THE USE OF QUESTIONS IN INTERNATIONAL PILOT AND AIR TRAFFIC CONTROLLER COMMUNICATION

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Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
DOCTOR OF PHILOSOPHY
May 2008

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PILOT AND AIR TRAFFIC CONTROLLER

COMMUNICATION

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ACKNOWLEDGEMENTS

Any major project such as a dissertation cannot be completed solely by an individual. In particular, I would like to specifically acknowledge the guidance and wise words I have received throughout the process of designing, researching, writing and completing this project.

It takes a department to help write a dissertation. My dissertation committee members have provided guidance and enthusiasm about my project from the beginning. I have been most fortunate to also have ongoing encouragement from many of the graduate students on the fourth floor as well as from the broader English department faculty throughout my doctoral program.

This project would never have been completed without the positive input from the Air Traffic Control professionals who participated in the Oklahoma State University Aviation English program, especially Arturo Garcia (now deceased) and Ronald Vega, both Air Traffic Controllers from the Cenamer Air Traffic Control Center, Costa Rica.

Most importantly, I want to acknowledge the encouragement I have received from my family: my three children, who have always applauded all my academic efforts, and my parents, whose spirits have been with me throughout my doctoral program.

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CHAPTER I

INTRODUCTION

The discipline of applied linguistics developed to examine and document the use of and variations of language that is “concerned with the solution of human problems” (Kaplan, 1980, p. 64). More specifically, applied linguistics investigates the functions and features of authentic examples of language use, not imaginary examples created to demonstrate a specific grammatical concept. The focus of this research project is to examine authentic samples of the language of pilots and air traffic controllers involved in their daily tasks of moving planes from a point of departure to a final destination. Because the pilot and controller are never in face-to-face contact, their communications are conducted entirely through radio messages using a specialized language designed to make communication as accurate and efficient as possible (International Civil Aviation Organization, 2004; Federal Aviation Administration, 2004b).

Any language (such as English) may develop specific vocabulary and phrases for particular occupations or processes, such as aviation. By developing a more restricted vocabulary designed to precisely address the demands aviation contexts, the specialized language evolves specific formulaic phrases necessary to effectively and efficiently conduct the tasks or processes of that discipline (Robertson, 1988).

This study examines how pilots and controllers frame a request or clarification for information during tower-to-plane communications. Questions are not considered as part of the routine language in controller/pilot discourse. According to air traffic controller regulations, all communications are to be expressed in command-based or instructional language (International Civil Aviation Organization, 2001a; Federal Aviation Administration, 2004a). When non-routine situations do occur, neither the pilot nor the controller has an available formula-based phraseology that will apply to the situation. Thus, the speaker must be prepared to describe the situation using language not included in the standard phraseology and ask pertinent questions to build an accurate image of the nature of the problem. These non-standard situations contribute to many of the communication problems that impede the overall effectiveness of aviation communication.

The purpose of this study is to identify questions used in daily aviation communication and to investigate how questions may be a discourse resource used by aviation professionals. Using principles of discourse analysis and functional language use, specific attention will be given to identify the types of questioning functions and the types of forms found in a corpus of aviation communication. The remainder of this section provides an overview of key issues in aviation discourse research.

The English used in these restricted conditions, however, is not limited to only specialized phrases or vocabulary. Research in the area of English for Specific Purposes (ESP) has shown that while the specialized phrases are key to the operation of the field, more general language is also necessary to conduct the interactions of the participants (Candlin, 2002; Hutchinson & Waters, 1987; Johns & Dudley-Evans, 1993; Robinson, 1991; Swales, 1985). The overlap between a specialized phraseology that can be memorized and the need for more general language to conduct non-specialized conversations relative to the field is an area of current interest in applied linguistics (Belcher, 2004; Nevile, 2004; Tajima, 2004; Tarone, 2005). Applied linguists have examined the scope of these specialized languages as well as the accuracy of their use, examining how participants incorporate the jargon of their area of expertise with less formal language. The process of incorporation becomes more problematic when speakers do not share the same native language (for example, see Sullivan & Girginer, 2002). Although the jargon or phraseology may be successfully employed in another language, any accompanying general discourse may not be so successfully accomplished by a non-native speaker. Further, comprehension by others may also be impeded by the speaker's accent, pronunciation or intonation patterns even among native speakers who come from different regions or countries.

English language proficiency within the specialized domain of aviation, for both native and non-native speakers of English, has drawn attention as a global issue since the 2003 mandate by the International Civil Aviation Organization (hereafter, ICAO), the United Nations' regulatory agency for international commercial aviation. The mandate specifies that all pilots and controllers working in international aviation contexts, as well as certain other aviation-related positions, must be able to satisfy the ICAO oral English proficiency standards (see Appendix D: ICAO Language Proficiency Rating Scale) at the Operational level by 2008 (International Civil Aviation Organization, 2004; Elizabeth Mathews, 2004b). This mandate, ratified in 2003 by member states of the United Nations, has led to an increased interest in developing aviation-related programs that will enable controllers and pilots worldwide to enhance their oral English skills in order to pass the oral proficiency tests.

Since the inception of the International Civil Aeronautical Organization (ICAO) in 1944, international airborne traffic management has been the responsibility of the United Nations as well as of individual countries within their national boundaries. The specialized language used in airborne traffic management has been referred to as "Airspeak" (Robertson, 1988), or by its international label ICAO phraseology or "radiotelephony" (for example, International Civil Aviation Organization, 2004; Elizabeth Mathews, 2004a; Mell, 2004b). This dedicated language, a variety of English for Specific Purposes, is based on a minimalist syntax designed to facilitate efficient communication between air traffic controllers and pilots during all phases of ground and airborne movement of commercial, business and private airplanes.

Because English is an official language of global aviation, there are two key issues that affect English users in the aviation context. First, pilots and controllers must be able to use the memorized phraseology with sufficient skill to pronounce and comprehend the phraseology as spoken by both native and non-native speakers of English. Second, speakers must also be able to construct and comprehend novel utterances appropriate to a particular situation which may require words or phrases that are not exclusively included in the phraseology. For example, questions are not part of the formal phraseology, but derive from the more general English used to convey aviation-related information (Mitsutomi & O'Brien, 2004).

Summary of the Literature

Pilot/Controller Communications

Over the past 30 years, researchers have attempted to categorize and classify aviation communications in an effort to reduce miscommunication or misunderstandings by both native and non-native speakers of English. Researchers have looked at transcripts of aviation accident or communication errors found in various parts of the world to examine specific language features to describe or identify communication problems that may have been a key factor in the accidents (for example, Driscoll, 2002; Goguen & Linde, 1983; Golaszewski, 1989). Other studies have drawn language data from accidents or incidents reported in the official Aviation Safety Reporting System newsletter, *Callback* (Cushing, 1994b; Monan, 1983, 1986). These studies have relied heavily on three sources: (1) printed transcripts produced by government agencies such as the (American) National Transportation Safety Board (NTSB) (Sassen, 2005), (2) reports submitted by pilots or controllers to self-reporting systems such as the NASA-sponsored Aviation Safety Reporting System or the International Air Transport Association (ASRS: Cushing, 1994c; Orasanu, Davison, & Fischer, 1997), or (3) transcripts derived from aviation-simulator exercises, or simulated aviation-task activities (Barshi, 1997).

As a result, most of the available aviation research does not analyze authentic language data from real-time recordings between controllers and pilots working in a tower control area. Use of accident transcripts provides only the last thirty minutes of the flight and ends with language that derives from highly stressful situations. Though these transcripts are useful for safety-related studies, the language does not portray pilots and controllers in more routine conditions, conditions that would represent more typical discourse. The reports submitted to ASRS are voluntary, written after an event occurs and are based primarily on the reporters' subjective memory of the dialog that may have occurred. Although these reports may show quoted dialog, the language cited is not drawn from any objective source. Aviation-simulator exercises are designed to create specific conditions either to study crew operations or to test crew on specific equipment. The language recorded from these exercises may be accurate for a given context, but there is no way to determine if the participants' knowledge of the simulated environment affects their behavior, thus affecting the language used during the simulation.

