step 1f This air is ducted directly into the heated air plenum and is distributed throughout the cabin.

Title[3] 3. System Operation

Step 1c A. The amount of fresh air entering the cabin can be controlled by any of the six Wemacs. Rotating the Wemac valve will vary the airflow from fully closed to fully open.

B. Air flow into the cabin can also be adjusted by the CABIN AIR control cable. Pulling the control fully aft allows the maximum amount of fresh air to flow through the distribution system. Pushing the control fully forward closes the scoop (door) and allows no fresh air to flow through the distribution system.

Precautionary Note NOTE: Air temperature in the distribution system can be altered by use of the CABIN HT control. As the CABIN HT control is gradually pulled out, more and more heated air will blend with the fresh air from the scoop and is distributed into the cabin. Either one or both of the controls may be set at any position from full open to full closed.

The analysis revealed that the steps in Move 1 indicate some variations in terms of their organisation. Firstly, it can be observed from the example above that the steps are not in order. The order of the steps in this move is mixed and not following the sequence as proposed earlier. The ATA Specification 100 (ATA, 1990) and GAMA Specification No. 2 (GAMA, 1978), also did not mention that the information given in this *Page block* should follow a sequence of order. Secondly, the structure of the steps found in this move show "cyclical" or "recursive" occurrence, for example:

$$H \rightarrow T^1 \rightarrow 1a \rightarrow T^2 \rightarrow 1e \rightarrow 1c \rightarrow 1d \rightarrow 1e \rightarrow 1c \rightarrow 1f \rightarrow T^3 \rightarrow 1c \rightarrow PN^1 \text{ (D\&O, Text 40)}$$

According to Biber, Connor and Upton (2007), it is possible that some move types recur in a cyclical fashion within a section of the text. They also added that each appearance of a particular move can be considered as a separate occurrence.

In terms of the boundaries of each step, it is observed that there are cases that the steps are separated by the titles as shown in the example above. This kind of boundary shows a straightforward linear structure.

Apart from that, this move is realised by the relational, existential and material processes. It can be concluded that the relational process is the most dominant process type to appear in the move. This is due to the writer's intention to inform the readers about the features, functions and location of the subsystems and their components. The processes are written in the indicative declarative mood that accomplishes its function to inform. It is also noted that the declarative mood is written in both active and passive voice.

According to Lago and Lloret (2012), manuals are organised according to the order of relevance use. As for their first move, Lago and Lloret (2012) pointed out that the first move combined the elements of evaluation, definition, description, specification, recommendation and instruction. However, only some of the elements echoed in my study such as, definition, description and specification. These elements of definition, description and specification are realised through the three types of processes: relational, existential and material. Move 1 in both AMMs does not display any instruction as the communicative purpose of this move is to inform, not yet on performing tasks.

In order to determine the mood of the clause, the subject and the finite should be identified before this clause can be verified as a declarative, interrogative or imperative mood (Fontaine, 2013). With reference to the types of verbs used in Move 1, it is observed that these verbs established the indicative declarative mood. This is in accordance with the communicative function of Move 1 that is to inform.

Based on the discussion above, it can be concluded that the steps found in my study are different from Lassen's (1998) and Lago and Lloret's (2012) steps in Move 1. These differences are shown in Table 5.13 below:

Table 5.13

Comparison of Steps in Move 1

Lassen (1998)	Lago and Lloret (2012)	Present study
M1: Establishing contact and orienting the reader towards the text and the product	**M1: Establishing contact and orienting the reader towards the text and the product**	**M1: Orienting reader's understanding towards the aircraft subsystem and its operation**
STEPS	**STEPS**	**STEPS**
S1: Introduction	S1: Cues	Heading
S2: Warnings	S2: Introduction	Title
S3: Description	S3: Description S4: Warnings	1a: Introducing the subsystem
	S5: Safety S6: Evaluation	1b: Describing major assemblies of the subsystem
		1c: Describing the features of the subsystem
		1d: Stating the functions of the subsystem
		1e: Illustrating the location of the subsystem
		1f: Explaining how the subsystem works
		Precautionary Note
		Cue
		Aside

As can be seen, Lassen (1998) had proposed three steps in her Move 1, while Lago and Lloret (2012) proposed six steps. As for this study, there are eleven steps in total with six of the steps are the main steps that realised this move.

5.5.3 Page block 101-200: Troubleshooting → Move 2: Anticipating and solving problems

The second *Page block* of the AMM is TROUBLESHOOTING (*Page block 101-200*), which is labelled as **Move 2: Anticipating and solving problems**. The terminological phrase for this move comes directly from Lassen (1998). As stated in the GAMA Specification No. 2 (GAMA, 1978, p. 1), "Troubleshooting information describe probable malfunctions, how to recognise those malfunctions, and the remedial action for those malfunctions shall be provided". It can be construed that the purpose of this move is to guide the readers to identify, locate, and correct faults that are predicted to occur on the aircraft. This *Page block* could also operate as an independent technical manual like Part 3 of the technical manual of Lago and Lloret's (2012) corpus. Not only that, for Lago and Lloret (2012), this move is positioned as their Move 3 but it is positioned as Move 2 in this study.

As outlined in the ATA Specification 100 (ATA, 1999), the organisation of the information in this *Page block* can be presented in the form of:

1. charts or also called "logic tree" charts, or
2. text, or
3. combination of text and supplementary charts.

Since the presentation of the information differs from one manual to another, the proposed linear description of the possible steps of this Move 2 are listed below:

Step 2a. Introducing the troubleshooting procedure
Step 2b. Illustrating the signs of faulty subsystem
Step 2c. Indicating possible causes that initiated the fault
Step 2d. Outlining the procedure to isolate fault
Step 2e. Outlining the corrective procedure
Step 2f. Outlining the procedure to verify fault has been corrected

5.5.3.1 Step 2a. Introducing the troubleshooting procedure

This step introduces the readers to background information of the subsystem that might be at fault as the first step found in Troubleshooting procedure. The examples are given below:

(64) This section provides trouble shooting charts for incidences of a surge (or stall) to determine cause of surge. References are made to 72-00-00 I/C inspection procedure to determine if surge caused damage to engine. (T, Text 10)

(65) This section contains the information that is needed to complete the self-test for the ARTEX ME406 Emergency Locator Transmitter system. The system transmits on two frequencies at the same time. (T, Text 20)

This step is realised by the relational and material processes. The relational process in this step is represented by the verb *be* which indicates intensive attributive relational process. This process signifies the types of troubleshooting procedure and the attributes are expressed by the adjectives (underlined) as shown below:

(66) Trouble shooting the VHF communication systems **is** <u>comparatively simple</u> (…)

(67) Both procedures **are** <u>applicable</u> to either engine No. 1 or (…)

Similar function as the relational process, the material process used in this step also describes the types of troubleshooting. This process is indicated by the verb like *provide* as shown in the following examples:

(68) Troubleshooting with Engine running **provides** a method of (…)

(69) Troubleshooting with Test Set **provides** a method of isolating (…)

As can be seen in the examples (68) and (69) above, the information is written in the indicative declarative mood. As noted earlier, the sentence in the indicative declarative mood focuses on the actor, in this case, the actor refers to types of troubleshooting.

To conclude, the intensive attributive relational and material processes are used in this step to indicate the background information of the subsystem that might be at fault. The communicative purpose of this step is to inform, and hence, the processes are written in the indicative declarative mood.

5.5.3.2 Step 2b. Illustrating the signs of faulty subsystem

Step 2b. Illustrating the signs of faulty subsystem depicts the signs that the readers might experience to indicate that something is wrong with the units of the aircraft. Below are the examples:

(70) Smoke or fumes flow into the passenger cabin or the flight compartment through the air distribution system during flight. (T, Text 1)

(71) No green or amber PROP HEAT annunciation. (T, Text 21)

In the excerpts above, the phrases such as '*smoke or fumes flow*' and '*no green or amber*' indicate the signs of faults that occur at parts of the aircraft. Not only that, the adjectives such as *poor*, *defective*, *excessive* and *low* are also frequently used in the corpus to exemplify the signs of faults of the subsystem.

In terms of the process types used in this step, it is observed that this step is illustrated by two types of processes: (1) relational, and (2) material processes. it is noted that attributive circumstantial relational process is the process that occurs frequently in this step. The process is dominantly shown by the verb *be*. The clauses containing this verb tend to be realised by circumstantial element of appearance. This process describes the condition of the subsystem, and the adjectives used demonstrate the condition. In addition to that, this process is written in the indicative declarative mood. The following are the examples of the relational process:

(72) "Pack" light on the P5 panel **is** on.

(73) The residual voltage **is** low (8 volts).

(74) The control for the generator transfer breaker **is** defective.

Another type of process used in this step is the material process. As material process shows 'doing', the subsystem in the clause is perceived as an actor. The verbs serving as material process like *indicate*, *continue* and *fail* are often used to describe what is happening with the subsystem. As shown in the examples below, the material process is written in the indicative declarative mood. The following clauses illustrate the material process:

(75) A reading of more than 2 **indicates** a faulty antenna circuit.

(76) Logic 1 **indicates** a flight deck switch was actuated (…)

(77) The normal actuator motor **continues** to operate after extension (…)

(78) The standby air stair motor **continues** to operate after retraction.

(79) If the GCU regulator **fails**, the variable FVRTDL logic equals (…)

(80) Valve transit light **fails** to illuminate when correspondence (…)

Apart from the processes used to illustrate this step, it is worth noticing that this step is also realised by the use of phrases. For instance, "*Intermittent or poor transmission*", "*No indication of fuel entering tank*", "*Pressure above 3100 psi*" and "*A rotating rectifier failure*". These phrases, however, are only used when the information is presented in a form of charts as shown in 5.5.3.7.

To sum up, the attributive relational process clauses with the verb *be* dominantly operate this step to illustrate the signs of the faulty subsystem. Apart from the relational process, the material process with the selection of verbs is used to indicate the fault of the subsystem. Hence, it can be said that both relational and material processes signify the signs of the faulty subsystem, parallel with the communicative function of this step, which is to inform.

5.5.3.3 Step 2c. Indicating possible causes that initiated the fault

The third step that realises Move 2 is known as *Step 2c. Indicating possible causes that initiated the fault*. The data shows that this step only occurs in the B737 manual. This step describes the types of possible causes that might lead to the faulty subsystem. For example:

(81) Possible causes:
(1) Contamination in the Engine No. 2 pneumatic system.
(2) Hydraulic Fluid leakage.
(3) Contamination in the air distribution system.
(4) Overheating of the recirculation fan.
(T, Text 2)

(82) Probable cause:
(1) Incorrect installation of the aircraft linkage to the mixture control.
(2) Mixture valve leaks.
(T, Text 25)

(83) The neutral power wires for the generator are not installed correctly at the neutral current transformers. (T, Text 3)

As seen in the examples above, this step is presented in a form of list in phrases or clauses. The possible causes of each trouble demonstrate which components of the subsystem that might be at fault. The adjectives of probability, such as *possible* and *probable*, are frequently used. Since the causes are given in the form of probability, the readers are provided with the list of conditions of the unit that may be causing the trouble. The lexis such as *incorrect*, *leaks*, *contamination* and *overheating* are the hints of the faults that the unit might be experiencing. These words are used so that the readers would be able to recognise the faults.

In terms of the linguistic features found in this step, it is observed that this step is frequently written in a form of phrases rather than the clauses. When performing troubleshooting procedures, the readers read this step to find the causes of the faulty subsystem. Hence, the phrases help the readers to determine the possible causes. Following are the examples of phrases observed in this step:

(84) Faulty antenna or coax cable.

(85) Defective overheat test relay.

Even though most of the information given in this step are in the form of phrases, it is noted that this step is also shown by the clauses that are expressed through the relational process. The first relational process expresses the attributive circumstantial with the verb *be* such as:

(86) The VSCF BITE test – possible causes **are** load current distortion (…)

(87) When the current in 1 phase **is** less than 5 amps and the remaining (…)

Another type of the relational process used in this step is presented through the verb *have*. This type of process denotes attributive possessive as shown in the clauses given below:

(88) The voltage regulator in the GCU **has** a <u>defect</u>.

(89) A fire switch or its wiring **has** a <u>defect</u>.

It is observed that the relational process is written in the indicative declarative mood. Apart from that, it also noticed that the verb *be* signifies possible causes of the faulty subsystem. The noun *defect* (as underlined) used with the verb *have* is to confirm the fault of the subsystem.

Apart from relational process, the material process is also used in this step although it shows low frequency of occurrence. The examples of clauses are listed below:

(90) Pack valve butterfly **failed** to open position or to (…)

(91) Trim air modulating valve is **failed**.

(92) (…) or the standby motor, is **sheared** or **broken**.

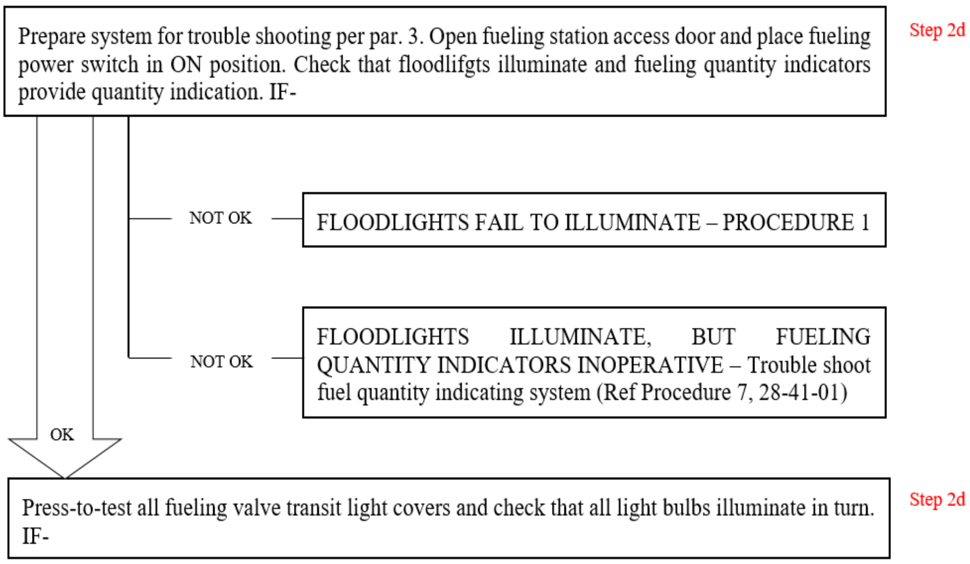
As seen in the examples above, the verbs used in the clauses indicate the fault as a hint to the possible causes of the defect of the subsystem. It is also noted that the material process is written in the indicative declarative mood through the passive and active voice.

It can be summarised that this step is realised by two types of processes: relational and material. Even though these processes are not frequently used, the processes found in this step is parallel with the communication purpose of this step which is to illustrate the possible causes of the faulty subsystem.

5.5.3.4 Step 2d. Outlining the procedure to isolate fault

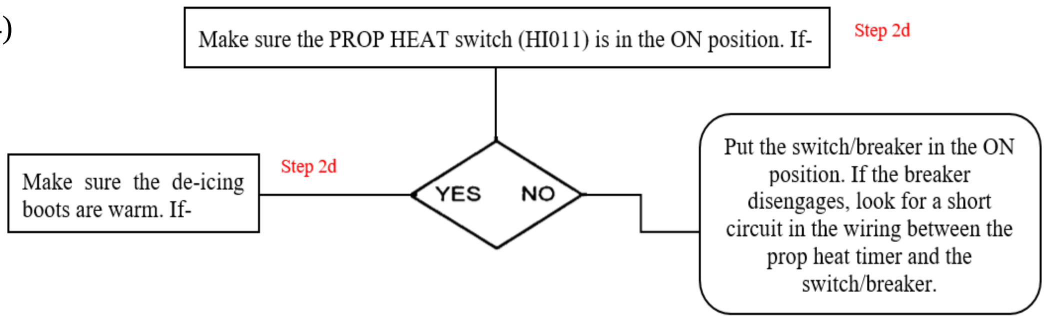
The communicative purpose of the fourth step in Move 2 is to give command on how to isolate the faults so that the actual fault could be identified. The examples are illustrated below:

(93)



(T, Text 6)

(94)



(T, Text 22)

Based on the above illustration, to isolate the faults, the readers have to examine all the possible causes before the actual defect can be identified. The readers have to perform one test after another until they discover the actual defect.

It is noted that this step is presented using the material process and it is written in the imperative mood as shown in the following examples:

(95) **Feel** lines for pulse of hydraulic pressure at up port of lock actuator and visually **check** movement of piston rod.

(96) **Place** fueling shutoff valve switches (one at a time) in OPEN position.

(97) **Repeat** last previous fueling step with each remaining fuel tank.

(98) **Make sure** that all VHF circuit breakers on circuit breaker panel 18 are **closed**.

(99) **Operate** system and **monitor** ammeter on forward overhead panel.

(100) **Check** for security of lock mechanism linkage attachment to door sequence valve.

In terms of the verbs used, it is observed that the verbs like *repeat*, *monitor*, *operate* and *check* denote the procedure to isolate the possible causes of the faults. Not only that, the instruction also requires the readers to continue with the following procedure depending on the results of the first test conducted. There are three types of methods of selection used. Firstly, by including the conjunction *if* at the end of the first step in isolating the faults as in "*Feel lines for pulse of hydraulic pressure at up port of lock actuator and visually check movement of piston rod.* ***IF***". The conjunction *if* signifies two different results in which the readers need to perform depending on the results of the test conducted.

Apart from the conjunction *if*, the indicative interrogative of *yes/no* type of questions are also used as:

(101) **Does** the 'pack' light **go off**?

(102) **Does** the visual indicator **show** that the valve is failed in the open position?

Yes/no questions are defined as the questions for which either *YES* or *NO* is the expected answer (Larsen-Freeman, Celce-Murcia, Frodesen, White & Williams, 2016). The indicative interrogative mood in this step isolates the faults before the faults can be corrected or fixed. This is in accordance with the function of Step 2d as well as the linguistic realisations suggested by Lago and Lloret (2012). Hence, when referring to the examples (101) and (102) above, the answer *YES* or *NO* leads to another new instruction: either (1) to carry on with the correction procedure, or (2) to continue with the inspection procedure to isolate the faults. The purpose of this type of questions is to assist the readers with the answers like *OK*, *YES* and *NO*, which are given at the beginning of the sentence. This is to guide the readers to choose the option in accordance with the results of the test that they have performed. In this case, the readers are required to choose the options between continuing with the isolation procedure or to proceed with the corrective action. If the next step is to fix the fault, the readers will continue with Step 2e, which is the solution to fix the fault.

The last technique used to isolate the faults is the use of exclamation *OK* or *NOT OK*. Similar to the indicative interrogative *yes/no* questions and the conjunction *if*, the answer to exclamation *OK* or *NOT OK* leads to another new instruction, which is either to carry on with the correction procedure or to continue with the inspection procedure to isolate the faults.

To conclude, it is predictable that the imperative mood is the most salient mood used to realise this step since the purpose is to give command. The material process, on the other hand, denotes how to isolate the faults through the choice of verbs like *repeat*, *monitor*, *operate*, *check* and others.

5.5.3.5 Step 2e. Outlining the corrective procedure

This step instructs the readers to correct or to fix the cause of the faulty subsystem. This step usually occurs after Steps 2d, or 2c. Here are some examples:

(103) If there is smoke from the air recirculation fan or the related wiring, then do the applicable steps below:

(1) Replace the air recirculation fan. These are the tasks:

Recirculation Fan Removal (AMM 21-21-22/401)

Recirculation Fan Installation (AMM 21-21-22/401)

(2) Repair the applicable wiring.

(T, Text 1)

(104) Remove and clean the nozzles. Soak the nozzles in Hoppes #9 Gun cleaning solvent for 20 minutes. Rinse the nozzles in a Stoddard solvent. Blow dry the nozzles. (T, Text 23)

As can be seen in the examples, this step is presented in the form of instruction with the purpose to instruct the readers to perform the procedures given. As mentioned earlier, the communicative purpose of this step is to correct the fault that has been identified in the previous step (Step 2d).

As for the type of process used, it is observed that the material process is more salient in this step. The excerpts below show the examples of the verbs used to indicate material process:

(105) **Replace** control panel.

(106) **Replace** the APU generator.

(107) **Adjust** cables as necessary.

(108) **Adjust** or replace the switch.

(109) **Repair** wiring between receptacle and ground.

(110) **Repair** defective components in cooling packs

It is noticed that this step is represented by the imperative mood to instruct the readers. The verbs like *replace*, *adjust* and *repair* are among the verbs used as hints of actions required to fix the fault of the subsystem.

In conclusion, the clauses are usually written in the imperative mood to give command to the readers. The verbs, on the other hand, are used to represent the material process. It is observed that this process is the most salient process used to realise this step.