Among the few studies that have used live recordings, Morrow, Lee & Rodvold (1993) and Morrow, Rodvold & Lee (1994) examined the language used by American air traffic controllers from four major US airports in terms of speech acts derived from recordings from American air traffic control tower for errors in "*readback*" (formal repetition of controller instructions made by a pilot). The Federal Aviation Administration (FAA) also sponsored a series of studies that examined all phases of flights (Ground, Departure, Enroute and Approach) for errors in phraseology. The projects sought to identify the types and quantity of information in the controller's message in relation to any subsequent errors made by the pilot when repeating the controller's instructions (the *readback*) or when the pilot needed any part of the message repeated by the controller (Bürki-Cohen, 1995; Cardosi, 1993, 1994; Cardosi, Brett, & Han, 1996).

In addition, there have been few studies done outside of the United States that focused on aviation language in everyday settings. These studies provided only examples of pilot/pilot or pilot/controller interactions but no quantitative analysis of the communications (Nevile, 2004; Sanne, 1999; Sullivan & Girginer, 2002; Wyss-Bühlmann, 2004).

The other major category of investigation in aviation language has targeted linguistic problems causing miscommunication that have led to aviation incidents (non-fatal crashes or events) or accidents (see Cushing, 1994b; Sassen, 2005; Symer, 1998). These projects focus on errors in communication by describing language used in stressful or critical situations by looking at specific incidents or isolated phrases, but the research does not provide a comprehensive description of more ordinary messages that represent tower-to-plane communication.

Aviation English Instruction

In addition to studies on the language of controllers and pilots, the teaching methodology for training aviation professionals is also an area of interest for applied linguists investigating specialized aviation language use (commonly identified as English for Specific Purposes). In Aviation English, restricted or formulaic language must be taught as the language may not use lexical items in the same contexts as general conversational language (for example, Howard, 2003; Orasanu, Fischer, & Davison, 1997, etc.). Members of the Aviation English teaching community have identified the need for specific language instruction targeting general English proficiency for both controllers and pilots. Papers presented at the 2004 International Civil Aviation Educators Association Forum held in Montreal, Canada (2004) repeatedly called for instruction that addresses not only standard aviation vocabulary and ICAO phraseology, but also general language strategies such as asking for clarification of messages and rephrasing previously given information to improve listener comprehension (see Mell, 2004a; Mitsutomi & O'Brien, 2003; Robertson, 2004).

The available research targeting aviation discourse generally falls into two broad categories. First, a large body of data provides quantitative documentation of failures to use correct phraseology, targeting the lexical form of aviation discourse (for example, Cardosi, 1994; Cardosi, Brett, & Han, 1996; Bürki-Cohen, 1996; Golaszewski, 1989; Morrow, Lee & Rodvold, 1993; Morrow, Rodvold & Lee, 1994; Prinzo, 1996). The second major research area has focused on aviation language functions using "operational aspects of language" (Goguen & Linde, 1983, p. 3). Several classification systems have been developed from Searle's (1969) Speech Act theory to investigate aviation-related speech acts (for example, Kanki & Foushee, 1989; Prinzo, 1996; Sassen, 2005) discussed later in this chapter.

There has been limited investigation with extended samples of live aviation discourse to provide a foundational study of the language the pilots and controllers actually use without evaluating their communications only as correct/incorrect or as a deviation from the standard phraseology. Although casual listening to a few minutes of plane-tower transmissions shows that questions occur between pilots and controllers, controllers and pilots have repeatedly stated that "there are no questions in air traffic control" (personal communication). The official phraseology guides for national and international phraseology bear out this statement (ICAO, 2004; CAA, 2006); however, radio transmissions of daily communications indicate that this statement is not entirely accurate. In addition, incidental comments in various studies mention questions used by both pilots and controllers, but they are discounted as inappropriate or non-standard language and, thus, not considered suitable for further investigation (for example, Bürki-Cohen, 1995; Prinzo, Britton, & Hendrix, 1996). By focusing on questions as elements of daily aviation discourse, rather than as features of standard/non-standard phraseology, the questions can be examined separately from the constraints of the phraseology.

Research Focus

My interest in the area of pilot/controller English language oral proficiency and use of questions stems from my experience working with a joint project between Oklahoma State University and the Federal Aviation Administration to develop courses in Aviation English designed to improve overall English proficiency of international air traffic controllers. As an instructor and materials writer for the project, I found that even the more proficient controllers often had trouble framing questions or understanding the implications of intonation features in non-interrogative structures frequently found in daily communications between pilots and controllers. Barry (2002) points out that the diverse forms and complex syntax of English questioning forms create problems for even native speakers of English. As a result, for non-native speakers, using questions effectively poses even greater challenges for pronunciation and comprehension.

A related issue for this research project is to investigate what role intonation plays in expressing and comprehending questioning in non-interrogative forms in addition to the syntax and semantics of the interrogative forms. Non-native speakers frequently do not understand the role of stress and intonation for expressing meaning in English. My experience as an instructor for an International Graduate Teaching Assistants program also confirms this important aspect of learning to speak English in a comprehensible manner. Many of the graduate students needing further work on their language skills do not need further grammar or vocabulary instruction, but rather they require guided instruction for recognizing and practicing the importance of intonation and stress for conveying meaning in the English language.

The dissertation research project outlined below examines the language of questioning of air traffic controllers and pilots communicating in Canadian and Irish airspace. The research focuses on both the syntax and intonation of question functions and question forms recorded from scheduled flights. The goal is to document question forms used in the daily work by these pilots and controllers, not to count the speakers' deviations from formal aviation phraseology. There are no accidents or incidents in these recordings, only pilots and controllers working together to get the planes and passengers safely to their destinations.

Research Questions

Drawing from these experiences, I developed the following research questions.

1. Do questions occur frequently enough to be considered important as a discourse resource used by pilots or controllers?
2. Do question forms and functions occur more often in pilot or controller messages?
3. Do pilots and controllers use questions more often to seek information, to clarify and/or repair information, or to confirm misunderstood or incomplete messages?
4. How frequently do controllers or pilots use syntactic or lexical <u>forms</u> in questions to seek information or to clarify and/or check misunderstood or incomplete messages?
5. Do controllers or pilots incorporate any pragmatic or politeness features to express questions?

The research study begins with Chapter II which examines a review of literature in English discourse describing questions as grammatical and interactional forms of discourse. The review includes relevant work in discourse analysis with a specific focus on linguistic interpretation of question functions. The role of intonation is discussed as a means of signaling a question function in non-interrogative syntax. The chapter concludes with a tentative working definition of the act of "questioning."

Chapter III provides a background to the aviation environment. Beginning with an overview of the regulatory agencies and relevant international regulations, the discussion moves to a brief introduction to formal aviation phraseology. The discussion then outlines the recent English language proficiency standards established for all pilots and controllers working in international aviation. A second section discusses Aviation English as a specialized language within the field of English for Specific Purposes (ESP). Included is a discussion of the important distinction between subject matter language and plain language for analyzing the research data. The focus of this study is directly related to these changes in international English language proficiency standards in aviation that are based on ESP principles applied to aviation communication.

A third section of Chapter III focuses on the sources of data used to study aviation communication, including self-reporting systems, accident transcripts, mechanical simulators, laboratory studies and live recordings. The advantages and disadvantages of each type of data are discussed in relation to their function for studying daily pilot-controller interaction.

Chapter IV provides a general discussion of the ATC environment as it relates to the language used in pilot and controller communication. Beginning with an overview of descriptions of two major classifications systems used for analyzing aviation discourse, the section then continues with a discussion of existing studies of aviation communication, focusing on those studies that have described questioning in the aviation environment.