5.5.3.6 Step 2f. Outlining the procedure to verify fault has been corrected

Step 2f. Outlining the procedure to verify that fault has been corrected guides the readers with the procedures to confirm and verify that the fault has been fixed and it can be declared as airworthy. As shown in the excerpt below:

(111) Repair Confirmation

(1) Check that smoke and fumes do not appear in the flight deck and passenger cabin when the air conditioning system is operating (AMM 21-00-01/201)

(2) If the oil contamination removal procedure is run until no smoke or fumes are present, and if the problem does not occur on the next flight, you have corrected the fault.

(3) If smoke and fumes remain, go to PROCEDURE 1do the step for contamination in Engine No. 2, and the step for hydraulic leakage.

(T, Text 1)

This step only occurs in two texts in the corpus. However, only one procedure was found written in a complete form as shown in the example (111) above. Another statement found only states "*Do the Repair Confirmation at the end of this task*" (T, Text 3). This step is also written in the imperative mood.

5.5.3.7 Summary

The following are two different examples of Move 2 structure taken from Texts 8 and 17.

Example 1: Move structure of Move 2 (Text 8)

Heading **WING THERMAL ANTI-ICING SYSTEM – TROUBLE SHOOTING**

Title^{1} 1. <u>General</u>

Step 2a A. Before using the following trouble shooting chart, prepare to test the wing TAI system in accordance with adjustment/test procedure. Proceed with test to extent practical to determine extent of trouble. When checking system for air mode of operation, press GND SENSING TEST switch on Landing gear module.

Title^{2} 2. <u>Trouble Shooting Chart</u>

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Step 2b One light does not come on (on press to test or in any switch position)	*Step 2c^{1}* Defective lamp	*Step 2d^{1}* Check continuity of lamp. IF – *Step 2d^{1a}* No continuity – *Step 2d^{1b}* Continuity OK – Check for defective lamp base	*Step 2e* Replace lamp
	Step 2c^{2} Defective lamp base Defective lamp	*Step 2d^{2}* Check for continuity with lamp installed between base terminals 1 and 2, and 1 and 3 with light cover normal and between terminals 1 and 4 with light cover depressed. IF - *Step 2d^{2a}* No continuity - *Step 2d^{2b}* Continuity OK	*Step 2e* Replace lamp base *Step 2e* Replace P5-11 module (Ref 30-11-41, R/I)

As mentioned previously, there are three types of format used to organise the information for this *Page block*. Example 1 above is categorised as text in a form of table, which is suggested in the ATA Specification 100 (ATA, 1999). As can be seen in the example above, the red arrows indicate the information is organised horizontally and vertically. The schematic structure of the steps can be illustrated below:

$$H \rightarrow T^1 \rightarrow 2a \rightarrow T^2 \rightarrow 2b \rightarrow 2c^1 \rightarrow 2d^1 \rightarrow 2d^{1a} \rightarrow 2e \rightarrow 2d^{1b}$$

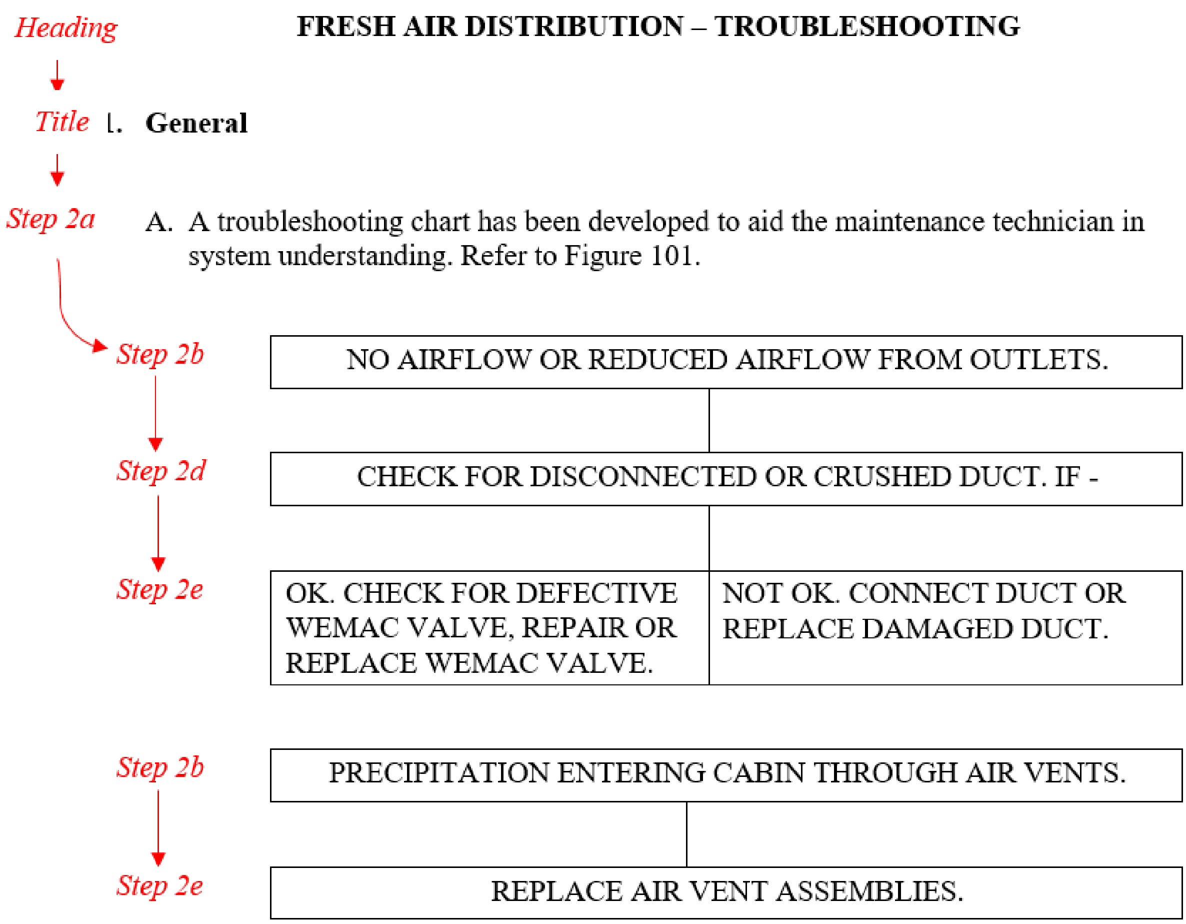
$$\rightarrow 2c^2 \rightarrow 2d^2 \rightarrow 2d^{2a} \rightarrow 2e \rightarrow 2d^{2b} \rightarrow 2e$$

It is noticed that if the information is organised in a form of table (Troubleshooting chart), only four steps are included in this move, which are:

- Step 2b - Illustrating the signs of faulty subsystem,
- Step 2c - Indicating possible causes that initiated the fault,
- Step 2d - Outlining the procedure to isolate fault, and
- Step 2e - Outlining the corrective procedure.

It is also noted that some of the steps show the feature of recurrence. This is due to the fact that the signs of the subsystem might indicate several possible causes of the faults. Hence, the steps will recur depending on the possible causes that might occur.

Example 2: Move structure of Move 2 (Text 17)


Heading — **FRESH AIR DISTRIBUTION – TROUBLESHOOTING**

Title — **1. General**

Step 2a — A. A troubleshooting chart has been developed to aid the maintenance technician in system understanding. Refer to Figure 101.

Step 2b — NO AIRFLOW OR REDUCED AIRFLOW FROM OUTLETS.

Step 2d — CHECK FOR DISCONNECTED OR CRUSHED DUCT. IF -

Step 2e — OK. CHECK FOR DEFECTIVE WEMAC VALVE, REPAIR OR REPLACE WEMAC VALVE. | NOT OK. CONNECT DUCT OR REPLACE DAMAGED DUCT.

Step 2b — PRECIPITATION ENTERING CABIN THROUGH AIR VENTS.

Step 2e — REPLACE AIR VENT ASSEMBLIES.

Unlike the previous example, Example 2 above shows a different format of organisation, in which the steps do not proceed in such a linear fashion and are characterised by the recurrence of the steps. When organising the information using this type of chart, it is noticed that the steps which commonly occurred are: (1) Step 2b (*Illustrating the signs of faulty subsystem*), (2) Step 2d (*Outlining the procedure to isolate fault*), and (3) Step 2e (*Outlining the corrective procedure*). In other words, Step 2c (*Indicating possible causes that initiated the fault*) is not included, unlike the previous type of organisation (Example 1).

Move 2 in my framework mirrors Lassen's (1998) and Lago and Lloret's (2012) third move. However, in their studies, this move comprised four (Lassen) and eight steps (Lago and Lloret), while my Move 2 consists of ten steps as can be seen in Table 5.14 below.

Table 5.14

Comparison of Steps in Move 2

Lassen (1998)	Lago and Lloret (2012)	Present study
M3: Anticipating and solving problems	**M3: Anticipating and solving problems**	**M2: Anticipating and solving problems**
STEPS	**STEPS**	**STEPS**
S1: Problem	S1: Cues	Heading
S2: Symptom / Cause	S2: Action	Title
S3: Action S4: Corrective action	S3: Result S4: Explanation	2a: Introducing the troubleshooting procedure
	S5: Aside S6: Warnings	2b: Illustrating the signs of faulty subsystem
	S7: Warranty S8: Trouble-shooting	2c: Indicating possible causes that initiated the fault
		2d: Outlining the procedure to isolate fault
		2e: Outlining the corrective procedure
		2f: Outlining the procedure to verify fault has been corrected
		Precautionary Note
		Cue
		Aside

The difference in the number of steps is because the steps for my move were designed according to the guidelines provided in the GAMA Specification No. 2 and the ATA Specification 100 manuals with some modifications.

5.5.4 Page block 201-300: Maintenance Practices → Move 3: Outlining steps and procedures for maintenance exercises

The third *Page block* in the AMM is called MAINTENANCE PRACTICES (*Page block 201-300*). For this study, this *Page block* is classified as Move 3 called **Outlining steps and procedures for maintenance exercises**.

The communicative purposes of this move are to inform and to instruct the readers to perform maintenance activities besides reminding or advising them. The procedures given are for the purpose of periodically checking and servicing items to prevent system failure. The maintenance procedures given also provide the requirements of the subsystem and/or its components to be repaired (ATA, 1999; GAMA 1978). The steps in this move are listed below:

Step 3a. Introducing the maintenance task
Step 3b. Providing job set-up information
- 3b.1 Reasons to perform the maintenance task
- 3b.2 Limitations of the process
- 3b.3 Scope of work involved
- 3b.4 Equipment and materials required
- 3b.5 Reference materials required
- 3b.6 Location of the subsystem

Step 3c. Outlining the procedure to perform the maintenance task
- 3c.1 Topic or procedure of the main task
- 3c.2 Procedure of the maintenance subtask
- 3c.3 Additional information or procedure of the sub-subtask

Step 3d. Outlining close-up procedure to restore the airplane to its usual condition

5.5.4.1 Step 3a. Introducing the maintenance task

The first step that realises Move 3 introduces the maintenance activity that will be performed. This is done by elaborating on the types of maintenance activity as shown in the examples below:

(112) The removal and installation procedure for the openable window assembly is the same as the removal and installation procedure for the standard side window. (MP, Text 28).

(113) The cabin door maintenance practices give procedures for the removal and installation of the cabin doors, weather-strip, locks, latches, handles, and cable

> assemblies. The cabin door maintenance practices also give procedures for the adjustment and the test of the cabin door, latch cable, and inside handle (MP, Text 31).

The transitivity analysis shows that this step is realised by the relational and material processes. It is also found that the attributive and identifying relational processes are among the relational processes used to realise this step.

(114) The removal and installation procedure for the openable window assembly **is** the same as the (…)

(115) One procedure **is** to tow the airplane around a compass rose (Tow—Around Procedure).

(116) This procedure **contains** a functional test of the wing TAI valve (…)

(117) This procedure **has** three tasks.

As shown in the examples above, the verbs like *be*, *have* and *contain* are among the verbs that are frequently used in this step. These verbs are used to link two relative elements: to introduce the types of procedures to the type of subsystem. It is also noted that the relational process used in this step is written in the indicative declarative mood as the function of this step is to inform.

In addition to the relational process, the material process is also found in this step. The verbs chosen are to introduce the procedures as shown in the following clauses:

(118) The oil breather pressure test is **performed** with cowl panels and breather (…)

(119) An additional procedure is **given** for removal/installation of the engine control (…)

(120) This section **gives** maintenance practices for the NAV/COM component removal (…)

(121) This maintenance practices section **covers** removal and installation for (…)

As seen here, the function of both processes in this step is similar, which is to introduce the types of maintenance activities. As for the types of mood used with this process, it is mainly written in the indicative declarative mood in the form of the active and passive voice.

Even though the material and relational processes are more dominant in this step, there is an occurrence of the existential process found in this step as seen in the following example:

(122) <u>These</u> **are** the maintenance practices for the cathode ray tube (…)

Similar to the other types of processes, the purpose of this process is also to introduce the types of maintenance activities and it is written in the indicative declarative mood.

5.5.4.2 Step 3b. Providing job set-up information

This step describes the information prior to performing the aircraft maintenance task. There are six sub-steps that realised this step.

Sub-Step 3b.1: Reasons to perform the maintenance task
Sub-Step 3b.2: Limitations of the process
Sub-Step 3b.3: Scope of work involved
Sub-Step 3b.4: Equipment and materials required
Sub-Step 3b.5: Reference materials required
Sub-Step 3b.6: Location of the subsystem

a) ***Sub-step 3b.1* - *Reasons to perform maintenance task*** tells the readers the purpose of performing the maintenance activities (ATA, 1999; GAMA, 1978). This is to provide reasons why the maintenance activities are required. This sub-step only occurs in seven texts with nine occurrences. Following are the examples of this step:

(123) The operational test makes sure that the pressurization control system can change modes of operation. (MP, Text 1)

(124) Evacuation of fuel between fuel tank boost pumps and engines is required whenever a line, fitting, or component is loosened or disconnected from the fuel feed lines.

In general, this step is realised by the material process which is written in the indicative declarative mood using the active and passive voice. The verbs are mostly written with the modal verbs to strengthen the reasons why maintenance task is required (Larsen-Freeman, Celce-Murcia, Frodesen, White & Williams, 2016) The following clauses exemplify the material process in this step:

(125) This would usually occur when the airplane engine is not operating.

(126) Fuel vents may become clogged as shown by field experience, and can cause fuel starvation (…)

(127) Between these intervals the pump case drain filter should be checked for metal (…)

b) ***Sub-step 3b.2 - Limitations of the process*** describes the restrictions that the readers need to obey when performing maintenance activities. This is to support the previous sub-step (3b.1) given. This sub-step occurs in eight out of 33 texts. The following are the examples of sub-step 3b.2:

(128) When operating hydraulic system B pumps to pressurize A and B rudder systems the following precautions must be taken:

(1) At least 250 gallons of fuel is required in the No. 1 fuel tank to provide hydraulic fluid cooling. On hot days or when fuel temperature is known to be above 90°F, monitor the system B overheat indicator on the third crewman's panel and switch pumps off when overheat is indicated.

(MP, Text 7)

(129) If your airplane has the AMSAFE inflatable restraint system, do not do maintenance on the seats or the seat restraint system unless you first obey all applicable precautions and instructions in the E508804 Supplemental Amsafe Maintenance Manual and this Maintenance Manual. (MP, Text 27)

It is also noticed that passive clauses are more dominant in this sub-step. Since the purpose of this sub-step is to describe the restrictions when performing the procedures, the passive clauses focus on the limitations of the process for the readers' benefit. The use of modal verbs in this sub-step also strengthen the restrictions. The following examples belong to the passive voice:

(130) No test of the sensing loop **should be done** unless (…)

(131) When operating hydraulic system B pumps to pressurize A and B rudder systems the following precautions **must be taken**.

(132) When performing maintenance inside the vertical stabilizer extreme care **should be exercised** to avoid (…)

c) ***Sub-step 3b.3 - Scope of work involved*** takes after the GAMA Specification No. 2 (GAMA, 1978). This sub-step informs the readers "on what the job consists of, what is to be worked on, and what operations are to be done" (GAMA, 1978, p. 23). This sub-step directs the readers to the subsequent task. This sub-step occurs in eight texts and only found in B737 manual. Some of the examples are:

(133) The L and R PACK switches and RECIRC FAN switch must be OFF to do an operational test of the forward outflow valve. The check of the forward outflow valve is done during the operation of the aft outflow valve. (MP, Text 1)

(134) The other task is to remove the magnetic field from the strut assembly of the nose landing gear. (MP, Text 14)

It is observed that this sub-step is realised by the material process and written in the indicative declarative mood using the active and passive voice. The verbs such as *cover* and *require* indicate the boundaries of maintenance activity on the subsystem as shown in the following examples:

(135) Paragraph 4 **covers** pressurization of hydraulic systems A and B (…)

(136) The engine fuel suction feed test **requires** special fuel quantities (…)

d) ***Sub-step 3b.4 - Equipment and materials required*** is another guideline which was stated in the GAMA Specification No. 2 (GAMA, 1978). The communicative purpose of this sub-step is to inform the readers about the required tools, equipment and materials to perform maintenance activities. This sub-step occurs 21 times in 15 texts and it is only found in B737 manuals. It is observed that this sub-step is mostly written in a form of list as in (136). Below is the example of sub-step 3b.4:

(137) A. Equipment and Materials

(1) Tensiometer – 0- to 100-pound capacity

(2) Cable clamps

(3) Corrosion Preventive Material – MIL-C-16173, Grade 2

(4) Spanner Sockets – STS2580-176 and -178, or equivalent

(MP, Text 19)

e) ***Sub-step 3b.5 - Reference materials required*** shows other reading materials that the readers need to refer to before or while performing aircraft maintenance activities. This sub-step is only found in the B737 manual with eleven occurrences. This sub-step is important as some information may not be covered in the same chapter since the subsystem may be connected to other components (ATA, 1999). Hence, it is covered in a different chapter to avoid redundancy of information. Due to this, references are included as part of Move 3. Similar to sub-step 3b.5, this sub-step is also written in the form of a list as shown below:

(138) B. References

(1) 24-22/201, Manual Control

(MP, Text 1)

It is observed that sub-steps 3b.4 and 3b.5 only found in the B737 manual since these steps were prepared following Boeing's (1998) recommendation as an additional information. The purpose of this information is to help new AMP to familiarise themselves with the organisation in the Boeing manual. These sub-steps are not included in the C182 manual due to the size of Cessna aircraft being small and less complex. Due to this, these steps are not applicable to the smaller aircraft.

f) ***Sub-step 3b.6 - Location of the subsystem*** illustrates the location of the aircraft subsystem and its components. There are two communicative purposes of this sub-step. Firstly, the purpose is to ensure the readers have a clear picture on the position of the subsystem. Secondly, the information given helps the readers to identify the location zone of the subsystem to get to the location. The latter reason is specifically meant for bigger aircraft, as the subsystem of this type of aircraft is more complex. However, there is no specific format in presenting the information. Hence, it is found that this information is written in a form of list (139) or in a form of statements that detail the information (140). The following are the examples:

(139) C. Access

(1) Location Zones

101 Left Control Cabin

102 Right Control Cabin

208 Forward Cargo Compartment

(MP, Text 1)

(140) The nose gear has a steering nose wheel, mounted in a fork, attached to an air/oil oleo shock strut. The shock strut is attached to the firewall with upper and lower strut fittings. (MP, Text 30)

The format of the latter example (140) appeared similar to Step 1e in Move 1. The communicative purpose for both Step 1e and sub-step 3b.6 is also similar, which is to verify the position of the subsystem and its components before performing the maintenance activities. Due to this, the description of other components that are related to the subsystem when describing the location of the subsystem is also included. Even though the occurrence of this type of format is relatively low, it is noted that it is realised through two types of processes, which are the relational and material processes.

5.5.4.3 Step 3c. Outlining the procedure to perform the maintenance task

The third step in Move 3 consists of the procedure to describe specific maintenance procedure and its requirements, and to instruct the readers to perform maintenance activities. As stated in the GAMA Specification No. 2 (GAMA, 1978), the procedure requires "a breakdown of the job into logical steps or operations" (p. 23). There are three sub-steps to realise Step 3c, which were stated in the ATA Specification 100 (ATA, 1999). The three sub-steps are:

Sub-step 3c.1: Topic or procedure of the main task
Sub-step 3c.2: Procedure of the maintenance subtask
Sub-step 3c.3: Additional information or procedure of the sub-subtask

a) ***Sub-step 3c.1 - Topic or procedure of the main task*** provides guideline for specific maintenance task. This sub-step occurs in all 33 texts with 234 occurrences, the highest number of occurrences in this move. Below are the examples of excerpts that illustrate this sub-step:

(141) Check Pump Case Drain Magnetic Plug. (MP, Text 9)

(142) Verify that no-smoking and fasten-seat-belt sign switches on pilots' overhead panel are set to off and attach do-not-operate identifier. (MP, Text 12)

(143) Determine type of seal, fillet, faying surface, etc., which will be required to carry out repair. (MP, Text 17)

(144) Remove the NAV/COM Unit. (MP, Text 24)

(145) If you use a Gill TSC-01V battery charger, do the instructions that follow. (MP, Text 26)

This sub-step is categorised as the lead instruction in performing maintenance task and the sub-tasks will be followed accordingly. Due to this, the imperative mood is used to instruct the readers to read the subsequent procedures. It is also observed that a single word such as "Procedure" is also used in this sub-step that functions as the topic of the subsequent maintenance activities.

b) ***Sub-step 3c.2 - Procedure of the maintenance subtask*** is classified as a major action steps in performing maintenance tasks. In the ATA Specification 100 (ATA, 1999), this sub-step is called *Steps of Procedure* or *Subtask*. This sub-step also occurs in 33 texts with 218 occurrences. The examples of this sub-step are listed below:

(146) (1) Apply force of approximately 1 pound to pull reset outward about ¾ inches. If handle will move out about ¾ inch but cannot be rotated in either direction the plunger assembly did not stop the idler gear as required for a disconnect (Fig. 201, Detail A).

(2) Check to determine whether or not the solenoid is functioning properly. A response "click" should be heard in the solenoid when the disconnect switch is actuated. A positive check may also be made after removing the solenoid by observing the nose pin as the disconnect witch is actuated.

(MP, Text 24)

(147) (1) Remove and keep the screws that attach the brake fairing to the main wheel speed fairing.

(2) Remove the screws that attach the main wheel speed fairing to the mounting plate.

(MP, Text 32)

It is analysed that this sub-step is written in the imperative clauses as the purpose of this sub-step is to give command. It is also observed that the material process is the most dominant process used in this sub-step.

Sub-steps 3c.1 and 3c.2 show the most frequent cycle of occurrence in Move 3. Most of the texts analysed showed that the number of occurrences of sub-step 3c.2 is in accordance with the number of occurrences of sub-step 3c.1. This is because sub-step 3c.1 has two major functions: 1) it is the main topic of the procedure of the subtask, or 2) it provides the procedures of the main task. According to the ATA (1999), the subtasks (Step 3c.2) are established based on the following notion:

1. Subtasks must provide complete details of significant steps of procedure.
2. Subtasks may include enumerated steps or may stand alone without sub-steps.
3. A subtask without steps may directly provide reference to another task or subtask.
4. Steps within a subtask may also contain reference to other subtasks.

Hence, the subtask can be:

(1) independent, or

(2) extended with the sub-subtasks (sub-step 3c.3), or

(3) added with the references to another subtask.

c) ***Sub-step 3c.3 - Additional information or procedure of the sub-subtask*** is the last sub-step that realises Step 3c. This sub-step usually occurs when it requires another task or subtask. Below are the examples of sub-step 3c.3:

(148) (a) Make sure that the battery operates correctly.
(b) Make sure that the meter is adjusted for a correct meter-zero value

(MP, Text 3)

(149) (a) Make sure the solenoid shaft moves freely in and out of the solenoid body.
(b) Make sure there is no dirt, contamination or corrosion around the solenoid shaft.
(c) Make sure the release spring freely pulls the shaft out of the solenoid and against the stop fitting.

(MP, Text 23)

Having presented the discussion of sub-steps to realise Step 3, it is observed that the material process clauses are dominantly used in this step. The verbs that indicate the material process like *remove*, *install* and *make* are among the verbs that are frequently used in this step. Some examples include:

(150) **Remove** all solvent from assembled faying surface by blast of oil (…)

(151) **Remove** grease, oil, dirt, and chips, immediately prior to solvent (…)

(152) **Install** the fuel drain valve in the fuel tank and safety the valve with wire (…)

(153) Carefully **install** the fuel quantity sender into the fuel tank and **attach** (…)

(154) **Make** a record of the heading shown on the standby magnetic compass.

It is also noticed that the verb *remove* will be followed by the verb *install* as this sub-step fulfils the process of remove and install as mentioned in Step 3a. This kind of process requires the readers to first remove the components of the subsystem and this is followed by the installation of the components.

In terms of sentence mood, Step 3c in this study shows a similarity with the imperative mood found in Lassen's (1998) Step 3 (*Inducing Action*). This is due to the fact that communicative purpose of both Lassen's Step 3 (*Inducing Action*) and Step 3c in this present study is to instruct, thus, the imperative is typically used. Not only that, it is also observed that the instructions in this study are written in simple and short sentences and are in accordance with the outline stated by the ASD-STE100 (ASD, 2013).

5.5.4.4 Step 3d: Outlining close-up procedure to restore the airplane to its usual condition

This step guides the readers with the final task that needs to be completed after performing maintenance operations. The purpose of this step is to give command to prepare the airplane to be airworthy. As stated in the GAMA Specification No.2 (GAMA, 1978), the last step in the basic operations of maintenance activities should be *Close-up* or *Clean-up*. This includes the results obtained after performing maintenance procedure, setting right the aircraft and cleaning the workplace. This step provides a procedure on how to reassemble all the components to its subsystem. This step only occurs nine times. The following extracts exemplify Step 3d:

(155) If the airplane to be stored outside, tie it down using the procedures outlined in Chapter 10, Mooring – Maintenance Practices. Attach a warning placard to the propeller to identify that the propeller must not be moved while the engine is in storage. (MP, Text 1)

(156) Do a test of a fan.

- (a) Put the MASTER switch in the BATT position.
- (b) Put the MASTER switch in the ON position and listen for the fan operation.

(MP, Text 2)

(157) Put the Airplane back to Its Usual Condition

- (a) Remove unwanted materials from the CRT face.
- (b) Push the INIT/REF key on the FMCS CDU to get out of the EFIS BITE.
- (c) Remove equipment cooling if it is not necessary (Ref 21-58-02/501 and 21-58-03/501).
- (d) Remove electrical power if it is not necessary (Ref 24-22-00/201).

(MP, Text 1)

(158) Restore Airplane to Normal

- (1) Remove locks from elevator hydraulic modular units (Fig. 201). Reconnect electrical connectors.
- (2) Position elevator systems A and B hydraulic power switches on panel P5 to ON.
- (3) Close flight control elevator shutoff valve circuit breaker on panel P6.
- (4) Pressurise hydraulic reservoirs as required (AMM 29-11-00).

(5) Remove electrical power, if no longer required.

(MP, Text 7)

As the communicative purpose of this step is also to instruct or to give command, it is observed that this step is also written in the imperative mood with the material process as the most dominant process used. It is also noted that *if*-clause (at the beginning) may sometimes be used with the main clause as shown in example (155). The purpose of this clause is to illustrate a possible situation which will be linked to the action that should be taken by the readers. However, the occurrence of this clause is relatively small.

5.5.4.5 Summary

The following is the example of move structure of Move 3 taken from Text 4.

Heading **BATTERY - MAINTENANCE PRACTICES**

Title[1] **1. General**

Step 3a A. The battery is a 24-Volt, 12.75 Amp-hour or an optional heavy-duty 15.5 Amp-hour flooded lead acid type. Either of these batteries can be installed. The battery is installed in the tailcone, aft of the baggage compartment on the left side.

Precautionary Note **NOTE:** The Amp-hour rate is based on a five-hour discharge rate.

Title[2] **2. Battery Removal/Installation**

Sub-step 3c.1 A. Remove the Battery (Refer to Figure 201).

Sub-step 3c.2 (1) Remove the access plate (310AR). Refer to Chapter 6, Access/Inspection Plates - Description and Operation.

(2) Cut the tie straps to the positive terminal cover.

(3) Remove the positive terminal cover.

Precautionary Note **CAUTION:** Disconnect the negative battery cable first, then the positive cable. This will prevent an accidental short of the battery from hand tools.

(4) Disconnect the negative cable from the battery.

(5) Disconnect the positive cable from the battery.

(6) Disconnect the drain tube from the battery.

(7) Remove the battery hold-down bolts and washers.

(8) Remove the battery cover.

(9) Remove the battery from the airplane.

The occurrence of the steps and their sub-steps is cyclical. Not only that, the steps cycle is fixed and its appearance is predictable. This is in accordance with the recommendation outlined in the ATA Specification 100 (ATA, 1999). The move patterns of Move 3 are illustrated below:

3a → 3b (3b.1→3b.2→3b.3→3b.4→3b.5→3b.6) → 3c (3c.1→3c.2→3c.3) → 3d

Generally, only four steps occur in all the 33 texts, namely *Heading*, *Title* and *Step 3c* (*sub-steps 3c.1* and *3c.2*). These steps can be classified as obligatory due to their occurrence. Table 5.15 below shows the comparison of steps in Move 3 with Lassen's (1998) and Lago and Lloret's (2012) Move 2.

Table 5.15

Comparison of Steps in Move 3

Lassen (1998)	Lago and Lloret (2012)	Present study
M2: Inducing action	**M2: Inducing action**	**M3: Outlining steps and procedures for maintenance exercises**
STEPS	**STEPS**	**STEPS**
S1: Preview	S1: Cues	Heading
S2: Headline	S2: Action	Title
S3: Action	S3: Result	3a: Introducing the maintenance task
S4: Result	S4: Explanation	
S5: Explanation	S5: Aside	3b: Providing job set-up information
	S6: Warnings	3b.1: Reasons to perform the maintenance task
		3b.2: Limitations of the process
		3b.3: Scope of work involved
		3b.4: Equipment and materials required
		3b.5: Reference materials required
		3b.6: Location of the subsystem
		3c: Outlining the procedures to perform the maintenance task
		3c.1: Topic or procedure of the main task
		3c.2: Procedure of the maintenance subtask
		3c.3: Additional information or procedure of the sub-subtask
		3d: Outlining close-up procedure to restore the airplane to its usual condition
		Precautionary Note
		Cue
		Aside

In her study, Lassen (1998) titled this move as *Inducing Action* which was positioned as the second move. According to Lassen (1998), Move 2 was to instruct the users on how to perform a task. She also added that there was an element of 'informing', which provided the users with the necessary background information to carry out the instructions. Taking after Lassen (1998), Lago and Lloret (2012) also positioned this move as their second move. According to Lago and Lloret (2012), the communicative purpose of this move was to instruct the users on how to assemble the Silestone worktop, which appeared as the second part of their manual. It was observed that the communicative purposes of their studies are similar to mine which are: to inform and to instruct. However, instead of instructing the users on how to assemble as in Lago and Lloret (2012), the purpose of this move in this study is to perform the task in order to maintain the system, subsystem and/or its components. This move is positioned as the third move, unlike Lassen (1998) and Lago and Lloret (2012).

The number of steps to realise this move for Lassen (1998), and Lago and Lloret (2012) is also different. Lassen proposed five steps, while Lago and Lloret proposed six steps for their Move 2. As for this study, only five main steps are anticipated besides the common steps that occurred in every move. In total, there are ten steps that describe the move in this study.

5.5.5 Steps in embedded or combined occurrences within moves

The results also revealed that there were combined configurations of steps within the moves. In Move 1, there were three embedded steps that occurred frequently. The following are the discussions on the embedded steps with their examples.

1. Describing the features of the subsystem (1c) & Stating the functions of the subsystem (1d)

Examples:

> (159) The propeller heat system also includes a larger alternator for additional current capacity (1c). It has a higher Amp/Hour Battery (1c) to support the additional current load required by the propeller heat system (1d). (D&O, Text 39)

The combined steps (Steps 1c & 1d) illustrated the highest number of occurrences with 33 times, which were found in 16 texts.

2. Describing the features of the subsystem (1c) & Illustrating the location of the subsystem (1e)

Examples:

(160) The wire is arranged in a single plane coil and imbedded in a thin plastic wafer (1c) installed near the lower edge of the window (Fig. 1 and 2) between the outer pane and plastic core (1e). (D&O, Text 15)

(161) The lower hinge arm (Fig. 1) is bolted to the hinge pin (1c) which is located in two plain bushings in the lower hinge support (1e). (D&O, Text 22)

(162) The battery pack has two D-size lithium cells (1c) mounted under a battery cover (1e). (D&O, Text 38)

These combined steps occurred in 11 texts with 19 occurrences. The information given provides the readers with the features and location of the subsystem within a sentence.

3. Illustrating the location of the subsystem (1e) & Stating the functions of the subsystem (1d)

Examples:

(163) A safety rod is installed in the jackscrew shaft (1e) to support the stabilizer in the event of jackscrew failure (1d). (D&O, Text 9)

(164) A pressure switch installed in the pump pressure line, and a green light on the third crewman's panel (1e) is provided to indicate when the standby hydraulic pump is in operation (1d). (D&O, Text 14)

This configuration was only found in eight texts. These combined steps allow the readers to identify the location of the subsystem with its functions.

In their discussions, Lago and Lloret (2012) reported that almost all moves occurred were accompanied by: (1) changes in terms of steps, (2) steps occurred in other moves, or (3) steps converted into sub-steps to best fit the text's structure. As for this study, it is noticed that there were steps in **Move 1 - Orienting reader's understanding towards the aircraft subsystem and its operation**, which were embedded in **Move 2 - Anticipating and solving problems** as shown below:

(165) The Inlet Cowl Anti-Icing System uses engine hot bleed air from the 5th and 9th-stages of the high pressure compressor (HPC) to maintain ice-free inlet cowl surfaces during flight and ground operations. (1d) (…) All trouble shooting procedures are based on the following assumptions… (2d) (T, Text 9)

(166) The 12-volt cabin power outlet on the pedestal uses a power converter to convert 28-volt DC input power to 13.8-volt DC output power. (1c) In airplanes with the Garmin G1000 the power converter is in the cockpit on the aft, right side of the firewall. The power converter in all other airplanes is in the tailcone. (1e) (T, Text 19)

It is observed that the embedded steps only occurred under the first and the second *Titles* (T^1 and T^2) in all the texts analysed. T^1 and T^2 in Move 2 usually covered the elaboration about the subsystem. The three steps that found in Move 2 were Steps 1c (*Describing the features of the subsystem*), 1d (*Stating the functions of the subsystem*) and 1e (*Illustrating the location of the subsystem*). These steps occurred in seven texts. It can be assumed that steps in Move 1 are embedded in Move 2 in order to add more information about the features, functions and location of the subsystem. This is the reason why these steps only occurred under the first two *Titles* (T^1 and T^2) in Move 2.

5.6 Conclusion

Having discussed the relevant literature on genre analysis in technical manuals and the results revealed in the present study, I find the data in my corpus cannot be placed in the move models proposed by Lassen (1998) and Lago and Lloret (2012). It can be summarised that:

1. There are only three moves that represented three *Page blocks* in the present study. As compared to Lassen (1998), she developed four-move model for her Booster Manual and her move-model could be applied to the corpus that were studied by Lago and Lloret's (2012). Even though Move 2 for this study was initiated by Lassen's and Lago and Lloret's Move 3, the steps in this move were different. This is because the three moves in this study were developed based on the communicative purpose of each *Page block* in the AMM. Hence, the move-model developed by Lassen (1998) did not fit the AMM corpus.
2. The steps in the three moves in my study were different from those by Lassen (1998) or Lago and Lloret (2012). Even though the moves in their studies were echoed in my study, most of the steps were not similar. Most of the steps proposed in this study were developed following the guidelines given in the ATA Specification 100 (ATA, 1999) and GAMA Specification No. 2 (GAMA, 1978). These guidelines were very specific as they were only applicable to the AMM.
3. The moves in my study could not be considered obligatory because the occurrence of these moves depends on their necessity. As noted earlier, each *Page block* is independent. Due to this, the occurrence of Moves 2 and 3 was not influenced by the occurrence of Move 1. Hence, this is contradicting with Lassen (1998) and Lago and

Lloret (2012) as they classified their moves as obligatory except for the last move, which is not covered in my study.

It can be concluded that the differences between my data with Lassen's (1998) and Lago and Lloret's (2012) model marked my departure from their model. A new move structure corresponding to the *Page blocks* of the AMM in the corpus is illustrated in Table 5.16 below.

Table 5.16

Move Structure of Three Page Blocks

MOVE 1	MOVE 2	MOVE 3
Orienting reader's understanding towards the aircraft subsystem and its operation	**Anticipating and solving problems**	**Outlining steps and procedures for maintenance exercises**
	STEPS	
• Heading • Title 1a. Introducing the subsystem 1b. Describing major assemblies of the subsystem 1c. Describing the features of the subsystem 1d. Stating the functions of the subsystem 1e. Illustrating the location of the subsystem 1f. Explaining how the subsystem works	• Heading • Title 2a. Introducing the troubleshooting procedure 2b. Illustrating the signs of faulty subsystem 2c. Indicating possible causes that initiated the fault 2d. Outlining the procedure to isolate faults 2e. Outlining the corrective procedure 2f. Outlining the procedure to verify that fault has been corrected	• Heading • Title 3a. Introducing the maintenance task 3b. Providing job set-up information 3b.1 Reasons to perform the maintenance task 3b.2 Limitations of the process 3b.3 Scope of work involved 3b.4 Equipment and materials required 3b.5 Reference materials required 3b.6 Location of the subsystem 3c. Outlining the procedure to perform the maintenance task 3c.1 Topic or procedure of the main task 3c.2 Procedure of the subtask 3c.3 Additional information or procedure of the sub-subtask 3d. Outlining close-up procedure 3e. Providing procedure to restore the airplane to its usual condition
• Precautionary Note - Note - Caution - Warning • Cues - Meta text • Aside - Reference materials	• Precautionary Note - Note - Caution - Warning • Cues - Meta text • Aside - Reference materials	• Precautionary Note - Note - Caution - Warning • Cues - Meta text • Aside - Reference materials

In terms of the system of transitivity and mood used in each move, it can be concluded that:

1. There were three processes used to realise the three moves in the present study. The three processes were relational, material and existential processes. It was observed that the processes showed a variety of frequency for each move. Not only that, the analysis revealed that the relational process was mostly dominant in Move 1, while material process was more salient in Moves 2 and 3. In comparison to the previous studies, it can be said that the use of processes showed in Xiong's (2019) study for example, was not the same. The analysis in Xiong's (2019) study revealed that the material process was the predominant process type that characterised the manuals of household electric appliance. While the processes for the three *Page blocks*, as noted earlier were characterised by the relational and material processes.

2. As for the sentence mood used with the processes, the processes were written in three types of moods: indicative declarative, indicative interrogative and imperative. Since the AMMs are categorised as maintenance manual and are considered as procedure text, it is not surprising that the processes are mostly written in the imperative compared to other types of moods. However, the types of moods were also determined by the communicative purpose of each move. It is observed that Move 1 was mostly written in the indicative declarative mood as the function of this move is to inform. As for Moves 2 and 3, the imperative mood is used more often. Oktay's (2011) study revealed that his technical operation manual texts are highly instructional. In addition to that, there was no mention of other types of mood and hence, the imperative mood was more dominant in his corpus.

3. As for the selection of verbs used that represent the processes in this study, it is found that the verbs used for the material process are in-line with the function of the AMM - maintenance manual. Since the corpus for the present study is categorised as maintenance manual, the verbs used for Moves 2 and 3 signify the communicative purpose of these moves. For instance, the verbs such as *remove*, *check*, *install* were frequently used in Move 3 to indicate ways to perform maintenance activities. This might be due to the fact that when maintaining the subsystem, the procedure includes removing the subsystem to be checked and fixed followed by installing the subsystem to its position. On the other hand, the verbs such as *check*, *repair*, *adjust* and *replace* were frequently used in Move 2 as the communicative purpose of this move is to

perform troubleshooting procedure. Due to this, these verbs were more prominently used and fulfilled the purpose to check and repair as part of troubleshooting procedure. Oktay's (2011) findings in her technical operation manual corpus revealed that the material process was the most dominant process used in the manual with the use of verbs *keep*, *connect* and *unplug*. Oktay (2011) also concluded that these verbs signified that technical communicator tried to direct the users into action. Hence, the selection of verbs for this study can be deduced as being more specific unlike the technical operation manual as studied by Oktay (2011).

In the next chapter, the tense choices and the modals that realised the mood in three *Page blocks* are examined, to explore how do the technical writers set the boundaries to differentiate the use of the verb form tenses and modals from one *Page block* to another.