Chapter V outlines the methodology used to conduct the research: data collection, transcription conventions, and coding of the data. Chapter VI presents the results of the analysis of the research data and revisits the definition of questioning as it relates to the aviation context. Chapter VIII outlines limitations of the research project, the implications of the research findings. In addition, this chapter proposes several recommendations for training in air traffic control/pilot courses as well as applications of the research results in ESP and EFL (English as a Foreign Language) classrooms. The chapter ends with some final remarks on the subject of questioning used in the international aviation context.

Appendix A includes an abbreviated glossary of aviation terminology used in this volume; Appendix B presents a list of transcription conventions used in the data transcription and Appendix C shows an example of a transcript used in the analysis. Appendix D lists an ICAO language proficiency rating scale.

CHAPTER II

DISCOURSE AND QUESTIONING

The question is an entity that is often assumed but seldom defined.

Dwight Bolinger, 1957

Section I. Introduction

Aim and Scope of This Chapter

The objective for this chapter is to examine the importance of language-in-use as the foundation for the study of the questioning forms that are investigated in the research data. Interrogative as well as non-interrogative structures will be discussed in conjunction with features of conversational analysis and pragmatic uses of language that occur in questioning.

Section II begins with a review of the literature on syntactic forms of questioning with a focus on grammatical sentence types. Section III addresses the contributions of Speech Act theory to a more functional explanation of question use. Section IV looks at features of social interaction including Turn Taking; Adjacency Pairs, Side Sequences and Repairs. This section also discusses pragmatic features of language used to interpret questioning forms, such as Politeness, Indirectness and Intonation. The section ends with a discussion of markedness of syntactic or discourse features as a clue to a speaker's intentions. The final section of this chapter will propose a working definition of questioning that will serve to guide the discussion and analysis in later chapters.

Section II. Questioning: Syntax

One of the underlying objectives of this research study is to discover syntactic, semantic and pragmatic features used in aviation communication to express questioning functions. However, a universal definition of *question* is not readily available in the literature. In this section, syntactic descriptions of “question” will be examined, followed by a discussion of imperatives and declaratives to provide a foundation for the research discussed in Chapters V and VI.

Syntax provides the basis for describing the structure of language, the framework of relationships of words found in phrases, clauses and sentences. (Davies, 2005; Matthews, 1997; Trask, 1993). Early definitions of “questions” focused on the syntactic forms found in written texts (*OED*, 1971; S. Johnson, 1773). Most definitions identified *question* as a semantic category and classified *interrogative* as the syntactic form used to express the question (Bolinger, 1957; Pei & Gaynor, 1954; Quirk & Greenbaum, 1973; Trask, 1993). For this study, both *question* and *questioning* will refer to the semantic category while *interrogative* will refer to syntactic forms.

Intonation and Interrogative Forms

Semantic descriptions of general English sentence types are classified as “questions, statements, directives and exclamations,” while syntactic forms of these sentence types are identified as “interrogatives; imperatives, declaratives, and exclamatives” (Quirk, Greenbaum, Leech, & Svartvik, 1985, pp. 803-804). The specific form of the semantic form of a question, however, is not so easily defined. In their comprehensive study of English grammar, Quirk, Greenbaum, Leech and Svartvik (1985) define *question* in terms of "…what it means and what it is used for" (p. 78). The authors point out that, even in subordinate clauses, interrogative constructions "leave a gap of unknown information" (Quirk et al., 1985, p. 1051). This "gap of unknown information" addresses two important features of the syntactic definition. First, the reference to subordinate clauses suggests potential variations in grammatical constructions in which the questioning utterance may occur. Second, the reference to the "gap" indicates the speaker's need for information or knowledge that only the hearer(s) can provide. However, Bolinger (1957) also suggests that there is no one form that is identifiable as a question, rather "[a question] is fundamentally an attitude, which might be called 'craving' – it is an utterance that 'craves' a verbal or other semiotic (e.g., a nod) response" (p. 4).

Another approach to define questioning is by "the *type of answer* the questions *expect* [italics added]" such as a WH-word or YES/NO question (Quirk & Greenbaum, 1973, p. 173). The form of the response provided to classify the form of a question-structured utterance is derived from the syntactic form of the interrogative utterance. Although various authors provide slightly different terminology, there are at least three commonly recognized forms of interrogatives that are defined by either the form of the interrogative structure or by the type of response that the interrogative structure anticipates. These forms are employed by the speaker to fill a "gap of information" and can be defined by the type of information expected by the speaker. The WH-word questions seek new information from the listener. When the speaker seeks to have some piece of already presented information reiterated or rephrased, then a YES/NO question is used to seek confirmation (or disconfirmation). A speaker who seeks to clarify some aspect of the previous utterance will choose an ALTERNATIVE question which provides two or more choices from which the listener is expected to choose. Syntactic and semantic features specific to each of these forms will be discussed in the following paragraphs.

WH-word questions

One form of questioning calls for a new piece of specific information to be supplied by the listener: information not previously mentioned by the speaker. The utterance typically incorporates interrogative lexical markers, such as WHO, WHAT, HOW, WHY, WHEN, or WHERE as the subject of the construction. Quirk and Greenbaum (1973) suggest that the WH-words serve to "elicit information" regarding an unknown item, person or action (p. 23).The structures used these lexical items are commonly referred to as "WH-words" (Quirk & Greenbaum, 1973) or "HOW-WHY questions" (Bolinger, 1957, p. 7). examples of this kind of question include "WHAT is your name?" or "WHY was your flight late?" Both questions ask the listener to provide specific data (either as a single word or a more expanded form) that is as yet unknown to the questioner.

Bolinger (1957) also subdivides the WH-question form (requesting new information for the speaker) to include "COMPLEMENTARY" questions. These questions occur when the speaker formulates the utterance as an open-ended clause requiring the listener to respond with new information that expands, or "completes" the topic under discussion (p. 7). These types of questions do not use the "WH-word" construction and generally employ a more elliptical form, such as, “His reason being?” or “And John?” (Bolinger, 1957, p. 7).

YES/NO questions

A second interrogative form requires only a positive or negative response from the listener. These constructions, often referred to as “YES/NO” questions, are used when the questioner expects only affirmation or rejection (Bolinger, 1957; Quirk & Greenbaum, 1973). examples of this type of question take the form, “Is that your book?” or “Will you come tonight?” (p. 11). When a speaker employs this construction, the response will serve to confirm the predication of the speaker’s utterance (Quirk & Greenbaum, 1973, p. 24).

YES/NO questions generally employ an inverted auxiliary form which places the auxiliary of the principle verb before the subject of the verb to create the interrogative form, as in Figure 2.1.a.

Figure 2.1. Auxiliary Inversion for YES/NO Questions.

a. The flight operations <u>have</u> been amended.
   → <u>Have</u> the flight operations manual been amended?

b. The runway *(~)* appears clear of debris.
   → <u>Does</u> the runway appear to be clear of debris?

However, the sentence in Figure 2.1.b contains no auxiliary verb (represented by ~), therefore an inverted form requires the addition of the auxiliary “does” in order to complete the syntactic construction. A variation of YES/NO questions, the “CONDUCIVE” question, suggests a bias or “predisposition” of the speaker for a positive or negative response (Quirk et al., 1985, p. 808). Figure 2.2 shows a negative conducive (DON’T) question expecting an affirmative answer.

Figure 2.2. Conducive Question.

Didn't the tests show the lights worked anyway?

TAG questions

A third form of questioning syntax employs "TAG" questions. TAG and CONDUCIVE questions both predispose the listener to a YES/NO answer. The TAG is a final element to the clause that uses interrogative syntax, but TAG clauses are found following a main clause using a declarative form. Examples of TAG questions are shown in Figure 2.3.

Figure 2.3. Declarative Main Clause with Interrogative TAG.

a. Runway eight eight is longer, isn't it?