CHAPTER 6

VERB FORM TENSES AND MODALS IN THREE PAGE BLOCKS OF AIRCRAFT MAINTENANCE MANUAL (AMM)

6.1 Overview and Research Aims

The previous chapter revealed that the three *Page blocks* of the AMM are represented by the three moves and each move fulfils different communicative purpose. As discussed in the previous chapter, the communicative purpose of Move 1 is to inform the readers of the structure and functions of the subsystem, while Move 2 is to inform and instruct the readers on how to identify, locate, and correct faults that are predicted to occur on the subsystem. Lastly, the communicative purposes of Move 3 are to inform and instruct the readers to perform maintenance activities besides reminding or advising the readers. Apart from the communicative purpose of each move, it was also found that these moves were realised by different types of processes and mood systems. It was revealed that the relational, material and existential processes were the types of processes used across the three moves. As for the mood systems, it was found that the three processes were written in the indicative declarative, indicative interrogative or imperative moods.

Geared by the findings of the previous chapter on the types of mood found, the present chapter aims at identifying further the tense choices that realised the mood in three *Page blocks.* The *Rule of tenses* is one of the restrictions stated in the Section 3 - Verbs of ASD-STE100. ASD-STE100 (ASD, 2013) outlined technical manuals to be written using only the three types of tenses, namely:

- Simple present tense
- Simple past tense
- Future tense

The decision to analyse the modal verbs, on the other hand, was motivated by the results obtained in the previous chapter. It was observed that the modal verbs were found in the three *Page blocks* even though the use of modal verbs was not mentioned in the ASD-STE100 manual.

Therefore, the questions that emerge are: (1) On which standards should technical writers base their tense usage and modals when preparing *Page blocks* in the AMM, and (2) How do these technical writers set the boundaries to differentiate the use of the verb form tenses and modals from one *Page block* to another?

In order to examine how the meaning conveyed by the different tenses and modal verbs of each move and their steps, the following research questions are formulated:

- How do the verb form tenses and modals differ to realise each move and steps of three *Page blocks* of the AMMs?
  a. What is the relative frequency of verb form tenses and modals in the three *Page blocks*?
  b. What are the functions of these verb form tenses and modals used in the three *Page blocks*?
  c. What factors influence the choice of verb form tenses and modals in the three *Page blocks*?

These research questions will be answered by the quantitative analysis to investigate the frequency of verb form tenses and modals. The results and the discussion involve comparing the total number of occurrences and the frequency of each verb form tense in the corpus. The findings of the quantitative analysis will be used in reviewing the functions and the factors that influence the use of these verb form tenses and modals in the three *Page blocks* to differentiate the features found in each move.

6.2 Review of Related Studies on Tenses and Modals

According to Hanania and Akhtar (1985), verb profile can vary considerably from one rhetorical section of the text to another, and that differences are interpretable in terms of the communicative purpose and subject matter. By providing an overview of the relative use of the verb groups, the work helps clarify relations between verb form and rhetorical function. For example, the passive voice which was frequently used in the methods section of a research article could be associated with the characteristic of science writing. The following review of related literature focuses on the previous research related to verb form tenses and modals. It acts as the foundation for the analysis of my data in studying the profile of verb form tenses and modals that could be related to the communicative purpose of each move and its steps.

Malcolm's (1987) research focused on the use of tenses in the EST by analysing 20 articles from the Journal of Paediatrics. Her objective was to see whether the tense usage in the EST discourse was governed by the rhetorical functions which were unique to a particular genre. In order to analyse the rhetorical functions, Malcolm (1987) first correlated the tense of the finite verb in each clause with the rhetorical function expressed by that clause. These were identified by means of a uniform set of criteria, and then the tense of each verb was identified as being past, present perfect, or present. Secondly, Malcolm (1987) analysed the tense usage based on the temporal meanings that governed the tense choice in general English. The purpose of this second task was to test whether the tense choices could also be accounted for by the temporal meanings attributed to tense categories in general English. The analysis revealed that:

- 74 per cent of generalisations (citations without researcher agents) were written in the present tense.
- 61 per cent of references to specific experiments (indicated by a researcher agent and a footnote to only one study) were in the past tense.
- 72 per cent of references to areas of inquiry (indicated by a researcher agent and a footnote to more than one study) were written in the present perfect tense.

Based on the findings obtained, Malcolm (1987) claimed that the obligatory temporal constraints and optional rhetorical choices affected the tense usage, in which the authors' selection between these choices relied on the rhetorical functions.

In another study, Hanania and Akhtar (1985) analysed finite verbs in English writing within the domain of scientific research. Their focus was on the profile of the use of verb in relation to the rhetorical divisions of the discourse in Master Science theses in three areas: biology, chemistry and physics. The following table revealed the findings of their analyses:

Table 6.1

Distribution of Tense and Voice per Section (adapted from Hanania & Akhtar, 1985, p. 52)

	Introduction %	**Review %**	**Methods %**	**Results %**	**Discussion %**
Active					
Present	50.4	36.1	17.4	36.2	41.8
Past	7.5	20.7	10.7	17.4	15.7
Perf/Prog	1.8	2.7	0.6	2.2	2.0
Passive					
Present	18.4	11.8	12.2	15.0	13.0
Past	6.9	14.6	55.3	20.5	10.2
Perf/Prog	3.9	5.1	1.0	1.8	2.2

Their analyses demonstrated that the simple present tense was more than twice as frequent as the simple past, particularly in the introduction and discussion sections. The data on the verb forms also showed relatively high with the use of the third person singular such as, "*The first step involves…*" and "*Figure 2 illustrates…*". These resulted the V-s form occurred almost twice as frequently as the V form in the simple present. The analysis of modals showed that the modal *can* was the most frequent and uniformly used in all sections, while the modal *may* was mostly used in the review and discussion sections. Last but not least, the modal *will* was mostly used in the methodology section. Hanania and Akhtar (1985), however, commented that some of the patterns and differences of the results of the modals could be interpreted in functional and rhetorical terms, the semantics of modals were quite complex and they suggested further analysis at a more detailed level.

In a more recent study, Saeed Abdul-Majeed (2016) examined 20 MPhil theses to analyse the types of tense used in the results and discussion sections of academic writings. His study focused on two major components: (a) quantitative analysis to determine patterns and variations in usage of tense in the two chosen disciplines, and (b) contextual analysis to identify factors that affect tenses choice and the reasons for the variations. Using mixed-method approach as his methodology, he found that the simple present tense occurred most frequently in the results and discussion section of the English theses and followed by the simple past. In terms of the function of each tense, it was inferred that the simple present is used when the information presented is generally accepted as scientific fact. On the other hand, the simple past describes the situation as complete at some point in the past. The simple future tense, furthermore, was used in writing further research possibilities.

To date, there are relatively few studies focusing on modals in the AMM. One of them is a study by Gabrielatos and Sarmento (2006). Gabrielatos and Sarmento (2006) examined the frequency and distribution of central modal: *can*, *could*, *may*, *might*, *must*, *shall*, *should*, *will* and *would*, in aviation manuals, using a corpus-based and predominantly quantitative approach. The corpus was selected from three different types of manuals for BOEING 737: (1) the Maintenance Manual (MM) which was used by mechanics and technicians, (2) the Quick Reference Handbook (QRH), and (3) the Operations Manual (OM) which were used by pilots. They found that there was a great deal of variation in the use of modal verbs and the structures they occur in, depending on the context of use. This might be due to the influence of three interrelated contextual aspects such as their intended audience, purposes, as well as the nature and urgency of the conditions under which they are normally used. These have led to the occurrence of different characteristics that each manual has. When comparing their results to the Simplified English (SE), they found that the language of aviation manuals is simplified in comparison to other written genres. There were three indicators towards these findings: (1) the tendency towards monosemy in the use of central modals – seven out of nine modals were used in only Epistemic or Root meaning, (2) simplicity were observed in terms of structure – almost all cases of modals in the aviation corpus were followed by the present infinitive, active or passive – which were the simplest forms that in each voice can take, and (3) there were no instances of infinitive ellipsis that could be taken as an indication that the authors avoided taxing the memory of users.

As can be seen from the previous studies, the findings on verb form tenses in academic and scientific discourse are varied. Many of these published research on verb form tenses have been done on other types of genre, and it is hoped that the findings could assist me in developing my framework to analyse tenses in the technical manuals as this chapter attempts to investigate tense choices in the technical manuals. As for the modals, a study by Gabrielatos and Sarmento (2006) would help me in analysing the modals in the AMM.

6.3 Methodology

This chapter presents a corpus-based analysis of the verb form tense along with the modal verbs in the genre of technical manuals. A combined analysis of both quantitative and qualitative is made possible. As Khalid (2013) points out, "quantitative analysis allows an easier way of detecting a new patterning rather than through qualitative analysis alone" (p. 58). The analysis begins with a quantitative analysis of verb form tenses along with the modal verbs to identify and quantify their occurrences before qualitative approach is taken. The qualitative approach is used in order to describe the meaning and the functions of the verb form tenses and modal verbs used in each move.

The analysis is divided into three sections: Move 1, Move 2 and Move 3. The following sub-sections describe the corpus, the procedures to prepare the texts for analysis, and the quantitative and qualitative analysis of verb form tenses and modal verbs of three moves.

6.3.1 The corpus

As mentioned in 4.4.3, the data for this study were compiled from 100 texts from three *Page blocks* of two AMMs: 42 texts from *Description and operation* page block, 25 texts from *Troubleshooting* page block and 33 texts from *Maintenance practices* page block. The total word tokens are 124,607 as shown in Table 6.2 below.

Table 6.2

Total Word Tokens for Three Page Blocks

	Word tokens		**Total**
	B737 Manual	C182 Manual	
Description and operation	54,742	2,281	57,023
Troubleshooting	27,915	5.076	27,920
Maintenance practices	19,850	19,814	39,664
		Total	124,607

6.3.2 Preparing files for analysis

This study examines the corpus of the AMM that comprised three *Page blocks*, Description and Operation (*Page block 1-100*), Troubleshooting (*Page block 101-200*) and Maintenance Practices (*Page block 201-300*). As mentioned in 4.4.5, there were several stages involved in order to prepare the files for analysis as summarised in Figure 6.1.

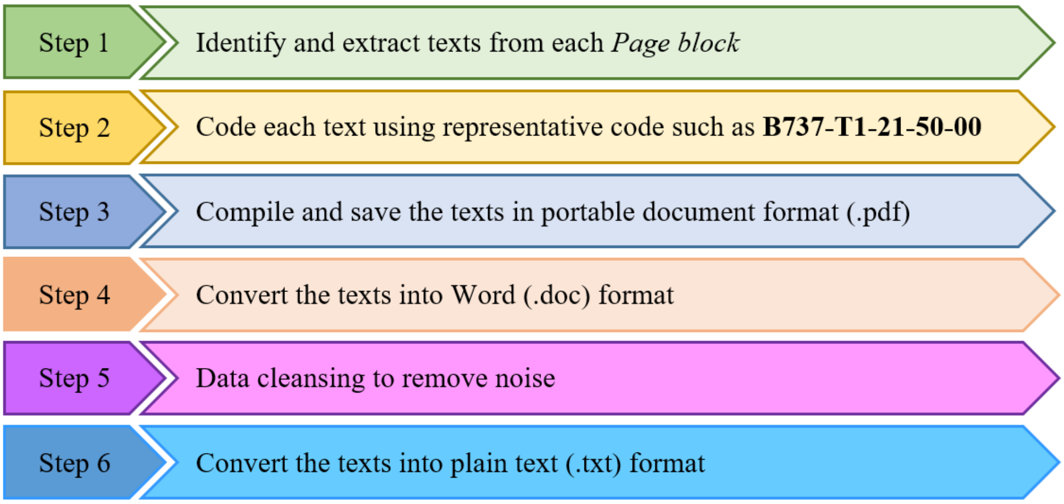


Figure 6.1 Summary of stages involved to prepare the corpus for analysis

As for the selection of software for analysis, Biber, Conrad and Reppen (1998) point out that there are a lot of software programs or corpus analysis tools available to facilitate the investigation of lexicographic issues. Corpus analysis tools are used to analyse lexical components such as lemma (head of word), node (the word being examined within a specific number of words to the left and the right of the word), and collocation (two or more words that co-occur more frequently than chance) (Davis, 2015, p. 37).

As discussed in 5.4.4, the present study used a web-based tool, *Wmatrix3* (Rayson, 2008), in which only CLAWS (the Constituent Likelihood Automatic Word-tagging System) part-of-speech (POS) was used to classify the verb forms tenses and modal verbs as the CLAWS (POS) made the categorisation of tenses and modals possible. I also mentioned that I was familiar with the user interface for *Wmatrix3* and it enabled me to access the tool easily.

6.3.3 Data analysis

This study of verb form tenses is based on the main and secondary verbs (if any) in the clauses across the three *Page blocks*. As mentioned previously, these three *Page blocks* were represented by the three moves. The analysis began with the process of identifying and classifying the boundaries of internal structure of each text to divide the clauses and sentences into steps in each move (Fontaine, 2013). This procedure has been done in the previous chapter as part of move analysis. Then, the verb form tenses and modal verbs in 100 texts were identified, counted, their frequencies of occurrence were calculated, and comparisons were then made. According to Fontaine (2013, p. 116), a clause is considered finite if at least one of the following conditions is met:

- the clause includes a Finite verbal element that can be shown as an inflection for past or present tense such as walks, walked, is walking or was walking,
- the clause includes a Finite verbal element in the form of a modal auxiliary verb such as can or should, or
- the clause includes a verbal operator that can be shown to be inflected for grammatical mood such as indicative mood vs. imperative mood.

If none of these conditions are met, then the clause is non-finite. In order to identify the verb tense in her study, Tseng (2011) stated that the verb tense would be accepted as a verb if a move was represented by a sentence, in which the verb tense of that sentence was the verb tense of the move, such as '*Reading is a complex skill (...)*', in this sentence, '*is'* was identified as the present tense. The verb tense would not be accepted if the move was realised in a clause or a phrase and the verb tense was not included as in '*Using a mixed-method design (...)*'.

For the present chapter, a clause is considered finite if the conditions were met as shown in the examples given below:

(1) When trouble shooting, it *is* helpful to (...) (T, Text 1) → Present tense (active)

(2) The Artex ME406 Emergency Locator Transmitter (ELT) system *includes* an ELT unit, an integral battery pack (…) (D&O, Text 38) → Present tense (active)

However, if the verb is found in a subordinate clause which is attached to the main verb, both verbs will be analysed and accepted as part of the data. An example is shown below:

> Section 21-52-00, Ram Air System, **describes** the system, which **employs** outside air as a cooling medium for the air cycle system, and its control. (D&O, Text 1)

In the example above, I am interested in both verbs; the main verb *describes*, which appears in the main clause, and the verb *employs*, which is in the relative clause. This is because both verbs are considered as important for the readers as these verbs describe the structure, the function and the characteristics of the subsystem and its components. Hence, it is essential for the readers to take note of the verb that was used in the second clause.

The steps which are classified as non-finite segments and do not allow any meaningful verb transformations will not be investigated. Below is an example (MP, Text 13: *Step 3b.4*):

Equipment

1. Brush – Soft bristle (commercially available)

Consumable Materials

A. B50012 Cleaner, Optical Cleaning, Calotherm
   Solution – Supaspray (use with Supacloth)
B. B50013 Cloth, Calocoat Hi-Tech Lenscloth
   Supacloth (use with Supaspray)

As mentioned previously (Chapter 5), the main communicative functions of the AMM are to inform and to instruct. The presence of the imperative sentences in Move 2 (section 5.5.3) and Move 3 (section 5.5.4), can be said to be parallel with the communicative function, which is to instruct. It was also noted in 2.7 that the imperative clauses are finite. Therefore, there must be a finite element, which can be recovered. This can be done by checking the effects of adding an overt subject and finite element and comparing it with the resultant structures in both positive and negative polarity. In this study, the imperatives are formed by omitting the pronoun 'you' that refers to the readers as in '*(You) check for incorrect tire pressure*'. This is because the function of the imperative in the AMM is to give instructions on how to perform tasks. Hence, the imperatives in this study are taken as part of tenses with the notion that the imperative clauses consist of a finite element and when checking the effects of adding an overt subject and finite element, the structures can be in both positive and negative polarity.

In analysing the modal verbs, the basic modal verb phrase structure will be referred to in order to identify and classify the modal verbs. As pointed out by Gabrielatos and Sarmento (2006), the basic modal verb phrase can be:

- Modal + infinitive such as '*Sam can swim*'. → Modal with active.
- Modal + be + past participle such as '*It should be replaced*' → Modal with passive.
- Modal + have + past participle (or adjective) such as '*He might have done it*'

In order to differentiate between the active and passive verb form of these modals verbs, the modal verb phrase structure is classified as active or passive as shown in the examples given below:

(1) A crewman may transmit or receive over VHF system (D&O, Text 3) → Modal verb phrase structure (*may* + infinitive) (active)

(2) The affected area *must be decontaminated* (…) (PN^2) → Modal verb phrase structure (*must* + be + past participle) (modal with passive)

In addition to that, when analysing the modals, these modal verbs are defined based on the functions discussed by Palmer (2014) and Larsen-Freeman, Celce-Murcia, Frodesen, White and Williams (2016) (see section 2.7).

The quantitative analysis was used to analyse the frequency of verb form tenses and modals. The first level of results and discussion involves comparing the total number of occurrences and the frequency of each verb form tense in the corpus. At this level, the results and discussion cover the normalised frequency of the verb forms for all the texts. The purpose is to compare the frequency of the verb forms in each manual to arrive at the normalised frequency. This is because the corpus of the AMM in this study comprises texts of varying lengths. Therefore, it is important to ensure that the frequency count of the analysed features is comparable (Biber, Conrad & Reppen, 1998). According to Biber et al. (1998), a conclusion that was made from the analysis of two texts with varying lengths could be wrong. This is due to the fact that comparing the raw count does not give an accurate account of the relative words analysed. Biber, et al. (1998) thus, suggested normalisation as a method to adjust raw frequency counts from texts of different lengths for accurate comparison. The total number of words in each text must be taken into consideration when norming frequency counts. Specifically, the raw frequency count should be divided by the number of words in the text, and then multiplied by whatever basis is chosen for norming (for example 1,000, 10,000 or 1,000,000). For this study, the basis number chosen for norming is 1,000 words in accordance with a total number of words of each step, as frequency counts should be normed to the typical text length in a corpus (Biber et al., 1998).

The results and discussion for this chapter cover the distribution of verb form tenses in each step to look at variability within the corpus. For this purpose, an alternative method of calculating the frequencies of the verb forms was used. To obtain the data, the frequency of the occurrence of each verb form in each step was calculated. These frequencies were then averaged over the total number of steps, providing the mean and standard deviation values for each verb form. According to Taylor (2001), the large standard deviations indicate high level of variability.

The frequency of occurrence of the verb tenses and choices of voice was recorded. This was followed by an examination of their specific discourse context to relate the use of tenses to the functional value of these tenses in which they occurred.

6.4 Results and Discussion

As noted in 6.2, this study attempts to analyse the relationships between the verb form tenses and rhetorical functions of three moves. For this purpose, the verbs were first classified by their tenses and forms: simple present (active, passive), simple past (active, passive), perfective, progressive, or perfective progressive (active, passive) and future tense (active, passive). Modal verbs, on the other hand, were grouped separately under the category of modals and each modal was categorised according to its forms: active and passive voice. The findings from the quantitative analysis of the verb form tenses and modal verbs would then be used in reviewing the functions and the factors that influenced the use of these verb form tenses and modals in the three *Page blocks* of the AMM. The purpose is to differentiate the features found in each move.

This study compares the frequency of verb form tenses and the variables of each move. In order to get an overall view of the situation, the first discussion covers the overall results of verb form tenses in all the 100 texts. Secondly, the distribution of the verb forms tenses for each step will be discussed to govern the distribution of these variables according to the communicative function of each step. The following sections are divided into three moves: Move 1 (section 6.4.1), Move 2 (section 6.4.2), and Move 3 (section 6.4.3).

6.4.1 Move 1: Orienting reader's understanding towards the aircraft subsystem and its operation

As discussed previously in Chapter 5 (section 5.5.2), this move describes the structure, functions, characteristics, locations and operation of the subsystem with the intention to introduce the readers to the subsystems. At this stage, the readers only need to comprehend the information concerning the subsystem, not yet to perform maintenance tasks. Hence, the general function of this move is to inform. The analysis of verb form tenses and modal verbs focuses only on the main steps of Move 1 which comprises six main steps as shown below:

Step 1a. Introducing the subsystem
Step 1b. Describing major assemblies of the subsystem
Step 1c. Describing the features of the subsystem
Step 1d. Stating the functions of the subsystem
Step 1e. Illustrating the location of the subsystem
Step 1f. Explaining how the subsystem works

The following section discusses the distribution of the verb form tenses and modal verbs in Move 1.

6.4.1.1 Tenses in Move 1

The results for each step are presented in two Tables (Tables 6.3 and 6.4). Each Table has the same format of the results presented. Under each verb tenses heading, the first column represents the types of verb form tenses, while the second column shows the results of the occurrence of the corresponding tenses. Further information on the tenses used is provided by the distribution of tenses.

Table 6.3 below shows the number of occurrences and the frequency of each verb form tenses in 42 texts. The 42 texts showed a total of 2,969 verbs, 1,343 of which belonged to active verbs, 1,1183 to passive verbs, and 153 to future tense in active form. The overall findings indicate that Move 1 is characterised by a higher frequency of the present tense in active and passive verb form. The normalised frequency of the verb form tense also shows that the most dominant verb form tense is the simple present active verbs, with the highest occurrence normalised frequency of 25.8. This is followed by the occurrence of the simple present in the passive verbs with the normalised frequency of 22.7. On the other hand, the least frequent verb form tenses are perfective, or progressive, or perfective progressive in both active and passive voice, and future tense in passive verb form, with a normalised frequency of occurrence of less than one.

Table 6.3

Normalised Frequencies of Verb Forms and Tenses in Move 1

Verb tenses	**42 Texts (57,023 words)**	**Normalised (Per 1,000 words)**
Present		
Active	1,343	25.8
Passive	1,183	22.7
Past		
Active	54	1.0
Passive	--	--
Perf/Prog*		
Active	16	0.3
Passive	23	0.4
Future		
Active	153	2.9
Passive	34	0.7
Total verbs	2,969	

*Perf/Prog = perfective, or progressive, or perfective progressive aspect

To look at the variability of verb forms, an alternative method of calculating the frequencies of the verb tenses as noted previously in 6.4.3 is used. The distribution of verb form tenses is presented in Table 6.4 below. As noted earlier, Move 1 is governed by the simple present active verbs. It can be observed that the large standard deviations for the simple present active verbs (25.5) and simple present passive verbs (19.7) indicate a high level of variability. The future tense in active verb form shows the third highest standard deviations of 6.1 and the mean of 2.9. The simple present active verbs show higher percentage of frequency in Steps 1a (100 occurrences), 1b (150 occurrences), 1c (413 occurrences) and 1d (381 occurrences). On the other hand, simple present passive verbs illustrate a higher percentage of frequency in Step 1e (199 occurrences) and mostly in Step 1f (526 occurrences). The future tense in the active verb form, on the other hand, shows the highest frequency in Step 1f with 147 occurrences.

Table 6.4

Distribution of Occurrence of Verb Forms in Move 1

	1a	**1b**	**1c**	**1d**	**1e**	**1f**	**Mean**	**S.D***
Present								
Active	100	150	413	381	111	188	58.0	25.5
Passive	26	28	274	130	199	526	36.4	19.7
Past								
Active	1	--	8	5	1	39	1.2	1.5
Passive	--	--	--	--	--	--	--	--
Perf/Prog*								
Active	--	--	--	3	--	13	0.3	0.6
Passive	--	--	5	3	--	15	1.4	0.6
Future								
Active	2	--	3	1	--	147	2.9	6.1
Passive	--	--	5	--	--	29	0.6	1.2
Total	**129**	**178**	**708**	**523**	**311**	**957**		

*Perf/Prog = perfective, or progressive, or perfective progressive aspect, S.D = Standard deviation

The above quantitative analysis provides some understandings about the patterns and variations in verb form tenses across six main steps. The following section discusses the factors that determine the choice of verb form tenses and the possible reasons for the variations.

Overall, several general trends can be summarised from the distributions of tenses in Move 1:

1. As stated earlier, communicative function of Move 1 is to inform the readers about the functions, characteristics, location and operation of the subsystem. In terms of tenses, it is clear that the simple present tense is the most dominant verb tense in four out of six main steps in Move 1. This simple present tense is written in the active form to fulfil the communicative purpose which is to inform.

2. As pointed out in the previous section, the simple present tense shows the highest frequency in four steps (Steps 1a, 1b, 1c and 1d). However, this tense shows the highest occurrence in Step 1c (*Describing the features of the subsystem*) with 413 occurrences. The function of this step is to inform the readers of the characteristics of the subsystem and/or its components (section 5.5.2.3). The simple present tense describes the characteristics as in '*Each door* <u>*has*</u> *an outer sheet skin (...)*' and '*Each valve* <u>*consists*</u> *of (...)*'. This is parallel with the purpose of this step, which is to inform.

3. Simple present tense also shows a higher frequency in Step 1d (*Stating the functions of*

the subsystem) with 381 occurrences. This step states the purpose of the subsystem and what it is designed for in the aircraft in order to inform the readers of the function of the subsystem and/or its components. For example: *A vertical accelerometer provides acceleration information to (...), A flapper check valve prevents reverse fuel (...).*

4. Future tense with the verb '*will'* shows the highest frequency in Step 1f (*Explaining how the subsystem works*). This is in accordance with the communicative function of this step, which is to inform the readers about the operation of the subsystem and its components. The operation of the subsystem mainly involves describing the process of how the subsystem is operating and this process is connected to the components of the subsystem. Due to this, the information for this step is arranged in accordance with the chronological sequence of how the subsystem operates. In order to indicate the reaction of the subsystem when all of its components are operating, the future tense is used. This can be illustrated in the example below:

   (1) To transmit over the VHF systems, the VHF pushbutton must be pressed on the audio selector panel. Pressing the microphone push-to-talk button of the flight interphone system will then operate control circuits within the transceiver which will disconnect the receiver circuits and connect the transmitter circuits to the antenna. (D&O, Text 3: *Step 1f*)

   As can be seen, the future tense (active form) is used to show the reaction of the subsystem when it is operating.

5. Even though all the five steps (Steps 1a to 1e) show the occurrence of the simple present in the active form, surprisingly Step 1f shows a higher occurrence of the simple present in the form of passive voice rather than active voice. As stated in the ASD-STE 100 (ASD, 2013, p. 1-0-5), "Use only the active voice in procedural writing, and as much as possible in descriptive writing". However, this is not the case for Step 1f.

It can be concluded that the use of simple present tense in four out six steps in Move 1 is parallel with the communication of each step. The use of this simple present can also be said as timeless as it is not associated with the timeline. The function of the simple present tense in this move is to describe the subsystem that is related to its structure, function or location. Hence, the timeline is not applicable.

6.4.1.2 Modal verbs in Move 1

From the normalised figures shown below, the most dominant modal verb in 42 texts is *can* in the passive verb form, with the highest occurrence of normalised frequency of 0.68. This is followed by the modal verb *may* in the passive verb form, with the normalised frequency of 0.67. The least frequent modal in Move 1 is *could* in the active verb form, with the normalised frequency of 0.05. The patterns of occurrence of these modal in each step are discussed below.

Table 6.5

Normalised Frequencies of Modal Verbs in Move 1

Modal verbs	**42 Texts (57,023 words)**	**Normalised (Per 1,000 words)**
Must		
Active	5	0.09
Passive	19	0.33
May		
Active	13	0.23
Passive	38	0.67
Can		
Active	11	0.19
Passive	39	0.68
Should		
Active	22	0.39
Passive	8	0.14
Would		
Active	4	0.07
Passive	0	0.00
Could		
Active	3	0.05
Passive	0	0.00
Total	**104**	**2.84**

Referring to Table 6.6 below, there are two most outstanding modal verbs, which are: *can* and *may*. The modal verb *can* shows the highest frequency in Step 1f with 29 occurrences (23.2%). This is followed by the modal verb *may*, which also shows the highest frequency in Step 1f with 26 occurrences (20.8%). The modal verb *must*, on the other hand, displays the highest occurrences in Step 1f in the passive verb form with 14 occurrences (11.2%).

Table 6.6

Distribution of Occurrence of Modal Verbs in Move 1

		1a	1b	1c	1d	1e	1f	Total
Must	active	--	--	--	--	--	5 (4.0%)	**5**
	passive	--	--	5 (22.7%)	--	--	14 (11.2%)	**19**
May	active	--	--	1 (4.5%)	--	--	12 (9.6)	**13**
	passive	--	1 (50.0%)	9 (40.9%)	2 (20.0%)	--	26 (20.8%)	**38**
Can	active	1 (100.0%)	--	2 (9.1%)	--	--	8 (6.4%)	**11**
	passive	--	--	4 (18.2%)	4 (40.0%)	2 (100%)	29 (23.2%)	**39**
Should	active	--	--	--	3 (30.0%)	--	19 (15.2%)	**22**
	passive	--	--	--	--	--	8 (6.4%)	**8**
Would	active	--	1 (50.0%)	--	--	--	3 (2.4%)	**4**
	passive	--	--	--	--	--	--	**--**
Could	active	--	--	1 (4.5%)	1 (10.0%)	--	1 (0.8%)	**3**
	passive	--	--	--	--	--	--	**--**
Total		**1**	**2**	**22**	**10**	**2**	**125**	**327**

On the whole, it can be summarised that:

1. Modal verbs *may* and *can* are more dominant across the six steps. The examples of excerpts with the modal *may* are shown below:

   (2) The flyweights **may be attracted** or **repelled** to simulate decrease or increase of centrifugal force according to the direction and magnitude of direct current applied to the electromagnetic coil. (D&O, Text 4: *Step 1f*)

   (3) Either one or both of the controls **may be set** at any position from full open to full closed. (D&O, Text 37: *Step 1f*)

   By using the passive voice, the technical writer intends to stress the subject of the passive sentence, in this case, the subsystem, as can be seen in the examples given above. Larsen-Freeman, Celce-Murcia, Frodesen, White and Williams (2016) classified *may* as expressing logical probability, in this case, *may* illustrates prediction. The prediction, furthermore, indicates a future event when it combines with an ‘event verb’: *may be attracted*, *may be set* (Leech, 2004). Referring to the above examples, *may* predicts the results of an action shown by the components of the subsystems when they are connected to one another during operation which may happen in the future. This is parallel with the communicative function of this step (Step 1f) as this step explains the operation of the subsystem.

2. Similar to modal *may*, the modal *can* also mostly appears in the passive form. It is mostly used in Step 1f as in the examples given below:

   (4) Fire detection **can be maintained** by placing the area loop selector switch in the position of the operational Loop. (D&O, Text 7: *Step 1f*)

   (5) The FMC **can be disconnected** from the indicator allowing the target value to be set manually. (D&O, Text 32: *Step 1f*)

   (6) Air flow into the cabin **can** also **be adjusted** by the CABIN AIR control cable. (D&O, Text 37: *Step 1f*)

   The modal *can* in the form of passive voice can be denoted as stating the possibility (or potential) as it is connected with the communicative function, in which to explain the operation of the subsystem.

It can be concluded that the modal verbs *may* and *can* in Move 1 indicate the same function that is to display logical probability, or prediction. These modal verbs can only be distinguished according to its degree of probability between low and high (Larsen-Freeman, Celce-Murcia, Frodesen, White & Williams, 2016). For these modal verbs, *can* shows generally possible, yet the probability is higher than the modal *may*. Whereas *may* shows low probability as it only predicts the outcome when there is a possibility.

6.4.2 Move 2: Anticipating and solving problems

The finite verbs in Move 2 were examined to get the general overview of the distribution of finite verb forms. There are eight main steps in Move 2 as developed and discussed in 5.5.3. The main eight steps are listed below:

Step 2a. Introducing the troubleshooting procedure
Step 2b. Illustrating the signs of faulty subsystem
Step 2c. Indicating possible causes that initiated the fault
Step 2d. Outlining the procedure to isolate fault
Step 2e. Outlining the corrective procedure
Step 2f. Outlining the procedure to verify fault has been corrected

The communicative purposes of this move are to inform and instruct the readers on how to identify, locate, and correct faults that are predicted to occur in the aircraft. These purposes are presented in the form of description, instruction, explanation and recommendation, as pointed out by Lassen (1998). The following section discusses the distribution of the verb forms across the eight main steps in move 2.

6.4.2.1 Tenses in Move 2

As can be seen in Table 6.7 below, a total of 2,828 verb forms are found in Move 2, of which 2,520 belong to the active forms with a normalised frequency of 90.3. This is followed by the simple present passive form that shows 158 verbs with a normalised frequency of 5.7. The patterns of occurrence of this verb form indicate that Move 2 is characterised by a greater frequency of the active verbs, the most dominant verbs used in this move compared to other forms.

Table 6.7

Normalised Frequencies of Verb Forms in Move 2

Verb forms	**25 Texts (27,920 words)**	**Normalised (Per 1,000 words)**
Present		
Active	2,520	90.3
Passive	158	5.7
Past		
Active	18	0.6
Passive	12	0.4
Perf/Prog*		
Active	45	1.6
Passive	5	0.2
Future		
Active	69	2.5
Passive	1	0.0
Total verbs	**2,828**	

*Perf/Prog = perfective, or progressive, or perfective progressive aspect

Similar to Move 1, an alternative method of calculating the frequencies of the verb forms is to look at variability of verb forms in each manual. As shown in Table 6.8, the large standard deviations for the simple present active verbs (16.8) and simple present passive verbs (13.7) denote a high level of variability. The simple present active verbs show higher frequency in all the eight steps. However, Step 2e illustrates the highest frequency with 1,382 occurrences, and followed by Step 2f with 744 occurrences. On the other hand, the simple present passive verbs illustrate the highest frequency in Step 2e with 71 occurrences.

Table 6.8

Distribution of Occurrence of Verb Forms in Move 2

	2a	2b	2c	2d	2e	2f	Mean	S.D*
Present								
Active	63	190	119	1382	744	22	75.7	16.8
Passive	22	6	27	71	22	10	14.9	14.8
Past								
Active	2	--	5	11	--	--	0.8	1.2
Passive	2	2	5	2	1	--	0.8	1.2
Perf/Prog*								
Active	8	4	1	29	1	2	3.4	3.0
Passive	2	1	2	--	--	--	0.5	0.8
Future								
Active	8	41	5	14	1	--	4.0	6.2
Passive	--	--	1	--	--	--	0.1	0.2
Total	**107**	**244**	**165**	**1509**	**769**	**34**		

*Perf/Prog = perfective, or progressive, or perfective progressive aspect, S.D = Standard deviation

Based on the findings shown in Table 6.8, it can be summarised that:

1. The preponderance of the simple present tense portrays the communicative functions of Move 2: to inform and to instruct the readers to perform troubleshooting procedure that includes identifying, locating and correcting the faults found in the subsystem. The active voice is more salient in Move 2 with the simple present active verbs the most dominant verb form in all the six steps. Hence, the occurrence of the passive verbs in Move 2 is relatively low.

2. The simple present active verbs show the highest frequency in Step 2d (*Outlining the procedure to isolate fault*) with 1,382 occurrences. The communicative purpose of this step is to instruct the readers to follow the procedure to isolate the faults so that the actual fault could be identified. The simple present tense is used in a form of imperatives as in '*Check continuity of wiring in (...)*' and '*Disconnect the airplane wire bundle (...)*' to indicate its function which is to instruct.

3. The simple present active verbs also show the highest frequency in Step 2e (*Outlining the corrective procedure*) with 744 occurrences. This step instructs the readers on how to correct or to fix the cause of the faulty subsystem by the use of imperatives. As mentioned earlier, the imperative is marked as tense when the verb is finite. It is

observed that the sentence such as '*Replace the air circulation*', '*Repair the applicable wiring*' and '*Soak the nozzles (...)*' can be classified as the simple present tense. The function of this simple present tense, which is written in the imperative form is to instruct and it is parallel with the communicative function of this step.

To conclude, the functions of description, explanation and instruction are realised by the simple present active voice in this move. Hence, the use of the simple present active voice is parallel with the guideline outlined by the ASD-STE 100 (ASD, 2013). Even though simple present passive voice occurred in Move 2, the number of occurrences is relatively small.

6.4.2.2 Modal verbs in Move 2

The modal verbs in Move 2 show a frequency of 113 occurrences. There are seven modal verbs found in this move, in which the modal active verb forms are more dominant in six out of seven types of modal verbs. The modal verb *can* shows the highest number of occurrences (33 occurrences), but it is more prevailing in the passive verb form with the normalised frequency of 0.75. This is followed by the modal verb *should* with a total of 29 occurrences. On the other hand, the modal verbs *could* and *might* appear least (1 and 2 occurrences respectively). The variability of distribution of the modal verb forms in each step is discussed in the following segments.

Table 6.9

Normalised Frequencies of Modal Verbs in Move 2

Modal verbs	**25 Texts (27,920 words)**	**Normalised (Per 1,000 words)**
Must		
Active	11	0.39
Passive	7	0.25
May		
Active	14	0.50
Passive	10	0.36
Can		
Active	12	0.43
Passive	21	0.75
Shall		
Active	6	0.21
Passive	0	0.00
Should		
Active	17	0.61
Passive	12	0.43
Could		
Active	1	0.04
Passive	0	0.00
Might		
Active	1	0.04
Passive	1	0.04
Total	**113**	**4.05**

With respect to the overall use, the modal verbs mostly appear in Step 2e (*Outlining the corrective procedure*), with modal verb *should* in the active verb form showing the highest frequency of 24.5 per cent or 12 occurrences. The modal *can* in the passive form, on the other hand, frequently occurs in Step 2e with 11 occurrences (22.4%). However, most of the modal verbs are considered as relatively low with 1 occurrence in Step 2b for the modal verbs *must*, *should* and *could*. Similarly, Step 2f also shows low frequency of modal verbs with 2 occurrences (*must*), and 1 occurrence each for modal verbs *should* and *might*.

Table 6.10

Distribution of Modal Verbs in Move 2

		2a	2b	2c	2d	2e	2f	Total
Must	active	--	1 (5.0%)	--	3 (15.0%)	7 (14.3%)	--	**11**
	passive	--	1 (5.0%)	--	4 (20.0%)	--	2 (50.0%)	**7**
May	active	2 (14.3%)	6 (30.0%)	4 (66.7%)	--	2 (4.1%)	--	**13**
	passive	4 (28.6%)	1 (5.0%)	--	--	5 (10.2%)	--	**10**
Can	active	2 (14.3%)	3 (15.0%)	2 (33.3%)	4 (20.0%)	1 (2.0%)	--	**12**
	passive	3 (21.4%)	6 (30.0%)	--	1 (5.0%)	11 (22.4%)	--	**21**
Shall	active	--	--	--	1 (5.0%)	5 (10.2%)	--	**6**
	passive	--	--	--	--	--	--	**--**
Should	active	--	1 (5.0%)	--	3 (15.0%)	12 (24.5%)	1 (25.0%)	**11**
	passive	3 (21.4%)	--	--	4 (20.0%)	5 (10.2%)	--	**12**
Could	active	--	1 (5.0%)	--	--	--	--	**1**
	passive	--	--	--	--	--	--	**--**
Might	active	--	--	--	--	--	1 (25.0%)	**1**
	passive	--	--	--	--	1 (2.0%)	--	**1**
Total		**14**	**20**	**6**	**20**	**49**	**4**	**113**

The findings on the use of the modal verbs found in Move 2 of the AMMs stipulate that:

1. Generally, the modal *can* occurs more in the passive verb form. As mentioned previously, this modal mostly occurs in Step 2e. A related examples concerning the use of modal *can* in the passive verb form are:

    (7) The receiver **can be checked** for normal sensitivity by comparing the operation (…) (T, Text 2: *Step 2e*)

    (8) This **can be examined** with a VSWR meter. (T, Text 20: *Step 2e*)

    The modal verb *can* in the examples given above signifies probability of performing the tasks either to do the inspection or to fix the subsystem and its components. It is found that this step only uses three verbs with the modal verb *can*, which are *insert*, *check* and *examine*. This corresponds to the communicative function of this step that is to correct and fix the cause of the faulty subsystem. Not only that, the modal verb *can* is also written in the form of the passive verb form. This allows the object of the sentence to be used as the subject of the sentence, indicating the subject is more important for the readers to concentrate on (Conrad, Biber, Daly & Packer, 2009), in this case, the subject is the subsystem.

2. The modal *may* shows a higher occurrence in the form of active verb form instead of passive. It is noted that the modal *may* is mostly used in Step 2b. Examples of extracts with the modal *may* are shown below:

   (9) The voltage on the DCLINK **may show** a drop.' (T, Text 3: *Step 2b*)

   (10) The faults are usually intermittent and **may occur** during bus transfer.' (T, Text 3: *Step 2b*)

   (11) The current in the exciter field **may increase** in a snapshot on (screen 3).' (T, Text 3: *Step 2b*)

   As noted earlier, the modal *may* expresses logical probability, in this case, it indicates prediction. Referring to the above examples, the modal *may* predicts the results of an action shown by the components of the subsystems when they are connected to one another during operation.

3. The modal verb *should*, on the other hand, mostly occurs in the active verb form as shown in the examples given below:

   (12) A ground **should produce** an annunciation *if* the G1000 system is operating correctly. (T, Text 6: *Step 2e*)

   (13) A ground **should produce** an annunciation *if* the G1000 system is operating correctly. (T, Text 22: *Step 2e*)

   The modal verb *should* in this context denotes the prediction, like other modal verbs. The probability of the situation is reliant on the condition described; the condition is expressed by the '*if-clause*'.