[affirmative clause, negative tag]

b. The weather doesn't sound very promising, does it?

[negative clause, affirmative TAG]

Quirk & Greenbaum note that tags may show affirmative or negative agreement with the principal clause, but that this agreement is not as commonly found (p. 195). According to Bolinger (1957), the use of *do-did* in either the main clause or the tag constituent incorporates an element of "truth/falsity" and may substitute for *yes* and *no* (p. 23).

ALTERNATIVE questions

A third syntactic interrogative form asks the hearer to frame a response by choosing from one of two (or possibly more) responses provided in the question itself, generally referred to as "ALTERNATIVE questions" (Bolinger, 1957, p. 7; Quirk & Greenbaum, 1973, p. 191). The function of these forms is to clarify already presented information for the speaker. Rather than simply respond with either a “yes” or “no,” the hearer is expected to reply by selecting from the two or more alternatives offered in the speaker’s utterance. Syntactically, the main clause contains two or more coordinated subjects, verbs or objects. In addition, the second (and any subsequent) coordinated elements are generally in an elliptical form rather than a complete repeat of the original clausal structure.

Figure 2.4. Alternative Questions.

a. Was that taxiway Alpha <u>or</u> taxiway Golf?

b. Do you want me to line up for runway one five right <u>or</u> runway one five left?

In Figure 2.4.a, the answer is expected to either provide at least the appropriate number or to include the runway number, “two” or “four,” in the response to the question. In Figure 2.4.b, the speaker omits the original auxiliary + subject (*do you*) for the second option, indicating only the relevant runway number. The speaker would expect the response to contain the appropriate number plus the “left” or “right” designation to confirm the listener’s choice from the alternatives provided in the question.

Intonation in Interrogative Forms

Syntactic order alone does not identify all question forms in English. In addition to the syntactic form, intonation plays an important role in contributing to identification of certain interrogative forms (Calderonello, Martin, & Blair, 2003). In fact, intonation can reframe a declarative or command structure to create a questioning function (Calderonello et al., 2003). Givón (1993) points out that it is a combination of "intonation, morphology and word-order" which separates an interrogative form from its declarative counterpart (p. 249, vol. II).

Intonation patterns are important elements of understanding spoken language. In addition to the overall intonation of any given utterance, changes in the intonation of one or more words provide cues to significant changes in the speaker's meaning. The change of "pitch salience" (Bolinger, 1957, p. 13) or "contrastive stress" (Quirk & Greenbaum, 1973, p. 453) is a common feature used in English used as a verbal marking of the syntactic elements. Questioning that employs WH-words typically uses a falling terminal intonation, whereas YES/NO questions may employ a rising terminal intonation to target the specific information requiring a response (Quirk & Greenbaum, 1973, pp. 192, 197, 454-455). Because a yes/no question is seeking some form of agreement or denial, the "nuclear" stress placed on a specific element within the statement verbally highlights the portion of the statement the listener should reply (Quirk et al., 1985). For TAG-questions, the tag-phrase is expressed with a falling tone, "invit[ing] confirmation of the statement, and has the force of an exclamation rather than a question" (p. 195). In other words, speakers may use one syntactic form, but alter the function of the form through one or more cues using pitch, tone or stress.

But intonation patterns are not easily assigned to the varieties of questions identified above. Both Bolinger (1957) and Quirk & Greenbaum (1973) note that question intonation is commonly associated with rising intonation; but both also emphasize this pattern is not consistent:

> "Rising intonation is the norm for *yes/no* questions, but falling intonation occurs quite frequently….further analysis showed that *yes/no* questions

> with the modal operators *can, could, may, might,* and *would* tended to have almost as many falling tones as rising tones" (Quirk et al., 1985, p. 807, note [c]).

Other forms of questions also vary in intonation patterns. Bolinger (1957) suggests that questions that offer choices (i.e. YES/NO questions) have prominent stress on the verb to convey it as the most "contrastive element," to emphasize the specific the speaker's lack of information (p. 23). The ALTERNATIVE questions, while similar to YES/NO questions in requesting the listener to make a choice from options suggested by the speaker, expands the intonation pattern by introducing "a final rising tone…on each item in the list, except the last, on which there is a fall, indicating that the list is complete" (Quirk & Greenbaum, 1973, p. 198). The examples of questioning forms (both in this section and in grammar texts) suggest that interrogative structures generally occur only in full syntactic clauses. Of sources consulted, only Bolinger (1957) notes that "YES/NO, ALTERNATIVE and COMPLEMENTARY" structures can be found as incomplete clauses, such as "After they get there?" (p. 11). Bolinger also points out that some YES/NO questions occur in forms that are "grammatically incomplete but [also] indistinguishable from complete commands" (p. 11). This overlap between question and command syntax will be addressed in paragraphs below which describe the effect of intonation on imperative and declarative syntactic forms.

The interrogative forms discussed in this section consist of one or more principal clauses that may contain auxiliary verbs (as operators with no specific meaning) or modal verbs that mitigate the meaning of the principal verb. These constructions can be identified by their grammatical form and by their function to invite specific types of *response* from the listener: seeking new information (WH-questions), confirming previously given information (YES/NO questions), and clarifying previously given information (ALTERNATIVE questions). This added feature, anticipation of the response form, suggests interrogatives are constructed to serve the speaker's purpose for interacting (see Trask, 1993; Schiffrin, 1994).

The use of stress to highlight meaning suggests that intonation plays an important role in the decoding the overlapping boundaries of the syntactic and semantic forms used to convey linguistic functions. Bolinger concludes that intonation alone fails to "perform its quick and easy dichotomy, it cease[s] even to be the core of the distinction" (p. iii). As a result, analysis of any spoken data for questioning functions must include examination of syntactic and lexical cues combined with attention to intonation used to express the speaker's search for information.

Intonation as an Interrogative Form

The grammar of a language typically codifies the number of available constructions for a given language; therefore, multiple functions are often served by a more limited resource of grammatical forms (Shapiro & Murphy, 1993).This section briefly discusses key elements of intonation-based modifications to imperative and declarative syntactic forms to indicate questioning. In addition to interrogative structures, imperative and declarative clauses may function as questioning utterances without an initial WH-word or marked (inverted) word order typically found in interrogative clauses (Stenstrom, 1994; Weber, 1993). Bolinger (1957) claimed that only intonation distinguishes some questions from a declarative function. While interrogative syntax is closely associated with question forms, there are other clausal forms that provide questioning functions. These non-interrogative forms are an important component of this study since the command-based structure of aviation language suggests that the communications will appear in either declarative or, more specifically, imperative/command structures. As will be shown below, questioning can occur in either of these syntactic forms.

IMPERATIVE clauses

As with definitions of questions, the definitions of Commands and Imperatives overlap with the terms being used somewhat interchangeably. However, the most common distinction suggests that COMMANDS are the clause- or sentence-type while IMPERATIVES represent the verb-form typically used to construct the command statement (Matthews, 1997; Trask, 1993; Tsui, 1994). Command syntax is framed to articulate an order which is constructed using an imperative finite verb form (with no tense) and without an expressed subject or modal auxiliary verbs (Matthews, 1997; Quirk et al., 1985).

The main function of an Imperative clause is to motivate a behavioral response rather than solely a verbal response (see also Speech Acts, Section III). This realization of the Command function suggests that the imperative form may have varying degrees of strength or exigency. Requests structured as commands may also take on questioning functions, as in “[do you] smell the soup?” (Bolinger, 1957, p. 11). In utterances such as this, the grammatical boundaries between imperative and interrogative form become less distinctive and more dependent on the situation in which they occur. A speaker may also modify the imperative structure through addition of one or more modal auxiliaries to achieve a "more tactful form of request" (Quirk & Greenbaum, 1973, p. 201).

Figure 2.5. Modifications of Imperative Syntax

a. Command: Fly heading one eight zero [degrees].

b. Modified: <u>Could you</u> fly heading one eight zero [degrees]?