It can be concluded that the modal verbs *can*, *may* and *should* in Move 2 indicate the same function, which is to display logical probability, precisely prediction. The modal verbs are expressed in two different clauses in the sentence to show cause and effect scenario. The variety of the modals, on the other hand, points out the degree of probability, which is similar to Move 1.

6.4.3 Move 3: Outlining steps and procedures for maintenance exercises

As discussed in 5.5.4, Move 3 consists of four main steps as shown below:

- Step 3a. Introducing the maintenance task
- Step 3b. Providing job set-up information
  - 3b.1 Reasons to perform the maintenance task
  - 3b.2 Limitations of the process
  - 3b.3 Scope of work involved
  - 3b.4 Equipment and materials required
  - 3b.5 Reference materials required
  - 3b.6 Location of the subsystem
- Step 3c. Outlining the procedure to perform the maintenance task
  - 3c.1 Topic or procedure of the main task
  - 3c.2 Procedure of the maintenance subtask
  - 3c.3 Additional information or procedure of the sub-subtask
- Step 3d. Outlining close-up procedure to restore the airplane to its usual condition

In general, the purpose of Move 3 is to inform and instruct the readers to perform maintenance tasks with the emphasis more on instructing the readers. The following section discusses the distribution of the verb form tenses found in Move 3.

6.4.3.1 Tenses in Move 3

As shown in Table 6.11 below, a total of 3,159 finite verbs found in 33 texts in Move 3. 2,975 of the verbs are in the simple present active voice with a normalised frequency of 75.0. This is followed by103 verbs in the simple present passive voice with a normalised frequency of 2.6. As for the other types of verb forms, the frequency of occurrence is low, as the normalised frequency is lower than 1. Thus, it can be said that this move is also characterised by the highest frequency of the simple present active verbs, similar to Move 1 and Move 2.

Table 6.11

Normalised Frequencies of Verb Forms in Move 3

Verb forms	33 Texts (39,664 words)	Normalised (Per 1,000 words)
Present		
Active	2,975	75.0
Passive	103	2.6
Past		
Active	16	0.4
Passive	3	0.1
Perf/Prog*		
Active	11	0.3
Passive	11	0.3
Future		
Active	32	0.8
Passive	8	0.2
Total verbs	**3,159**	**79.6**

*Perf/Prog = perfective, or progressive, or perfective progressive aspect

As for the frequencies of the verb forms tenses found in each step, Table 6.12 below shows the frequency count of occurrence of verb forms for each step together with the mean and standard deviation. Overall, the frequencies of the simple present active voice show the highest variations across four steps, which are reflected in the large standard deviation of 608.4. This is followed by the simple present passive voice, which shows the standard deviations of 23.7 and the mean is 9.4. The simple present active verbs can be observed as the most dominant tense throughout the four steps, with Steps 3c.1, 3c.2 and 3c.3 showing higher frequency of 247 occurrences, 2,026 occurrences, and 581 occurrences respectively. The simple present passive voice, on the other hand, shows the highest frequency in Step 3c.2 with 80 occurrences.

Table 6.12

The Distribution of Occurrence of Verb Forms in Move 3

	3a	Step 3b						Step 3c			3d	Mean	S.D.*
		3b.1	**3b.2**	**3b.3**	**3b.4**	**3b.5**	**3b.6**	**3c.1**	**3c.2**	**3c.3**			
Present													
Active	34	8	26	13	4	--	--	247	2026	581	36	270.5	608.4
Passive	3	4	12	2	--	--	1	--	80	--	1	9.4	23.7
Past													
Active	1	3	--	--	--	--	--	--	10	2	--	1.5	3.0
Passive	--	--	--	--	--	--	--	1	2	--	--	0.3	0.6
Perf/Prog*													
Active	--	1	--	--	--	--	--	--	3	7	--	1.0	2.2
Passive	--	--	--	--	1	--	--	1	7	1	1	1.0	2.0
Future													
Active	3	1	3	--	1	--	--	--	14	10	--	2.9	4.7
Passive	--	--	1	--	--	--	--	2	2	3	--	0.7	1.1
Total	**41**	**17**	**42**	**15**	**6**	**--**	**1**	**251**	**2144**	**604**	**38**		

* Perf/Prog = perfective, or progressive, or perfective progressive aspect, S.D = Standard deviation

In summary, several general trends can be depicted from the findings discussed above:

1. In terms of verb form tenses, it is clear that the simple present active verbs dominate Move 3, a similar pattern to other moves in this study. The communicative purposes of Move 3, as noted earlier, are to inform and guide the readers concerning the maintenance tasks that need to be performed to ensure the aircraft is airworthy. Similar to Move 2, the functions of this move are also to inform and instruct the readers to perform maintenance tasks. Not only, its function to instruct is also more salient in this move.
2. The findings revealed that the occurrence of the simple present active verbs in the form of imperatives has the highest frequency in Step 3c with the Step 3c.2 being the highest. The main communicative purpose of Step 3c is to instruct which is similar to Lassen's (1998) Move 2 (*Inducing action*). Due to this, it is expected that the simple present active verbs in the imperative form are more salient for this step.
3. The simple present active verbs that are written in the declarative form is also found in this move to fulfil the function of description. This type of tense was mostly found in Step 3a as in '*The cabin door maintenance practices give procedures for the removal (...)*'. Hence, this tense fulfils the function of to inform.

As predicted, the verb form tenses used in this move are parallel with its functions which are to inform and to instruct. As the use of imperatives in this move is to instruct, the active voice can be seen as more salient.

6.4.3.2 Modals in Move 3

Table 6.13 below shows the number of occurrences and normalised frequencies of modal verbs in 33 texts with a total of 104 modal verbs. There are seven types of modal verbs found across 33 texts. The modal verb *must* shows the highest occurrence with 20 occurrences belong to the active form with a normalised frequency of 0.5 and 13 occurrences of the passive form with a normalised frequency of 0.3. This is followed by the modal verb *may* with the total occurrences of 13. However, the passive verb form illustrates a higher frequency with 10 occurrences compared to the active verb form that shows only three occurrences. The least frequent modal verb is the modal verb *would* with only one occurrence. The following segment discusses the variability of distribution of modal verb forms in each step.

Table 6.13

Normalised Frequencies of Modal Verbs in Move 3

Modal verbs	**33 Texts (39,664 words)**	**Normalised (Per 1,000 words)**
Must		
Active	20	0.5
Passive	13	0.3
May		
Active	3	0.1
Passive	10	0.3
Can		
Active	11	0.3
Passive	11	0.3
Shall		
Active	11	0.3
Passive	11	0.3
Should		
Active	5	0.1
Passive	8	0.2
Would		
Active	1	0.0
Passive	0	0.0
Total	**104**	**2.6**

As can be seen in Table 6.13, Move 3 is realised by the modal verb *must* as it shows the highest frequency with a total of 33 occurrences, in which 20 are in the active verb form and 13 in the passive verb form. When comparing the use of modal verbs in each step, it is noted that sub-step 3c.3 is mostly made up of the modal verb *must* in active verb form, with the highest frequency and a total of 12 occurrences (57.1%). Even though sub-step 3c.2 shows the highest number of modal verbs, the frequency mainly ranges from one occurrence to eight, with the most frequent modal verb used *shall* written in the passive verb form.

Table 6.14

The Distribution of Modal Verbs in Move 3

		3a	3b				3c			Total
			3b.1	3b.2	3b.3	3b.4	3c.1	3c.2	3c.3	
Must	Active	1 (12.5%)	1 (14.3%)	--	1 (33.3%)	--	--	5 (11.1%)	12 (57.1%)	**20**
	Passive	--	2 (28.6%)	1 (16.7%)	--	2 (66.7%)	2 (18.2%)	5 (11.1%)	1 (4.8%)	**13**
May	Active	1 (12.5%)	--	1 (16.7%)	--	--	--	--	1 (4.8%)	**3**
	Passive	--	--	--	--	--	4 (36.4%)	5 (11.1%)	1 (4.8%)	**10**
Can	Active	--	1 (14.3%)	2 (33.3%)	2 (66.7%)	--	--	6 (13.3%)	--	**11**
	Passive	4 (50.0%)	--	--	--	--	--	6 (13.3%)	1 (4.8%)	**11**
Shall	Active	--	--	--	--	1 (33.3%)	--	5 (11.1%)	5 (23.8%)	**11**
	Passive	--	--	--	--	--	3 (27.3%)	8 (17.8%)	--	**11**
Should	Active	1 (12.5%)	--	--	--	--	2 (18.2%)	2 (4.4%)	--	**5**
	Passive	1 (12.5%)	3 (42.9%)	2 (33.3%)	--	--	--	2 (4.4%)	--	**8**
Would	Active	--	--	--	--	--	--	1 (2.2%)	--	**1**
	Passive	--	--	--	--	--	--	--	--	**--**
Total		**8**	**7**	**6**	**3**	**3**	**11**	**45**	**21**	**104**

Based on the findings above, it can be inferred that:

1. Move 3 is realised by the modal verb *must* since it shows the highest frequency.

   The examples of modal *must* in the excerpts are shown below:

(14) You **must do** the manual trim system rigging before the servo trim system rigging. (MP, Text 23: *Step 3c.3*)

(15) The motor shaft **must turn** freely from side to side a small quantity. (MP, Text 25: *Step 3c.3*)

(16) The battery **must be** warm when the electrolyte level is increased. (MP, Text 28: *Step 3c.3*)

Based on the examples above, the modal *must* appears in the imperative mood when giving instructions (14) and as a declarative mood when describing the subsystem (15 and 16). The modal *must* stresses the necessity in the meaning conveyed in the sentences.

2. Modal verbs *shall* and *can* mostly occur in Step 3c.2, specifically in Text 17 in the passive voice. For example:

(17) Sealant <u>shall be applied</u> to one faying surface with a roller **to obtain** a thin, uniform, continuous coating of sealant over entire faying surface area. Sealant <u>shall be applied</u> thick enough **to** completely **mask** surface underneath, yet thin enough **to minimize** size of the continuous bead required by par. (2). (MP, Text 17: *Step 3c.2*)

(18) If permanent fasteners cannot be installed within required time, temporary fasteners (e.g., wing-nuts, clecos, or bolts) <u>shall be used</u> in each fastener hole **to hold** parts firmly together until permanent fasteners <u>can be installed</u>. (MP, Text 17: *Step 3c.2*)

The modal *shall* that is used in (17) and (18) signifies recommendation (Larsen-Freeman, Celce-Murcia, Frodesen, White & Williams, 2016), in which it expresses the purpose of the recommendation given. In this case, the '*to-infinitive*' clause (which is in bold in the example) is used to explain the purpose of the recommendation given.

(19) Sufficient sealant <u>shall be applied</u> **so** the space between the assembled faying surfaces is completely filled and a small excess is extruded continuously along the joint. Extruded sealant *shall* then be faired with a fairing tool **so that** a continuous, smooth fillet of approximately 0.06-inch depth is formed along the joint (Fig. 201). (MP, Text 17: *Step 3c.2*)

The modal *shall* in the example (19) above signifies suggestion, which is conveyed with a clause of purpose. The conjunctions of '*so'* and '*so that*' (written in **bold** in the examples above) are used to explain the purpose of performing the instruction.

3. Modal verb *shall* also moderately occurs in Step 3c.2 as shown in the following examples:

(20) Install silicone rubber grommets on element so that each is centred on its clamp and slit of each grommet faces outside of nearest bend. Clamps and

grommets **shall fit** element snugly. (MP, T16: *Step 3c.2*)

(21) Using the multimeter, the resistance of the centre conductor **shall not exceed** 0.2 ohm per foot of element length at room temperature. Measure the insulation resistance between either pin of the end fitting and the outer tubing using the megohm scale of the multimeter. (MP, T6: *Step 3c.2*)

In the active voice, *shall* is used as an advice in accordance with the instruction given before or after the *shall*-clause.

It can be concluded that the modal verbs *must* and *shall* in Move 3 indicate different functions. The modal *Must* indicates necessity to ensure the readers obey the instructions given, while the modal *shall* indicates the recommendation and advice to strengthen the instructions and description provided by the writer.

6.5 Conclusion

This study aims to analyse the verb form tenses and modal verbs in three moves in 100 texts. The linguistic features of these moves show the uniform voice and tenses. It is found that five out of six steps in **Move 1 - Orienting reader's understanding towards the aircraft subsystem and its operation** are realised by the simple present active voice. Only Step 1f is realised by the simple present passive voice. As for the modals, *may* and *can* are the most frequently used in Move 1, however, they mostly occur in Step 1c (*Describing the features of the subsystem*) and Step 1f (*Explaining how the subsystem works*).

Move 2 - Anticipating and solving problems, on the other hand, is illustrated by the simple present active voice used in all the eights steps with the modal verbs *should* and *can* mostly appear in Step 2e (*Outlining the procedure to isolate fault*).

Similar to other moves, **Move 3 - Outlining steps and procedures for maintenance exercises** is also illustrated by the simple present active voice. The modal verbs *can* mostly occurs in Step 3c.2 (*Procedure of the maintenance subtask*), while the modal *must* is used frequently in Step 3c.3 (*Additional information or procedure of the sub-subtask*).

To conclude, the findings show the simple present tense is the most dominant verb tense used in all the three moves. The simple past tense, however, shows low frequency compared to the future tense. However, the tenses used in the AMMs also showed the presence of other verb form tenses, apart from the three tenses (simple present tense, simple past tense and future tense) which were stated in the ASD-STE100 (ASD, 2013). It is also noticed that this study revealed the use of the simple present active verbs in the imperative form which is the most dominant to realise Moves 2 and 3. This is significant with the communicative purpose of these moves which is to instruct. As Oktay (2011) points out, active sentences are significant in manuals as they emphasise on who is doing the action rather than the action itself. As the AMM is classified as an instruction manual, the relationship between the readers and the writers can be said as: the readers read the manuals in order to act, and the writers write the manuals in order to assist the readers to act accurately (Lago & Lloret, 2012).

The modal verbs like *may*, *can* and *must* are mostly used across the three moves. These three modal verbs indicate logical probability, specifically prediction which can only be distinguished based on its degree of probability between low and high. The modal verb like *can* indicates a probability which has a higher degree than the modal *may*. Whereas *may* indicates low probability as it only predicts the outcome when there is a possibility. The modal *Must*, on the other hand, expresses a strong force. Even though the use of modals is not classified as part of the grammar in writing technical manuals, its use can be said as predictable. Procedures which are written in technical manuals are for the readers to follow. By using the modal verbs, the additional and specific meaning of the main verbs will strengthen any procedures that the readers need to follow strictly to avoid any damage and injury.

It is safe to say that when writing the *Page blocks* of the AMM, the writers used the verb form tenses and modals based on three notions: (1) the outlines given by the ASD-STE100 (ASD, 2013), (2) the communicative purpose of each step, and (3) the necessities to stress the main verbs for obligation, recommendation and prediction purposes. Furthermore, the linguistic features found in each *Page block* indicate the boundaries that differentiated the use of the verb form tenses and modal verbs from one *Page block* to another.

CHAPTER 7

CONCLUSION

7.1 Introduction

This study began with the primary aim to conduct a genre analysis of three *Page blocks* of the Aircraft Maintenance Manual (AMM) of two aircraft. The purposes are: (1) to understand the discourse community of aircraft maintenance domain to find the technical documentation used that are associated with the reading activities, (2) to develop and analyse the move structure used by the technical writers to answer the question: *why has this manual been written* (Lassen, 1998), and (3) to identify the linguistic features used to realise three *Page blocks* of the AMMs. This thesis has been organised in which Chapters 2 until 6 discussed the relevant theories, reviewed related previous studies, and discussed the results of the research questions. This chapter concludes this study by summarising the findings in relation to the main research questions (section 7.2) and discussing the limitations of the study (section 7.3). This chapter also discusses the significant contributions of the study (section 7.4) and offers suggestions for future research (section 7.5). Finally, the concluding remarks are presented in 7.6.

7.2 Review of Research Questions and Findings

This study has explored the discourse community of the aircraft maintenance domain, the move structure and the linguistic features of three *Page blocks* of the AMMs using the ESP approach to genre analysis. This general aim was further expanded into the following research questions:

1. Who are the key members in the discourse community of aircraft maintenance and what are the communicative activities that influence or complement their reading activities? (Chapter 3)
2. What is the structure of moves and steps of three *Page blocks* of the AMMs, and how are the steps illustrated to achieve the purpose of each move? (Chapter 5)
3. How do the verb form tenses and modals differ to realise each move and steps of three *Page blocks* of the AMMs? (Chapter 6)

7.2.1 The key members in the discourse of aircraft maintenance

The first research question is divided into two types of analyses. The first analysis attempted to determine the sample of discourse community of aircraft maintenance in three ways: (1) to identify the members of the community to distinguish the roles of the readers and the writers, (2) to identify the position of the AMP in the community, and (3) to investigate the relationships of the community members. The second analysis focused on identifying the types of technical documentation, the main reference used in performing aircraft maintenance activities, and to identify the difficulties in understanding the documents.

To answer the first part of *RQ1: Who are the key members and their relationships in the discourse community of aircraft maintenance*, I followed Bhatia's (1993) recommendation to begin the analysis by reviewing the literature of the discourse communities of aircraft maintenance. The review of the literature revealed three communities in this field, comprising the aviation authority, the aircraft makers and the end-users. It is found that each community of aircraft maintenance has a different role. The first community, the aviation authority, is responsible for monitoring the aviation rules and regulations. The aircraft makers are responsible for the design, construction and operations of the aircraft by following the guidelines set by the aviation authority. Lastly, the end-users such as the air operators and the Maintenance, Repair and Overhaul (MRO) organisations are responsible for the operation and maintenance of the aircraft according to the guidelines given by both the aircraft manufacturer and the aviation authority. Based on these roles, the relationships of these three communities are organised according to the hierarchy shown below:

Aviation authority
↓
Aircraft makers
↓
End-users

Based on the hierarchy, the end-users are classified as the readers of the documents produced by the aviation authority and aircraft makers. As the research context of the present study is in Malaysia, the aviation authority refers to the Civil Aviation Authority Malaysia (CAAM). As for air operators and the MRO organisations in Malaysia, they are categorised as the end-users. The AMP, are positioned under the end-users and they are classified as the specific readers of technical documentation that are pertaining to aircraft maintenance activities. Hence, the relationship between the writers and the readers in the aircraft maintenance domain can be described as ‘the readers read the manuals to act, while the writers of the manuals write to help the readers to act’.

Meanwhile, to answer the second part of *RQ1: what are the communicative activities that influence or complement their reading activities*, Beaufort’s (1997) and Davis’ (2015) frameworks were used to reveal the features and communicative activities of the discourse community sample that was selected among the end-users.

The three communities in the field of aircraft maintenance displayed two types of roles: the writers and the readers. It was revealed that the writers are from the community of the aircraft makers. The findings also show that these writers develop and design the technical manuals by following the restricted linguistic features as outlined in the ASD-STE100 and standard structural forms which are governed by the ATA Specification 100 (ATA, 1999; GAMA, 1978). It can be assumed that the genre of the technical manual is rigid or not flexible. In order to write the technical manuals, the writers must rely on their writing experience and knowledge of the aircraft systems when deciding how best to describe a procedure. It is important for the writers to ensure that these manuals are written following the guidelines given by the aviation authority, which are the ICAO and the NAA, to ensure a standardisation in terms of the organisation, the physical appearance and the linguistic features used.

Even though there were numerous types of documents used for aircraft maintenance activities, the analysis revealed that the AMM is used as the main reading material. The readers of these manuals are specific, the AMP, which are categorised as the community of the air operators and MRO organisations. The purpose of reading the technical manuals is to assist the AMP in their aircraft maintenance activities. According to Lago and Lloret (2012), when reading the technical manuals, technicians do not read the manuals to find the truth, but to perform an action in the right way. Hence, with the help of the manuals, the readers are able to perform the tasks using the correct tools and following the procedures accordingly. The actions performed by the readers can be considered as an accurate representation of the manual’s text if the readers follow the actions as instructed in the manual.

Since majority of the participants referred to the AMM, it can be concluded that this manual is vital in the process of aircraft maintenance. Without the AMM, the tasks would not be performed correctly and this resulting the aircraft are no longer airworthy.

7.2.2 The move structure of each *Page block*

RQ2: What is the structure of moves and steps of three Page blocks of the AMMs, and how the steps are illustrated to achieve the purpose of each move? focused on developing the move structure for each *Page block* based on Lassen's (1998) and Lago and Lloret's (2012) move model. The move structure was also developed with the guidelines outlined in the ATA Specification 100 (ATA, 1999) and GAMA Specification No. 2 (GAMA, 1978).