(Avianca Airlines Flight 052, 25 January 1990)

In Figure 2.5.a, the air traffic controller issues a command using imperative syntax, specifying a new direction for the flight. In 2.5.b, the same command is modified through addition of the modal auxiliary construction, "could you," although it still retains the obligation for the pilot to follow the command. In this manner, imperatives, as an available resource for a variety of functions, can be modified or mitigated depending on context where the context takes precedence over the available grammatical resources.

DECLARATIVE Clauses

In addition to Interrogative and Imperative clauses, Declarative clauses can also be used to convey questioning by the speaker. A declarative is typically spoken with a falling intonation at the end of the clause; however, when functioning as a conducive YES/NO-question, the declarative question uses a rising tone "to invite verification" of the statement (see discussion of YES/NO questions above) (Quirk et al., 1985, p. 815). Declaratives functioning as questions also differ from YES/NO questions because they do not anticipate a simple yes/no answer.

Figure 2.6. Declaratives Functioning as Questions

Controller: You can expect runway two seven left and just confirm your speed at three eighty knots?

In Figure 2.6, the controller uses declarative syntax (beginning with a definite subject, "you") in a compound sentence. However, in the second verb phrase, through use of rising intonation at the end of the controller's message, there is a clear request for the pilot to respond with the current speed of the plane. The question is not seeking new information, but instead seeks to confirm the controller's message by stressing the words of interest. Intonation plays a significant role in the recognition of questioning whether the utterance is syntactically constructed as an interrogative, imperative or declarative form.

Clause Elements

In addition to the two broad categories of interrogative and intonation-based questions syntax, there are elements of clauses that may also carry syntactic elements that contribute to questioning. These include Compound clauses as well as Auxiliary Verbs and Modal Verbs.

Compound Clauses

Compound clauses (or phrases) are found in all of the three syntactic structures discussed above. Compounded clauses are of interest in this study because aviation discourse focuses heavily on command-based expressions to efficiently convey messages between pilots and controllers using minimal syntax to avoid creating ambiguity (see discussion in Chapter III, Aviation Background).

The process of combining two or more clauses may result in the merging of similar elements to reduce the overall length of the compounded message without altering its meaning through the process of "ellipsis" (Quirk & Greenbaum, 1973, p. 251). In spoken English, ellipsis can also be used in interrogative, declarative, or imperative syntax to produce a more economically worded message. The listener is able to recover the ellipted, or missing, elements because they are identical to elements already produced in the original utterance (DeCarrico, 2000; Quirk & Greenbaum, 1973). Figure 2.7. is framed as a multiple clause statement which allows the speaker to reduce the total number of words uttered in an emergency condition.

Figure 2.7. Compound Clauses with Ellipsis.

Flight Attendant:

a. Put your mask over your mouth,
b. … and [put your mask over your] nose,
c. … and [*then*] adjust the headband

(Aviation Safety Network: Korean Air 007, Aug 31, 1983)

In Figure 2.7, lines a. and b. are instructions to the listener as to where the mask should be located on the face, with all of the information from line a. except the additional mask location ("nose") ellipted from line b. In line c., a related instruction is given but adds the complete verb phrase; in addition, the clause in line c. is coordinated to the first clause through the use of the word "and." Utterances such as 2.7 suggest that compound and ellipted clauses may be found in other areas of aviation discourse.

AUXILIARY verbs

In addition to multiple clauses carrying questioning forms in a sentence, two verb forms are used to construct interrogative clauses. "AUXILIARY" verbs are those verbs which serve as auxiliary forms to construct certain tenses and inverted-verb question forms: BE, DO, and HAVE (Quirk et al., 1985, p. 129). MODALS, the other auxiliary verb form, fulfill three functions in English. First, modals do add meaning to the clauses in which they are used (unlike the auxiliaries described in the previous paragraph) expressed through five verbs which address variations in expressing mood in English clauses: CAN/COULD, MAY/MIGHT, SHALL/SHOULD, WILL/WOULD (DeCarrico, 2000; Quirk & Greenbaum, 1973; Yule, 1998). In addition to these meanings, modals also occur with verbs to express "hypothetical IF-THEN" statements, where the modal occurs in the "then" portion to indicate an alternate condition as a result of the "IF" statement (Barry, 2002; Quirk & Greenbaum, 1973).

A third use of modals occurs in constructions where the speaker intends to make a request more polite by using modal forms (Quirk & Greenbaum, 1973). The use of modal constructions allows the speaker to modify the directness of a statement or question. The speaker's choice of a specific modal construction (WOULD, COULD, MAY, etc.) represents expressions of degrees of politeness intended to encourage the listener to accept the request made by the speaker. These four roles of auxiliary and modal verbs (constructing Interrogatives, adding meaning, establishing conditions, and expressing politeness) contribute to available forms in English that may be used to express questioning functions. Whether these forms are in fact used in aviation discourse to convey questioning is an important element of this study. A more detailed discussion of politeness in English will be presented later in this chapter in Section III, Pragmatics.

Objections to Syntactic Analysis

Grammatical descriptions have provided a foundation for investigating the forms of questions in English. However, there are several objections to using only a syntactic focus on interrogatives when studying questions. Aijmer & Stenström argue that a purely syntactic analysis focuses too heavily on complete sentences as the crucial structure for understanding language (Aijmer & Stenström, 2004). Another important objection to syntactic analysis is that sentences used for descriptive examples have not been drawn from authentic contexts, but have been constructed simply to illustrate the grammatical feature under examination (p. 2). Bolinger (1957) admits that he generated his own examples, in part, because designing his own examples was more convenient than searching for authentic material since “collecting instances of many borderline phenomena would have taken more than a lifetime” (Bolinger, 1957, p. iv).

A third objection to a grammatical analysis of language argues that a purely syntactic approach is too heavily based on the form of sentence(s) without addressing the contribution of either the listener or the context in which the discourse takes place. As a result, a grammatical approach that focuses only interrogatives as doing questioning also suggests that language exists “as an autonomous system” independent of the roles the participants in which the discourse occurs (Schiffrin, 1994, p. 22).

Syntax: Conclusion

This section began with an examination of interrogative forms of English clauses: WH-word, YES/NO and TAG questions. In addition, the role of the expected response to the construction of a given interrogative was discussed. Variations in clause structure included a discussion of ellipsis and multi-clausal constructions. Forms for non-interrogative clauses, both imperative and declarative, were also outlined. The role of intonation-based questions as an added feature to convey the speaker’s meaning was presented in conjunction with a brief look at how intonation modified certain general grammatical category definitions.

The final portion of this section presented three objections to using a syntactic analysis for the study of discourse. The objections included a lack of attention to analysis beyond the sentence level and the lack of authentic examples to support the definitions.

The syntactic classifications outlined in this section provide an overview of questioning forms found in English clauses: interrogative, imperative and declarative. In addition, questioning forms use auxiliary verbs, modals, and certain intonation features add to the resources available in syntactic and semantic constructions. Each of these forms will be used as the foundation for analyzing question forms and functions found in the aviation data discussed in Chapter V (Results).

Based on the evidence presented in this section, what is a question, grammatically speaking? The grammatical definitions discussed here suggest that interrogative syntax is constructed to obtain a specific type of information in the response to WH-word, YES/NO or ALTERNATIVE questions. However, the syntactic structure of interrogative, declarative or imperative forms may overlap when the speaker utters a phrase or clause when intonational markers are used to shift a declarative statement to a questioning function. Consequently, analysis of syntax alone, even with the incorporation of intonation features, does not provide sufficient information to clearly explain what is meant by questioning.

The next section looks at the role of Speech Acts in describing functions of language, specifically to focus on how Speech Act theory contributes to further understanding the function of questioning. Following the discussion of Speech Acts, a third section will look at discourse-based analysis of questioning functions. Pragmatic issues of politeness and intonation will be presented in Section V. This chapter will conclude with a working definition of questioning as a function of interaction between the speaker and listener.

Section III. Speech Acts: Questions and Requests

This section will look at the impact of Speech Act Theory toward building a broader definition of questioning.

Speech Act theory: A Philosophical Approach

Grammatical descriptions, or syntax, are not the only available explanation for how a speaker conveys a message to a listener. Another approach grew from the philosophical analysis of how spoken language is used rather than how it is syntactically arranged. In addition, research also began to study more closely the role of the listener as a target of the speaker's discourse rather than simply examining the grammar of utterances. As a result, language analysis expanded from a grammatical methodology to incorporate a functional approach through Searle's Speech Act theory (1969). Speech Act theory proposed that the speaker's intentions or functional purpose dictates the speaker's choice(s) of language structure(s) even prior to beginning to speak (Schiffrin, 1994). Important to this approach is the speaker's expectation that the listener will have the linguistic as well as social and contextual understanding of the speaker's intentions as well as the speaker's meaning (Wardhaugh, 2002).

J. L. Austin (1962/1975), a philosopher exploring the relationship between words and actions, proposed that sentences may represent more than simply describe what the speaker is doing at the time of the utterance. Austin linked actions with associated verbs in sentences as "performatives" (p. 6). For example, when a speaker states, "I name this ship the *Queen Elizabeth*," the speaker is in the process of officially naming a specific ship (pp. 5-8). Inherent in this act of naming the ship, more precisely, the performance of the action of naming the ship, is the speaker's intention to name the ship and assumes the speaker has the authority to name the ship. In addition, the underlying truth (or authority granted to the speaker) that allows the speaker to perform the action is also considered necessary for the action to take place under favorable, or "felicitous" condition(s) (Austin, 1975, pp. 10-11). If there is a failure in the action to take place or a speaker is insincere (i.e., lacks authority) when performing the action, then the utterance becomes "unhappy" or contains "an "infelicitous act" (pp. 15-16).

Austin's approach divides utterances into three phases, or "speech acts": *locutionary*, *illocutionary* and *perlocutionary* (Austin, 1975, p. 109). The locutionary act represents what is said (literal meaning) by the speaker; the illocutionary act (or intended "force") represents what is intended by the speaker, while the perlocutionary "force" represents what is (or isn't) actually accomplished by the utterance (Archibald, 2001, p. 455; Austin, 1975, p. 121). Specifically, Austin notes that through the locutionary act the speaker performs an action such as "asking or answering a question," or "giving some information…" (p. 98). At the same time, Austin also emphasized that situational context dictates the purpose for which specific language forms are used. Austin is clearly separating what is said from what happens next in the interaction. The listener's (verbal) response is a separate utterance; therefore it is independently subject to classification as a separate Speech Act. But by separating the response from the initial utterance, the classification system also isolates the complete interaction into separate speaker roles and provides minimal means to relate the speech act of the first speaker to the speech act of the second speaker.

Austin concludes that any proposition (utterance) as it is syntactically formed cannot explain the entire intention of the speaker's message. Instead, he argues that "we must consider the total situation in which the utterance is issued—the total speech-act…" (Austin, 1962/1975, p. 52). This "total situation" defines "how the words stand in respect of satisfactoriness to the facts, events, situations, etc., to which they refer" which causes the context to emerge as a critical component of the interpretation (p. 149). This approach also implies that infelicitous performatives may also contain intentional degrees of truth/falsehood or reality/unreality that operate on a separate level from the speaker's ability to express the performative and to be understood by the listener.

Building on Austin's work, Searle (1969) reclassified Austin's word-based categories (performative verbs) in terms of *functional* purposes based on the premise that "sentences, not words, are used to say things" (p. 25). A REQUEST, for example, is used by the speaker to ask for some action on the part of the listener; in contrast to a QUESTION which is used when the speaker seeks only information (Searle, 1969; Searle & Vanderveken, 1985). When a speaker solicits information, such as "What time is the plane arriving(?)," there is no physical behavior requested, these utterances become questions. But in examples such as, "Will you get me the mail?" or "Get me the mail, won't you?" these speech acts become requests if the listener is expected to alter his current behavior to do as requested by the speaker.

ORDER and COMMAND fall within Searle's (1969) REQUEST type. A *command* is distinguished by the pragmatic condition that to issue a command to someone, the speaker must be in a position of institutional authority over the listener (an asymmetrical relationship which is more likely to compel the listener to act accordingly) (Leech, 1983; Quirk et al., 1985). In contrast, an *order* has only the illocutionary requirement that the speaker is in some form of authority (not officially sanctioned by some legitimate agency) (Searle & Vanderveken, 1985). Unlike commands, the issue of authority for questions and requests is not relevant: the speaker is merely attending to the gap in knowledge, and asking for information that is relevant to the specific context.

Searle also categorized INDIRECT speech acts as necessary to more accurately reflect the speaker's intentions (G. Brown & Yule, 1983; Searle, 1969). Indirect speech addresses utterances in which the speaker may make an overt statement that also has one or more covert connotation(s) or intention(s) that do not match the speech act of the performative verb (Searle, 1969). Searle's classic example of a multi-level speech act is "Can you pass the salt?" (p. 30). Two meanings can be extrapolated from this sentence: (1) whether the listener is physically able to do such an action, but also (2) would the listener actually move the salt in the direction of the speaker. The speaker's choice of phrasing as a request of ability, is also intended to convey the speaker's desire to have the listener actually pick up the salt container and give it to the speaker. Thus the speech act is a Request, not a Question, since it suggests the speaker's underlying intention to get the listener to accomplish a particular action. Searle (1979) notes that imperatives and "explicit performatives" are commonly rephrased as questions in order to meet social norms for politeness, "the chief motivation for indirectness" (p. 36). The application of connotation expands the syntactic explanation (see Quirk et al (1985) and Bolinger (1957) in the previous section) so that the listener is not only responsible for understanding the grammar, but also making the appropriate interpretation of any indirect intent of the utterance (Wardhaugh, 2002). Indirectness is applied to the specific circumstance in which the utterance is made, identified as “the *speaker* meaning,” which extends beyond “the sentence meaning,” (syntactic/semantic meaning) which would remain constant if the sentence was taken out of its social context (Searle, p. 43).

Because both roles of speaker and listener are included in Speech Act theory, a more interactive approach to examining discourse is created. Schiffrin (1994) notes that each speech act also helps anticipate the type of response expected in the next speaker’s turn, thus “provide[s] a local, sequentially emergent basis for discourse” (p. 91). Due to the options created by both direct and indirect speech in each utterance, each speech act is also connected to the acts that precede or follow it.

Objections to Speech Act Theory

Austin and Searle have added to the understanding of how language is used beyond syntax. Speech Act theory provides an explanation as to why speakers choose specific forms to express their intentions and the Cooperative Maxims suggest how listeners are able to interpret those intentions from the discourse within the situational context. However, there has been criticism of Speech Act theory as a means to analyze conversational interaction. One major objection is that each Speech Act classification is generally derived from the (performative) verb within an individual clause. Searle & Vanderveken (1985) attempt to address this issue by stating

> “…a fairly high degree of idealization is necessary to give a systematic account of these verbs…We will be concerned with the central or standard or paradigmatic illocutionary senses of these various verbs and even those

> senses we will have to idealize to some degree in order to give a systematic account" (p. 181).

In the same volume, however, there is an extensive appendix entitled "Semantical analysis of English illocutionary *verbs* [italics added]" (pp. 180-216). Using headings for the five types of illocutionary forces (directives, assertives, etc.), specific verbs are described with examples provided to support the explanations. If the "senses" or meanings can only be interpreted in an "idealized" manner, there remains considerable leeway for establishing the "ideal" meaning and how it applies to the discourse context.