The AMM corpus was selected from the first three *Page blocks* of the AMMs, which are: Description and Operation (*Page block 1-100*), Troubleshooting (*Page block 101-200*) and Maintenance Practices (*Page block 201-300*). One hundred texts from these three *Page blocks* were randomly selected from two AMMs. These AMMs were written by two different aircraft makers for two different types of aircraft. The analysis of move structure of each *Page block* revealed that these three *Page blocks* occurred independently. Due to this feature, I categorised each *Page block* as an individual move and the move corresponded with each *Page block*:

Page block 1-100: Description and operation	→	Move 1: Orienting reader's understanding towards the aircraft subsystem and its operation
Page block 101-200: Troubleshooting	→	Move 2: Anticipating and solving problem
Page block 201-300: Maintenance Practices	→	Move 3: Outlining steps and procedures for maintenance exercises

The first *Page block*, which I classified as **Move 1: Orienting reader's understanding towards the aircraft subsystem and its operation**, comprised 42 texts. The communicative purpose of this move is to inform, unlike the communicative purpose of Lassen's (1998) *Stage One: Orienting the reader towards the text and the product*. The communicative purpose in her study was to "sell" the product. Compared to Lassen's (1998) and Lago and Lloret's (2012) move model which set out three and six steps respectively, eleven steps were developed and identified in my corpus. The eleven steps which realised this move were developed according to their communicative purposes and language features. However, the analysis of occurrence of these steps revealed only three steps that can be categorised as obligatory, which are:

Heading, *Title* and *Step 1c* (*Describing the features of the subsystem*). These steps are considered as obligatory since they were found in all the 42 texts. Apart from that, it was also found that the steps in Move 1 indicated some variation in terms of their organisations because the steps in Move 1 were mostly not in order. Not only that, the structure of the steps found in Move 1 showed "cyclical" or "recursive" occurrence. As for the linguistic features, it was found that the move was realised by the existential, relational and material processes, with the relational process being the most dominant in this move. It was also found that these processes were mostly written in the indicative declarative mood.

As for the second *Page block*, I classified this *Page block* as **Move 2: Anticipating and solving problem**, in which the terminological phrase came directly from Lassen (1998). The purpose of this move is to guide the readers on how to identify, locate, and correct faults that are predicted to occur in the aircraft, similar to the communicative purpose in Lassen's study. However, Lassen (1998) positioned this move as her Stage 3, similar to Lago and Lloret (2012). As for this study, this move is positioned as the second move. Apart from that, thirteen steps were developed and identified in this move unlike Lassen's Stage 3 that only had four steps, while Lago and Lloret (2012) developed eight steps. The occurrence of steps in this move was influenced by the format of the organisation as suggested by the ATA Specification 100 (ATA, 1998) and GAMA Specification No. 2 (GAMA, 1978). It was found that if the information was written in a form of table or called Troubleshooting Chart, only four main steps would occur: *Steps 2b*, *2c*, *2d* and *2e*. On the other hand, if the information was organised in a form of charts, it was noticed that the steps which commonly occurred were *Steps 2b*, *2d* and *2e*, which means *Step 2c* was not found. It was also noted that some of the steps showed the feature of recurrence due to these types of organisations. The steps that showed the most frequent occurrence were *Step 2d* (*Outlining the procedure to isolate* fault) and *Step 2e* (*Outlining the corrective procedure*). The frequency of occurrence was due to the signs of the subsystem that indicated several possible causes of faults (Step 2b). Due to this, the following steps (Steps 2e and 2f) recurred based on the possibilities of causes that might occur. This move was realised by the material process which was written in three different moods: the indicative declarative, the indicative interrogative and the imperative. As this move instructs the readers to perform troubleshooting procedure, the findings showed that the indicative and imperative moods were the most salient moods used in this move.

The third *Page block* is called **Move 3: Outlining steps and procedures for maintenance exercises**. In Lassen's (1998) move model, she titled this move as *Inducing Action* and it was positioned as the second move. The purposes of this move for this study are to inform and to instruct the readers to perform maintenance activities. It also serves as a reminder or advise to the readers. The procedures given are for the purpose of periodically checking and servicing subsystem to prevent system failure. This move comprised ten steps unlike Lassen's (1998) Move 2 which comprised five steps, while Lago and Lloret (2012) developed six steps. In terms of the occurrence of the steps, it can be concluded that the occurrence of the steps and their sub-steps was 'cyclical'. The steps cycle was also fixed as its appearance was predictable unlike the steps in Move 1. It was also found that only four steps in this move occurred in all the 33 texts, which are: *Heading*, *Title*, *Steps 3c* (*sub-steps 3c.1* and *3c.2*). These steps were classified as obligatory. In terms of system of transitivity and mood system used in this move, the material process was the most salient process used and presented in the imperative mood.

7.2.3 Linguistic realisations in three moves

The last research question, *RQ3: How do the verb form tenses and modals differ to realise each move and steps of three Page blocks of the AMMs?* focused on three areas: (1) verb form tenses, (2) modal verbs, and (3) contextual meanings to realise the three moves. In terms of verb form tenses, the analysis revealed that the simple present tense in the active verb form was the most dominant in all the three moves. This corresponded with the guidelines given in the ASD-STE100 (ASD, 2013), which mentioned that the active voice should be used in the procedural writing, and as much as possible in the descriptive writing. Even though other tenses were also used, the number of occurrences was reasonably low except for Move 1. The occurrence of the passive voice in Move 1 was primarily in the form of the simple present passive voice, which showed the highest frequency compared to other moves.

The modal verbs *may*, *can* and *must* were mostly found in all the three moves. These three modal verbs indicate logical probability, or prediction. These modal verbs can only be distinguished according to its degree of probability between low and high. The modal verb *can* shows probability that indicates a higher degree than the probability of the modal *may*. Whereas, the modal *may* shows low probability as it only predicts the outcome when there is a possibility. The modal *Must*, on the other hand, expresses a strong force. It can be concluded that the use of modal verbs can be seen as adding specific meaning to the main verbs as the reminders and suggestions that the readers need to strictly follow the procedures given to avoid any damage and injury.

7.3 Significant Contributions of the Study

The investigation of the genre of AMM using the ESP approach to genre analysis is the first of its kind in the genre of technical manuals. Since the AMM has been proven to be the main reference in aircraft maintenance activities, this study is of utmost relevance as the AMM is used by the aircraft maintenance students of UniKL MIAT and the Malaysian AMP. In fact, the AMM is also used by the AMP in other countries. Hence, this study offers some significant contributions towards teaching and testing the ESP for aircraft maintenance students, the future AMP and new AMP.

As the ESP focuses on when, where and why learners need the language, the decisions on what to teach and how to teach depend on how the language is used in a particular work environment that the learners will work in the future. Due to this, the ESP course content developed for the aircraft maintenance students should include items such as aircraft maintenance terminology, patterns of pilot-AMP interaction, written genres such as the AMM, logbook, and Airworthiness Directives (ADs). To the ESP lecturers and students of aircraft maintenance, the findings have managed to depict a real-life workplace reading which the ESP modules are expected to initiate a more practical, true life syllabus for reading courses. Thus, this study offers significant contributions in which:

1. The results obtained from the first phase of data collection covered the information such as what are the technical documents used by the AMP, how do they use these documents and what types of language difficulties that they might encounter when dealing with different types of documents. This kind of information is pivotal in designing, developing and teaching the ESP modules. As revealed in 3.5.2, there are three types of technical documents prepared by three communities of aircraft maintenance. Since most of these documents are relevant to the AMP, the information would assist the ESP lecturers in selecting suitable materials that are compatible with the proficiency level of the students. Not only that, the information can also assist the ESP lecturers in developing the communicative tasks to teach the students on how to use these documents.

2. The results obtained from the second phase of data collection explained the move structure of the AMM. The results are significant as the three *Page blocks* of the AMM can be included as part of the English modules. At present, UniKL MIAT students learn on how to read the AMM in their technical subjects. However, the students are mostly exposed to only one specific *Page block* of the AMM, that is Maintenance Practices (*Page block 201-300*). Even though there is no evidence from my study that it is a must for the AMP to know all the *Page blocks*, the current practice at the university might limit the student's knowledge of the other *Page blocks* of the AMM. Hence, the move structure of three *Page blocks* that was developed in this study would assist the lecturers to train the students in reading and interpreting the AMM. To the students, the move structure model enables them to identify the basic outline of the *Page block*, comprehend the information of each section that realises the *Page block* and define the linguistic features to grasp the communicative function of each section of the *Page block*.
3. The results obtained from the second and the third phase of data collection revealed the linguistic features of the three *Page blocks*. For example, the second phase of data collection confirmed that the material and relational processes were the most salient in the three *Page blocks*. As for the third phase of data collection revealed the use of tenses and modals in these three *Page blocks*. This indirectly would assist the ESP lecturers to guide the students to a better understanding of the linguistic choice of written text and the implications of that choice for its meaning. The ESP module that is developed based on these processes would ease the lesson as the students would be able to recognise the language features that differentiate the communicative functions of each move. Hence, this would assist the students to read, understand and interpret the AMM correctly.
4. Because of the recent CAAM (2014) policy change regarding the English Language Proficiency (ELP) among Malaysian AMP, it is a high time for the university to design and develop its own ELP test for the aircraft maintenance students and Malaysian AMP. This study contributes in preparing the materials for the ELP test. At the moment, UniKL MIAT English lecturers encounter difficulty in selecting the reading materials that are suitable to be included in the ELP reading comprehension. The move structure model developed for the three *Page blocks* would help the lecturers to design the ELP test, as they can use the model as a guideline to understand the structure of the AMM, the communicative functions and the linguistic features of each *Page block*.

7.4 Limitations of the Study

In the current study, the main limitations are that the sample of the corpus was restricted to only the AMM of two aircraft which are used at the university level. Even though the manuals represented two different aircraft manufacturers and prepared for different types of aircraft, the occurrence of *Page blocks* for each AMM limits the number of *Page blocks* to be analysed. This is due to the fact that this study aimed at studying the commonalities of the features of both AMMs, not the differences. Due to this, it limits the number of *Page blocks* to be selected as the corpus for this study. Not only that, the volume of chapterisation for each AMM is unequal since the Boeing 737 manual comprised more chapters compared to the Cessna 182. Since the difference between the number of chapters in these AMMs is large, the comparisons between these two AMMs cannot be drawn to determine the similarities and differences.

Another shortcoming of this study is the linguistic analysis in Chapter 5. It is not within the scope of this study to explore exclusively the metafunctions on the process types and mood system used in the three moves. Hence, no thorough conclusions can be drawn regarding the frequency of the occurrences, even though this might be beneficial for a deeper understanding of the structure of each move and its steps.

7.5 Suggestions for Future Research

This study concerns the move structure of three *Page blocks* of two AMMs. It is suggested that the future research can focus on other areas of studies such as:

1. Design and develop a move structure for other *Page blocks*. As mentioned earlier, the AMM comprises nine *Page blocks*. Since the present study only covers three *Page blocks*, the future research can be extended to the other six *Page blocks*. This would create a more comprehensive picture of the communicative purposes of the other *Page blocks*, the move structure of the other *Page blocks* and the linguistic features which realised these *Page blocks*.
2. Analyse the move structure on other AMMs. The move model developed for this study was examined on three *Page blocks* of Boeing and Cessna manuals. These AMMs were dated as the years of manufacture for both aircraft were between 1997 and 1998. Even though the contents of the AMMs are still relevant for analysis, it is recommended that

the move model to be tested on: (1) the AMM of new types of aircraft, or (2) the AMM of different aircraft besides, such as the AMM of helicopter.

3. Analyse the verb form tenses and modals of the Precautionary Note (PN): *Note, Caution* and *Warning*. This thesis did not include PN as part of the analysis in Chapter 6 because the main aim was to focus on only the three *Page blocks*. It is hoped that independent analysis of PN will reveal the variation of the verb form tenses and modals used. This is because these PNs are written for different functions. Not only that, the comparison on the verb form tenses and modal verbs between *Page blocks* and PN can also be conducted.

7.6 Concluding Remarks

The first research question set for the present study reveals that the AMM is the main reference for aircraft maintenance activities. This motivated me to conduct the genre analysis on three *Page blocks* of the AMM. The thesis demonstrates that the move structure developed through the adaptation of Lassen's (1998) and Lago and Lloret's (2012) move model can be mapped on the AMM to certain extent. Although both aircraft were different types of aircraft, written by different technical writers and manufactured by different aircraft manufacturers, the move structure developed proves that these AMMs were written following the rules set by the ATA Specification 100 (ATA, 1999, GAMA, 1978). Not only that, the results obtained from the linguistic features also prove that the verb form tenses for both AMMs were written following the Simplified Technical English (STE) requirements as outlined in the ASD-STE100. It is hoped that the AMM move model can contribute to the understanding of how the AMM is structured to serve the communicative purposes agreed upon by the discourse communities of aircraft maintenance. It is also my wish that this study has shed some light on how the technical writers establish their relationship with the readers by signalling their presence or absence through the use of variations in the linguistic features in three *Page blocks*. Lastly, it is hoped that this study can contribute to the existing literature of genre analysis of technical manuals.

Appendices

Appendix A: Research Ethics – Approval Letter

The University Of Sheffield.

Downloaded: 09/02/2019
Approved: 29/01/2015

Safura Abdul Rahman
Registration number: 130197399
School of English
Programme: PhD

Dear Safura

PROJECT TITLE: Developing a proficiency test of reading and speaking for undergraduates of aircraft miantenance
APPLICATION: Reference Number 002371

On behalf of the University ethics reviewers who reviewed your project, I am pleased to inform you that on 29/01/2015 the above-named project was **approved** on ethics grounds, on the basis that you will adhere to the following documentation that you submitted for ethics review:

- University research ethics application form 002371 (dated 05/12/2014).
- Participant consent form 006518 version 1 (16/03/2015).

The following optional amendments were suggested:

Supplying the consent form to be checked by supervisor and ethics reviewers.

If during the course of the project you need to deviate significantly from the above-approved documentation please inform me since written approval will be required.

Yours sincerely

Emma Bradley
Ethics Administrator
School of English

Appendix B: Sample of interview questions

Part 1: Personal background

Name: ______________________________
Age: ______________________________

Part 2: The nature of AMP and organisation

1. May I know where do you work and what is the nature of the organisation?
2. What are your position
3. What is the nature of your position?

Part 3: The nature of reading in the aviation

1. What types of reading materials that you read that you could relate to your position?
2. What are the main reasons of reading these materials?
3. On what occasion that required you to read these materials?
4. Which of these reading materials that you frequently read? Due to what reasons?
5. Are there any reading materials that you think difficult to understand?
6. May I know what the reasons are?
7. Do you have any experience dealing with misunderstanding or misinterpreting the content of the materials that you read?
8. What will happen if you misinterpreted or misunderstood the content?
9. How did you overcome the problems?

Appendix C: Sample of Consent Form

The University Of Sheffield.

FOR OFFICIAL USE ONLY

Participant Number/Initials

/

Title: Developing A Proficiency Test of Reading and Speaking for Undergraduates of Aircraft Maintenance

Consent Form for Interviews: a Qualitative Sub-study

If you are happy to participate then please complete and sign the form below. Please initial the boxes below to confirm that you agree with each statement:

Please Initial box:

I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason and without there being any negative consequences. In addition, should I not wish to answer any particular question or questions, I am free to decline.

I understand that my responses will be kept strictly confidential. I understand that my name will not be linked with the research materials, and will not be identified or identifiable in the report or reports that result from the research.

I agree for this interview to be tape-recorded. I understand that the audio recording made of this interview will be used only for analysis and that extracts from the interview, from which I would not be personally identified, may be used in any conference presentation, report or journal article developed as a result of the research. I understand that no other use will be made of the recording without my written permission, and that no one outside the research team will be allowed access to the original recording.

I agree that my anonymised data will be kept for future research purposes such as publications related to this study after the completion of the study.

I agree to take part in this interview.

Name of participant   Date   Signature

Appendix D: Example of Transcribed Interview (Participant 23)

L01 - First of all, thank you for being my participant. So let me brief you on the objective of the interview. The objective of this interview is for me to understand the nature of your work in order to know what kind of documents that you use every single day, when and how do you use those documents and do you have problems with the English language used. So I will start with your working experience, and then about your organisation. May I know what is your position and where are you working at the moment? #00:00:27-5#

L02 - As for now, my position is a Technician at GESM which is General Electric for Malaysia. #00:00:30-5#

L03 - May I know what is the nature of your position? #00:00:37-7#

L04 - Basically I do maintenance, in which my team and I maintain the engine that was sent by our customer. Generally, we do overhaul, we do some minor or major repairs of the engine. Then, once the repair has been completed and the engine has been fixed and can be used, we sent back the engine to the customer. #00:00:58-7#

L05 - What is the nature of the industry? #00:01:00-7#

L06 - What do you mean the nature you mean? #00:01:05-6#

L07 - What is the business of the industry? #00:01:07-8#

L06 - The nature of this industry is that we repair the aircraft engines that come from the customer. So we repair and we maintain the engine as well. So that the engine that was sent by our customer will be fixed and then we send back the engine to customer in good condition. So that it will give a good engine for the aircraft to fly. #00:01:43-3#

L08 - So, every day, in order to perform aircraft maintenance tasks, what are types of documents that you refer to or what are the documents that you need to read every single day? #00:01:51-9#

L08 - There are a lot of manuals that we need to comply with. For example, aircraft maintenance manuals and also manuals from the manufacturer. Basically these manuals are very important for us to refer to because it complies with the authorities' rules and it meets the customer's needs about what they want so we can fix the engine well. Because there are some limits or some condition that we call limitation. So we have to comply with those rules. As for the activities that we do for the engine, we also have to refer to the vendor itself, so that we know how can we do the work. It shows us how we want to manage the engine. #00:03:33-2#

L09 - Based on your own experience, which of these documents that you found difficult to understand? #00:03:37-6#

L10 - For a new guy like me, it is really hard to understand the manual because of the language. Even though the language is straightforward, but sometimes if the word used was the word that I have never seen or read before, it would be difficult for me to understand the word. So, I need to ask my colleague the meaning of the word. Sometimes it is a bit hard for me to understand but sometimes it is okay if the word is a common word. Basically a new guy like me, I guess I need to study more about the manuals so I can suit myself with the manual. At the very beginning it was a bit hard, but after some time practicing reading the manuals, I think I have improved and able to understand better the manuals. #00:04:46-6#

L11 - What about the illustration, do you need the illustration or diagram in order to assist you to understand better the manuals? #00:04:53-9#

L12 - For me, diagram and illustration are very important. I think it is very important because sometime my knowledge on certain parts of the aircraft is still limited as I have only been working for about six months. So they are parts that I am not familiar with. For example, when I was required to install something, I do not know where is the location of that system and how the system looks like. So, if I only relied on reading the manual, in which there was no image and only words and sentences, how can I imagine and visual the system? So the illustration and images in aircraft maintenance are very important. So that I can know where is the location of the system, how does it look like and how to install the part of the system. This is because illustrated parts catalogue illustrates the system in which they separate parts by parts of the system. So, I can know the structure of the aircraft system. Not only that, I will also know the exact location of the system for instance six o'clock or nine o'clock from the engine. So it helps me a lot and sometimes it also helps the seniors as they also must check and make sure the thing that we want to install is correctly installed. So the illustration and images help them to confirm back the location of the system and how to install correctly. #00:06:34-2#

L13 - What about your own experience, have you misinterpreted the manuals that you have read before? #00:06:39-0#

L14 - As for a beginner like me, of course mistake would happen. For example, there was once I installed something to the engine, I just referred to the illustration but I did not refer to information in the manual, which the part number was provided, so what happened was, I just installed based on the image and when my seniors checked what I have installed, they told me it was not the right part that I had installed.