In addition, there have been objections to Searle's classifications since the examples he cites are specifically created to substantiate theoretical claims rather than examples drawn from authentic discourse data. For researchers analyzing actual data,

> "…language in use contrasts so strikingly with the language imagined by those working on the theory of speech acts is, I suggest, an issue for speech-act theory…Speech Act studies present "recreated" examples of utterances which lack this [morphosyntactic, intonational, sequential] complexity" (Weber, 1993, p. 221).

The discrepancy between carefully constructed sentences and authentic discourse also implies that the theory is less satisfactory when applied to actual speech, an issue that becomes more pronounced with longer stretches of discourse or multiple participants.

Quirk et al suggest that a more precise meaning of "speech act" is that these utterances are "acts of verbal behaviour" and should not be directly assigned to precise meanings of specific verbs (Quirk et al., 1985, pp. 804-805). Quirk et al argue that only "occasionally" does the speaker match an illocutionary act with the corresponding performative verb; therefore, the context dictates the meaning of the verb, thus a performative verb does not rely on its "central, paradigmatic meaning" as posited by Searle & Vanderveken (p. 181). In other words, the context of the discourse may apply additional or alternate meanings beyond those explanations, and that listeners also need to attend to the context to make a successful interpretation of the speaker's meaning.

Another criticism is that the system does not allow for the influence of other features occurring within the sentence or the use of several sentence clauses to accomplish a single intention (G. Brown & Yule, 1983). These objections are grounded in research that has shown the function of a given utterance may have multiple interpretations which can include various pragmatic features, such as irony or sarcasm, in addition to the syntax and semantics (Quirk et al., 1985; Weber, 1993). In addition, Searle noted that variations of intonation caused indirect utterances to shift meaning from that of the corresponding literal or direct utterance, but he offered no explanation as to how to apply these shifts to the meaning of performative verbs.

In consideration for truth/falsity conditions in discourse, Givón argues that questions and commands (as non-declarative speech acts) do not "assert that some information is either true or false… [and that such an assertion] is but a small portion of the functional domain of speech-acts" (pp. 242-243, vol. II). Both "declarative and non-declarative speech acts" are clearly differentiated by virtue of their "notion of truth," but they are tied together for a broader functional purpose in the discourse (p. 241, vol. II). Bolinger (1957) had noted that "YES/NO questions are essentially true-false questions," an important concept in the philosophical foundation established by Austin and Searle. For TAG questions, the principal clause of the sentence is in a declarative form which is assumed to be true, however the TAG element, as an interrogative form, calls the truth into question (p. 29). Similarly, a stronger stress on the YES/NO element (as noted in the syntactic discussion above) corresponds with the typical English accent pattern that puts stress on the key element of the sentence (pp. 23-24).

It is the complexity of human language itself which demonstrates the major weaknesses of Speech Act theory. Relying on artificially created examples and focusing on verb-based analysis of individual sentences, Speech Act theory fails to fully explain how language is constructed by the participants. In addition, by considering only the speaker's language, the theory is unable to fully account for why the function(s) of a given utterance may cause problems in understanding the response or even in the listener's ability to comprehend problematic utterances (poor speech, hesitations or repetitions in the utterance) as in a situation where a deliberate use of an infelicitous performative cannot be separated from an accidental use of an infelicitous performative. A further weakness is that utterances (statements or questions) with more than one full clause cannot be analyzed as a unit, but must be separated into individual acts.

Cooperative Principle

If conversation, including questioning, is sequentially constructed in relation to the previous utterance(s), then participants should share a common objective for successfully sequencing the interaction. Grice (1967/1975), also drawing from a philosophical background, believed that the shared objective in conversation was founded on a "Cooperative Principle" that guides the participants in "a common purpose or set of purposes, or at least a mutually accepted direction" (p. 45). The Cooperative Principle assumes participants collaborate to accomplish the interaction by following four conversational "Maxims" that represent the essence of the Cooperative Principle: *quantity*, *quality*, *manner*, and *relation* (pp. 45-47). In other words, conversations should contain enough information (*quantity*) without being ambiguous (*quality*) while representing true conditions (*manner*) that are relevant to the specific conversational situation (*relation*).

Any speaker may modify or diverge from these Maxims in order to more accurately achieve the speaker's intentions through deliberate choices of syntax, semantics and prosody. Grice recognized that speakers may deliberately modify, or "fail to fulfill," one or more of the maxims and, by default, fail to invoke the Cooperative Principle (1967/1975, p. 49). As a result, the speaker's intentions are expressed through "conversational implicature(s)" which convey a more precise meaning indirectly, relative to the degree that the utterance does (or does not) follow the cooperative principles of conversation (p. 49). The Cooperative Principle expands the Speech Act approach by recognizing the mutual role of the participants in developing the cooperative sequencing of the talk. The maxims represent the means by which each participant's intentions are expressed during the interaction.

How does Speech Act theory and the Cooperative Principle contribute to the present discussion of questioning? Broadly speaking, Speech Act theory shifts analysis of spoken communication from a purely syntactic or semantic view to begin to focus on not only the speaker, but the speaker's intentions toward the listener. Austin added the element of the *speaker's* intention and the consideration of whether the speaker is successful or unsuccessful in accomplishing that intention. Austin (1962) also takes into account the infelicitous result of speech acts that incorporate deliberate use of irony or sarcasm. Searle contributed by including the (indirect) role of the listener who must interpret the speaker's intentions as well as the words. But a Speech Act approach still examines discourse at the sentence level (verb-based) and requires recategorizing every utterance as a new Speech Act. As a result, this approach minimizes the joint contribution of both participants in the whole interaction process.

The Cooperative Principle (Grice, 1967/1975) provides a framework for understanding how the joint contribution is organized. In addition, Grice's four Maxims show how speakers use a variety of strategies to convey more implicit meanings that indicate whether or not the speaker is being truthful.

Speech Act (1969) definitions for *question* and *request* types indicate that a question is based on the speaker's need for information from the listener, while a request assumes that the speaker needs some kind of action to be performed by the listener. Searle admits that these distinctions are often not made in actual usage since speakers may choose either of the speech acts while ignoring the semantic form. In spite of this overlap in semantic choices, Speech Act theory expands the notion of questioning by adding the speaker's intentions (as a cognitive action) to the speaker's syntactic/semantic utterance. Further, Speech Act theory and the Cooperative Principle also provide a foundation for investigating the role of the listener's answer (or response) in structuring the conversation. In other words, whether or not the listener provides the information or performs the requested action expressed in the query will have a direct impact on the direction and sequencing of the interaction.

Section IV. Discourse as Interaction

The previous sections have focused on the analyses of language using syntactic form and sentence level constructions. A key issue for these approaches was that there was little consideration of how the utterances actually functioned to achieve a mutually constructed interaction. This section will discuss research addressing discourse-level analysis of utterances as collaborative relationships between speaker and listener.

As study of language expanded beyond Speech Act theory, the focus shifted from investigations of the speaker's language to examining the conversation and the conversational context in which the participants interact. An essential feature of this approach focuses on the *function* of the utterances as a fundamental component of analysis, based on examining the discourse "as a system (a socially and culturally organized way of speaking) through which particular *functions* are realized" (Schiffrin, 1994, p. 32). A functional analysis also included examination of "language above the sentence" which created the opportunity for a "more open discovery of unanticipated uses of language" (p. 33). As a result, functional research began re-examining grammatical structures as they relate to the functional use of language:

> "A central tenet of the researchers defining this area has been that, if we take seriously the claim that the function of language as a tool of human communication is the central motivation for observed grammatical patterns, then the study of grammar entails both taking actual discourse as one's primary data, and explicitly relating the structure of grammar to the structure of discourse…" (Ochs, Schegloff, & Thompson, 1996, p. 10).

The interactive nature of discourse also permitted a broader interpretation of *questioning* which will be used as a foundation for the analysis used in the present study.