Another experience involved referring to the wrong manual. For example, I could not find the information in the manual, so I referred to VVU or something like SMM manual, but actually the information was in the AMM but since I referred to the wrong page, the information was not there, I ended up looking for the information in the wrong manual. Actually what we need to know is the real location of the information in the manual. So from there, misunderstanding can be avoided. #00:08:20-9#

L15 - Okay, thank you so much for your time. I really appreciate it. #00:08:25-3#

Appendix E: Demographic Data of the Participants

Participant	Gender	Age	Position	Types of company
1	M	52	Licensed Aircraft Maintenance Engineer	MRO
2	M	55	Licensed Aircraft Maintenance Engineer	Air Operator
3	M	35	Licensed Aircraft Maintenance Engineer	MRO
4	M	57	Senior Aircraft Technician	MRO
5	M	27	Junior Technician	MRO
6	M	56	Licensed Aircraft Maintenance Engineer	MRO
7	M	42	Engineer	MRO
8	M	27	Junior Technician	MRO
9	M	51	Licensed Aircraft Maintenance Engineer	MRO
10	M	47	Engineer	MRO
11	M	42	Licensed Aircraft Maintenance Engineer	MRO
12	M	38	Engineer	Air Operator
13	M	39	Licensed Aircraft Maintenance Engineer	MRO
14	M	42	Engineer	Air Operator
15	M	40	Engineer	MRO
16	M	26	Technician	Air Operator
17	M	26	Junior Technician	Air Operator
18	F	25	Junior Technician	MRO
19	F	27	Engineer	MRO
20	M	35	Technician	Air Operator
21	M	28	Technician	Air Operator
22	M	26	Junior Technician	MRO
23	F	32	Engineer	Air Operator

Appendix F: Permission Letter

Safura Binti Abdul Rahman
PhD Student (130197399/GS 38475JD)
Jointly-Awarded Degree Programme (UOS – UPM)

17 May 2016

Mr. Mohammad Iqmal Bin Mohd Ali
Deputy Dean
Universiti Kuala Lumpur Malaysian Institute of Aviation Technology (UniKL MIAT)
Lot 2891, Jalan Jenderam Hulu
Jenderam Hulu
43800 Dengkil, Selangor

Dear Sir

REQUEST PERMISSION TO USE AIRCRAFT MAINTENANCE MANUALS

I am a doctoral student from Jointly-Awarded Degree Programme (University of Sheffield and Universiti Putra Malaysia) and I am writing to request permission to use two Aircraft Maintenance Manuals (AMMs) as my data for analysis in my thesis titled '**Genre Analysis of Three Page Blocks in Aircraft Maintenance Manual**'. I wish to use the following:

Aircraft Maintenance Manuals, year
1. BOEING 727 Maintenance Manual, 1998
2. CESSNA 182 Maintenance Manual, 1997

Chapter range / page block
1-100 - Description and Operation
101-200 - Troubleshooting
201-300 - Maintenance Practices

The texts and one image (as attached) from these two AMMs will be used as samples in my PhD thesis.

Thank you for considering this request. A duplicate copy of this form is enclosed for your records.

Sincerely,

The above request is hereby approved on the condition specified below, and on the understanding that full credit will be given to the source.

Date: 19/5/2016 Approved by:

MOHAMMAD IQMAL MOHD A...
DEPUTY DEAN ACADEMIC & TECHNOL...
UniKL MIAT

Attachment

Sample of texts and image appear in my PhD thesis:

Sample Text

Step 1a. Introducing the subsystem is an opening statement in Move 1 that functions as to introduce the reader to the subsystem. The following extracts exemplify the first Step of Move 1: C182

(15) The auto throttle system is an electromechanical servo system that controls the airspeed of the airplane by automatically positioning the throttles to maintain a selected airspeed. (D&O, Text 1)

(16) The detection system is an electrical heat sensing system that responds to a general overheats condition or localized fire condition by activating warning lights and an alarm bell. (D&O, Text 7)

(17) The system is of an electro thermal type. (D&O, Text 38)

Sample Image

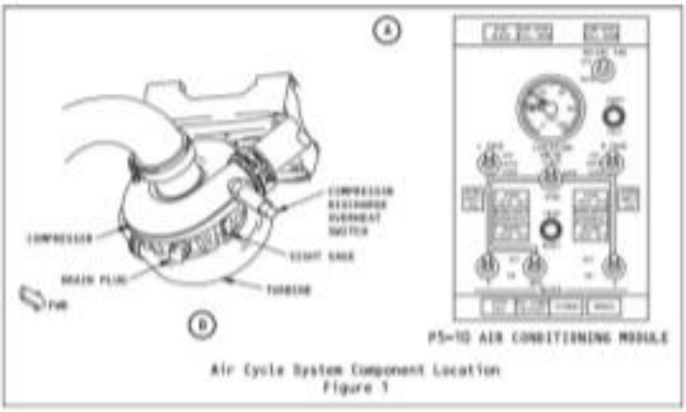


Figure 5.2 Example of *Cue* (D&O, Text 1, p. 3)

Appendix G: List of available manuals

<table>
<tr><th>AIRCRAFT</th><th>AVAILABLE MANUAL</th></tr>
<tr><td>Apache</td><td>Maintenance Manual
Repair Parts & Special Tools List
Trouble Shooting Manual
Operators Manual
Maintenance Test Flight Manual
Phased Maintenance
Inspection Checklist
Fault Detection Manual
Master Failure Symptom Index
Multiplex Read Codes
Theory of Operation
Wiring Diagrams</td></tr>
<tr><td>Boeing 727</td><td>Aircraft Maintenance Manual – Delta Airlines
Aircraft Maintenance Manual – Royal Airlines
Component Maintenance Manual/Overhaul Manual
Training Manual</td></tr>
<tr><td>Boeing 737</td><td>Aircraft Maintenance Manual
Component Maintenance Manual
Fault Isolation Manual
Illustrated Part Catalogue
Illustrated Tools and Equipment List
Overhaul Manual
Maintenance Planning Data
Aircraft Structure Repair Manual
System Schematic Manual
Power Plant Build Up Manual
Aircraft Training Manual
Weight and Balance Manual</td></tr>
<tr><td>Boeing 747</td><td>Aircraft Maintenance Manual
Structural Repair Manual
System Schematic Manual
Component Maintenance Manual
Fault Isolation Manual
Illustrated Part Catalogue
Illustrated Tools and Equipment List
Maintenance Planning Documents
Overhaul Manual
Power plant Build-up Manual
Flight Crew Operations Manual</td></tr>
</table>

	Weight & Balance Manual Training Manual
Boeing 757	Aircraft Maintenance Manual System Schematic Manual
Boeing 767	Aircraft Maintenance Manual Structural Repair Manual Component Maintenance Manual Fault Isolation Manual System Schematic Manual
Boeing 777	Aircraft Maintenance Manual Structural Repair Manual Component Maintenance Manual Fault Isolation Manual System Schematic Manual Fuelling Manual Maintenance Planning Documents Wiring Diagram Manual Illustrated Part Catalogue Course Notes
Cessna 150, 175, 180, 177 and 185	Service Manual
Cessna 182	Service Manual Illustrated Part Catalogue
Cessna 310	Service Manual
Fokker 50	Aircraft Maintenance Manual Illustrated Tools & Equipment Manual Non Destructive Testing Manual
Gulfstream AA-5	Aircraft Maintenance Manual
HS 125	Aircraft Maintenance Manual
DC 10	Flight Crew Ops Manual
Piper Aztech and Apache	Service Manual
Piper Cherokee Warrior	Maintenance Manual
Twin Otter HC-6	Aircraft Maintenance Manual

Appendix H: Frequency of occurrence of texts for nine page blocks

Boeing 737

Group	1-100	101-200	201-300	301-400	401-500	501-600	601-700	701-800	801-900
General	47	2	6	14	--	--	1	2	--
Airframe	25	12	80	--	1	1	3	1	--
Structure	10	--	9	--	--	--	0	--	--
Power Plant	11	5	18	--	--	--	1	--	--
Total texts	**93**	**19**	**113**	**14**	**1**	**1**	**5**	**3**	--

Cessna 182

Group	1-100	101-200	201-300	301-400	401-500	501-600	601-700	701-800	801-900
General	6	--	6	--	--	--	--	--	--
Airframe	29	12	39	--	--	--	--	--	--
Structure	5	1	17	--	--	--	--	--	--
Power Plant	11	3	9	--	--	--	--	--	--
Total texts	**51**	**16**	**71**	--	--	--	--	--	--

Total number of frequency of occurrence for three page blocks for both AMMs

Group	1-100	101-200	201-300
General	53	2	12
Airframe	54	24	119
Structure	15	1	26
Power Plant	22	8	27
Total texts	**144**	**35**	**184**

Appendix I: Summary table of inter-coder analysis for Move 1

Moves/Steps	Coded Unit	Agreement
Heading	5	5
Title	27	27
Step 1a	9	9
Step 1b	12	11
Step 1c	26	23
Step 1d	26	24
Step 1e	24	23
Step 1f	25	23
PN^1	4	4
PN^2	2	2
PN^3	1	1
Cue	13	13
Aside	5	4
Total	179	169

Appendix J: Summary table of inter-coder analysis for Move 2

Moves/Steps	Coded Unit	Agreement
Heading	5	5
Title	18	18
Step 2a	16	16
Step 2b	66	62
Step 2c	104	100
Step 2d	9	8
Step 2e	131	129
Step 2f	154	148
Step 2g	2	2
Step 2h	2	2
PN^1	22	22
PN^2	1	1
PN^3	2	2
Cue	6	6
Aside	2	2
Total	**540**	**523**

Appendix K: Summary table of inter-coder analysis for Move 3

Moves/Steps	Coded Unit	Agreement
Heading	5	5
Title	34	34
Step 3a	4	4
Step 3b		
Step 3b.1	2	2
Step 3b.2	1	1
Step 3b.3	1	1
Step 3b.4	1	1
Step 3b.5	2	2
Step 3b.6	1	1
Step 3c		
Step 3c.1	39	35
Step 3c.2	36	32
Step 3c.3	34	33
Step 3d	2	2
Step 3e	1	1
PN^1	32	32
PN^2	11	11
PN^3	2	2
Cue	16	16
Aside	1	1
Total	**225**	**216**

Appendix L: Results of steps occurrence in Move 1 (42 texts)

	STEPS OCCURRENCE												
TEXT	**H**	**T**	**1a**	**1b**	**1c**	**1d**	**1e**	**1f**	**PN^1**	**PN^2**	**PN^3**	**C**	**A**
1	1	1	1	0	1	1	1	1	0	0	0	1	1
2	1	1	1	1	1	1	1	1	0	0	0	1	1
3	1	1	1	1	1	1	1	1	0	0	0	1	0
4	1	1	1	1	1	1	1	1	0	0	0	1	1
5	1	1	1	0	1	1	0	1	0	0	0	0	1
6	1	1	1	1	1	1	1	1	1	0	0	0	1
7	1	1	1	1	1	1	1	1	0	0	0	1	0
8	1	1	1	0	1	1	1	1	1	0	0	1	1
9	1	1	0	1	1	1	1	1	0	0	0	1	1
10	1	1	1	1	1	1	1	1	0	0	0	1	0
11	1	1	1	0	1	1	1	0	0	0	0	1	0
12	1	1	1	1	1	1	1	1	0	0	0	1	0
13	1	1	1	1	1	1	1	1	0	0	0	1	1
14	1	1	1	1	1	1	1	1	0	0	0	1	1
15	1	1	1	1	1	1	1	1	0	0	0	1	1
16	1	1	1	1	1	1	1	1	1	0	0	1	1
17	1	1	1	1	1	1	1	1	0	0	0	1	0
18	1	1	1	0	1	1	1	1	0	0	0	1	1
19	1	1	1	1	1	1	1	1	0	0	0	1	1
20	1	1	1	1	1	1	1	1	0	1	0	1	1
21	1	1	1	1	1	1	1	1	0	0	0	1	0
22	1	1	1	0	1	1	1	1	0	0	0	1	0
23	1	1	1	1	1	1	1	0	0	0	1	1	1
24	1	1	1	0	1	1	1	0	0	0	0	1	0
25	1	1	1	1	1	0	1	1	0	0	0	1	1
26	1	1	1	1	1	1	1	1	0	0	0	1	1
27	1	1	1	1	1	1	1	1	0	0	0	1	1
28	1	1	1	1	1	1	1	0	0	0	0	1	1
29	1	1	1	1	1	1	1	1	0	0	0	1	1
30	1	1	1	1	1	1	1	1	1	0	0	1	0
31	1	1	1	0	1	1	1	1	0	0	0	1	1
32	1	1	1	1	1	1	1	1	1	0	0	1	0
33	1	1	0	1	1	1	1	1	0	0	0	1	0
34	1	1	1	1	1	1	1	1	1	0	0	1	0
35	1	1	1	1	1	1	1	1	0	0	0	1	0
36	1	1	1	1	1	1	1	1	0	0	0	1	0
37	1	1	1	0	1	0	1	1	1	0	0	0	0
38	1	1	1	1	1	1	1	1	0	1	0	0	0
39	1	1	1	0	1	1	0	1	0	0	0	0	0
40	1	1	1	1	1	1	1	1	0	0	0	0	0
41	1	1	1	1	1	1	0	1	1	0	0	0	0
42	1	1	1	1	1	1	1	1	0	0	0	0	0
	42	**42**	**40**	**32**	**42**	**40**	**39**	**38**	**8**	**2**	**1**	**34**	**21**

Appendix M: Results of steps occurrence in Move 2 (25 texts)

	STEPS OCCURRENCE														
TEXT	**H**	**T**	**2a**	**2b**	**2c**	**2d**	**2e**	**2f**	**2g**	**2h**	**PN 1**	**PN 2**	**PN 3**	**C**	**A**
1	1	1	1	1	1	1	1	1	0	0	1	0	0	0	0
2	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0
3	1	1	1	1	1	1	1	1	1	0	1	1	1	0	1
4	1	1	0	1	1	0	1	1	0	0	0	0	0	0	0
5	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0
6	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0
7	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0
8	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0
9	1	1	1	1	0	1	1	1	1	0	0	0	0	0	0
10	1	1	1	1	0	1	1	1	1	1	1	0	0	0	0
11	1	1	1	1	0	0	1	1	0	0	1	0	1	0	0
12	1	1	1	1	1	1	1	1	0	1	1	1	0	0	0
13	1	1	1	1	1	1	1	1	0	0	0	0	0	1	1
14	1	1	1	1	0	1	1	1	0	1	1	0	0	1	0
15	1	1	1	1	1	1	1	1	0	0	1	1	0	0	0
16	1	1	1	1	1	1	1	1	0	0	1	1	1	0	0
17	1	1	1	1	0	0	1	1	0	0	0	0	0	0	0
18	1	1	1	1	0	0	1	1	0	0	1	0	0	0	0
19	1	1	0	0	0	0	1	1	0	0	1	0	0	1	1
20	1	1	1	1	1	1	1	0	0	1	0	1	0	0	1
21	1	1	1	1	0	0	1	1	0	0	0	0	0	0	0
22	1	1	1	1	0	0	1	1	0	0	1	0	0	0	1
23	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0
24	1	1	1	1	0	0	1	1	0	0	0	0	0	0	0
25	1	1	1	1	0	0	1	1	0	0	0	0	0	0	1
	25	**25**	**23**	**24**	**14**	**13**	**25**	**24**	**5**	**5**	**13**	**6**	**4**	**3**	**6**

Appendix N: Results of steps occurrence in Move 3 (33 texts)

	STEPS OCCURRENCE																		
TEXT	**H**	**T**	**3a**	**3b.1**	**3b.2**	**3b.3**	**3b.4**	**3b.5**	**3b.6**	**3c.1**	**3c.2**	**3c.3**	**3d**	**3e**	**PN^{1}**	**PN^{2}**	**PN^{3}**	**C**	**A**
1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	0	0	1
2	1	1	1	0	0	0	0	0	0	1	1	0	0	0	1	0	1	1	0
3	1	1	0	0	0	0	1	0	0	1	1	0	0	0	1	1	0	1	0
4	1	1	1	0	0	0	0	0	0	1	1	1	0	0	1	1	1	1	0
5	1	1	0	0	0	1	1	0	0	1	1	1	0	0	1	0	1	1	1
6	1	1	0	0	0	0	1	0	0	1	1	1	1	0	1	1	0	1	0
7	1	1	0	1	1	1	1	0	0	1	1	1	0	1	1	0	1	1	0
8	1	1	1	1	0	1	1	0	0	1	1	1	0	1	1	1	1	1	0
9	1	1	1	1	0	0	0	0	0	1	1	1	1	0	1	1	0	1	0
10	1	1	0	0	0	1	1	1	1	1	1	1	0	0	1	0	1	0	0
11	1	1	1	0	0	0	0	0	1	1	1	1	0	1	1	1	0	1	0
12	1	1	1	0	0	0	1	1	1	1	1	0	0	1	1	1	0	1	0
13	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	0	1	0
14	1	1	0	0	1	0	1	0	0	1	1	1	0	0	1	1	1	1	0
15	1	1	1	0	0	0	1	0	0	1	1	0	0	0	1	1	0	1	0
16	1	1	1	0	0	0	1	0	0	1	1	0	0	0	0	0	0	1	0
17	1	1	1	0	0	0	1	1	0	1	1	1	0	0	1	1	1	1	1
18	1	1	1	1	1	0	1	1	1	1	1	1	0	0	1	1	1	1	0
19	1	1	1	0	1	1	1	0	0	1	1	1	0	0	1	1	0	1	0
20	1	1	0	0	0	0	0	0	0	1	1	1	0	0	1	1	0	1	0
21	1	1	1	0	0	0	1	0	0	1	1	0	0	0	1	1	1	1	0
22	1	1	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0	1	1
23	1	1	0	0	0	0	0	0	0	1	1	1	0	0	1	1	0	1	1
24	1	1	1	0	0	0	0	0	1	1	1	0	0	0	1	1	0	1	1
25	1	1	0	0	0	0	0	0	1	1	1	0	0	0	0	1	0	1	1
26	1	1	1	0	0	0	0	0	1	1	1	1	0	0	1	1	2	1	1
27	1	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	1	1	1
28	1	1	1	0	1	0	0	0	0	1	1	1	0	0	1	1	1	1	1
29	1	1	1	0	0	0	0	0	0	1	1	1	0	0	1	1	1	1	1
30	1	1	0	0	1	0	0	0	0	1	1	1	0	0	1	1	1	1	1
31	1	1	1	0	0	0	0	0	0	1	1	1	0	0	1	1	0	1	1
32	1	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	1
33	1	1	1	0	0	1	0	0	0	1	1	0	0	0	1	0	0	1	1
	33	**33**	**23**	**5**	**8**	**8**	**15**	**6**	**9**	**33**	**33**	**22**	**2**	**6**	**28**	**24**	**16**	**31**	**15**

Abbreviations

Abbreviation	Meaning
AD	Airworthiness Directive
AECMA	European Association of Aerospace Industries
AECMA SE	European Association of Aerospace Industries Simplified English
AIA	Aircraft Industries Association
AML	Aircraft Maintenance License
AMM	Aircraft Maintenance Manual
AMP	Aircraft Maintenance Personnel
AMT	Aircraft Maintenance Technician
AN	Airworthiness Notice
AOC	Air Operator's Certificate
ASD	Aerospace and Defence Industries and Associations of Europe
ATA	Air Transport Association
CAA	Civil Aviation Authority
CAAM	Civil Aviation Authority Malaysia
CAAUK	Civil Aviation Authority, United Kingdom
CAD	Computer Aided Design
CARS	Create-A-Research Space
CE	Controlled English
CL	Controlled Language
CLAWS	Constituent Likelihood Automatic Word-tagging System
CMM	Component Maintenance Manual
CMS	Central Maintenance System
DCA	Department of Civil Aviation
EASA	European Aviation Safety Agency
ELP	English Language Proficiency
EO	Engineering Order
ESP	English for Specific Purposes
EST	English of Science and Technology
FAA	Federal Aviation Authority
GAMA	General Aviation Manufacturers Association
GCSE	British General Certificate of Secondary Education
HOCL	Human-Oriented Controlled Language
ICA	Instructions for Continued Airworthiness
ICAO	International Civil Aviation Organisation
IPC	Illustrated Parts Catalogue
IPR	Illustrated Part Radar
JAR	Joint Aviation Requirements

LAME	Licensed Aircraft Maintenance Engineer
LEMMINGS	Lemmatiser
LSP	Language for Specific Purpose
MM	Maintenance Manual
MMEL	Master Minimum Equipment List
MOCL	Machine-Oriented Controlled Language
MPD	Maintenance Planning Data
MRA	Medical Research Article
MRO	Maintenance, Repair and Overhaul
MTO	Maintenance Training Organisation
MTOW	Maximum Take-Off Weight
NAA	National Aviation Authority
NTSB	National Transportation Safety Board
OEM	Original Equipment Manufacturer
OM	Operations Manual
PDF	Portable Document Format
PN	Precautionary Note
POS	Part of Speech
PWS	Worksheet for Practical
QDA	Qualitative Data Analysis
QRH	Quick Reference Handbook
RAI	Research Article Introduction
SARP	Standards and Recommended Practice
SB	Service Bulletin
SDM	Schematic Diagram manual
SE	Simplified English
SEMTAG	Word-Sense Tagger
SFG	Systemic Functional Grammar
SFL	Systemic Functional Linguistics
SM	Service Manual
SMS	Short Message Service
SPM	Malaysian Certificate of Education (Sijil Pelajaran Malaysia)
SRM	Service Repair Manual
STE	Simplified Technical English
TSA	Target Situation Analysis
UniKL MIAT	Universiti Kuala Lumpur Malaysian Institute of Aviation Technology
UoS	University of Sheffield
USAS	UCREL Semantic Annotation System
WDM	Wiring Diagram Manual

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