The Cooperative Principle suggests that the speaker/listener goal of cooperation serves to accomplish the expectations of the interaction. if there is a question, then the cooperative principle suggests there should be an answer that follows the question due to the expectations of the original speaker. There expectations (derived from expected or anticipated answers are more than simply filling a gap in the speaker's information. The speaker expects to receive an answer and the listener plans a response to provide it. Thus, the Cooperative Principle and Speech Act theory suggest the role of intentions and expectations to provide the participants with a framework for mutual understanding as to the *functions* expressed as questions. Stenström (1984) identified four general functions in questions. The first two functions, labeled "g," are those utterances used in "eliciting or re-eliciting a speech exchange.

The superordinate questions function to initiate an interaction to address missing information about a given proposition or to continue the interaction to provide more information to complete the proposition (Stenström, 1984, 149).

These questions are designed to only further an exchange currently in progress, such as asking the listener to "supplement details lacking in the discourse (clarifying or repeating)" or to "confirm the adequacy of the response (checking if the response was satisfactory)" (Stenström, 1984, p. 151).

Schiffrin (1994) reorganized Stenström's four questioning acts into "three communicative types" (Moder & Halleck, 1998). Schiffrin (1994) identified questioning types as those which seek information, obtain clarification or check the accuracy of information provided by the previous speaker.

Information-seeking questions drawing from Stenström's superordinate function, ask for specific information is unknown to the speaker. Questions of this type may be fulfilled by WH-questions, which fill a "gap of information" with an "open range of replies" (Quirk et al., 1985).

Information-checking questions, adapted from the subordinate category, serve to either check on "one's own talk…or another's talk" (Schiffrin, 1994, p. 183).

Information-clarifying questions, also from the subordinate category, are used to more fully explain or repeat some piece of information in the previous turn(s).

Two features of discourse categories address the present study of questioning: answer/response, as "second-pair parts" described under adjacency pairs, and the role of pragmatics in questioning, in particular politeness markers and intonation. This section addresses the literature that discusses these interactive functions of questioning, while the effects of pragmatic features will be addressed below in Section V.

As noted in the previous section (Syntax), a syntactic analysis of any research corpus can only provide information as to the grammatical features of each questioning form; thus, a syntactic approach requires all non-grammatical questioning forms to be discarded as errors in speaking. But function-based research has demonstrated that these non-grammatical segments of language are, in fact, not only relevant, but important to the emerging discourse and must also be accounted for when constructing descriptions of language use (G. Brown & Yule, 1983; Halliday, 1973; Schiffrin, 1994). The study of discourse incorporates a focused analysis of the broader interactional situation through the study of structural features inherent in samples taken from authentic conversational contexts (P. Brown & Levinson, 1978, 1987; Schiffrin, 1994). A fundamental principle of discourse analysis is to examine the actual interaction as raw data to discover the structure revealed in the context and only then seek to correlate the features with other discourse samples (Sadock, 1974; Schiffrin, 1994). As a result, discourse-based research has shown specific interactive features that occur in identifiable regularity within conversation, demonstrating patterns, or rules, which affect speakers' choices of language (see Sacks, Schegloff, & Jefferson, 1974; Schegloff, Jefferson, & Sacks, 1977, etc.). This rule-based behavior directs the ongoing development of the conversational sequences as well as takes into account the dual roles of both speaker and listener for each participant in the interaction.

Context

Context, a feature brought in from an ethnographic approach to discourse studies, emphasizes that the speakers alone do not supply all the meaning to a given interaction (G. Brown & Yule, 1983). Drawing on work by Hymes (1964), Brown and Yule point out that identifying the discourse context not only includes the participants, but also such features as the time (a historical period or contemporary moment), the type of interaction (conversation or argument, etc.) and the location where the interaction takes place (restaurant or apartment, etc.). As each of these features is changed or modified, the interaction itself reflects, to some degree, the different contextual features that become relevant for the particular interaction (G. Brown & Yule, 1983).

Interaction

Since speech events involve two or more participants, the analysis of discourse context also looks beyond the syntactic and semantic levels to examine what each participant contributed to the speech event. The context and the role of each participant contributed to a view of interaction where "since language is dialogic rather than monologic…[and] is constitutive of social relationships" (Davies, 2005, pp. 65-66). This socially-based, or interactive, view of discourse represents a significant departure from earlier definitions of speech which focused on the role of the speaker's grammar or intentions. From a functional view, the success of the interaction is determined through the cooperatively constructed utterances between the speaker and listener. As a "problem-solving tool" (Goody, 1978), the functions of question are to attract a response containing the speaker's desired new or additional information. The recognition or interpretation of the utterance as having a questioning function thus directly involves the listener who, following the rules of cooperative maxims, needs to produce a contextually appropriate response to the form and function of the question form.

Conversation Analysis

The exchange of utterances in a cooperative or interactive context can also be analyzed as a larger unit of discourse, specifically as a conversation. This approach to discourse evolved from research in ethnomethodology and sociology rather than from syntax and speech act studies. Conversation, as a product of social interaction, "both creates and is created by social context" (Schiffrin, 1994, p. 232). Since utterances are constructed during a locally-specific interaction, the particular function of an utterance is also highly dependent on its sequential position within the interaction than on the syntactic form of the utterance (Sacks et al., 1974; Schegloff et al., 1977). For purposes of this study, five elements of conversation are examined for their contribution to understanding how participants recognize and determine appropriate responses to each speaker's utterance: turn-taking, adjacency pairs, response/follow-ups, side-sequences, and repairs. The discussion will end with an overview of the functions of questioning: information seeking, information clarification and information checking.

Turn-taking

A basic feature of conversation is that two or more people are involved in a turn-taking process rather than all participants speaking at the same time. In their revealing study on turn-taking, Sacks, Schegloff and Jefferson (1974) determined that turn-taking is carefully organized and not a random series of utterances. The turn-taking system is both "context-free," as it happens in all conversations, and it is also extremely "context-sensitive," as each conversation will have turn-taking conventions with "local particulars," or rules sensitive to the immediate social situation, topic and participants (Sacks et al., 1974, p. 700).

Further research by Ford & Thompson (1996) showed that turns are also interactionally defined through intonation and syntactic units that project syntactic, intonational and pragmatic completion of the speaker's turn. A successful completion of the turn happens when the listener recognizes the opportunity for taking a turn and thus "displays the joint management of interaction" (Ford & Thompson, 1996, p. 172). Completion of syntactic units is the strongest indicator for speaker recognition of turn completion, but the speaker's recognition of syntactic completion still takes into account the features of intonation and pragmatic completion.

In questioning, not only is the speaker yielding the current turn, but the speaker's utterance also specifies the range of response topics that are expected to follow. As a result, certain syntactic, semantic and/or intonational features of the questioning form constrain (although do not necessarily require) specific types of lexical structures to follow the questioning item; in other words, there are verbal patterns of questioning and responses which occur regularly in conjunction with one another. Stenström's (1984) definition of questioning proposes a functional interpretation which incorporates the expectation of a forthcoming response by the listener during a questioning interaction:

> "Given that the speakers A & B cooperate, a question (Q) is any utterance by A that *may elicit a response R from B*; R is consequently an utterance elicited by Q…" (1984, p. 81).

Elicitations, a term used by both Stenström (1984) and Tsui (1994), are those utterances which function to request (or 'elicit') a linguistic response. The added feature of "elicit[ing] a response" emphasizes the interactive nature of questioning in a way that grammatical and speech act definitions did not address. Stenström's definition suggests that a verbal question cannot exist in isolation; rather it requires a context directly associated or paired with the potential for an answer or response. The question is a discourse move by the speaker to elicit from the listener some information that is unknown to the speaker, the "gap in information" described by Quirk et al. in the earlier section on Syntax (1985, p. 1051). Thus, an operational definition for questioning requires not only a means to initiate a request for information, but specifically an utterance that *expects an answer* in the immediately following context (Goody, 1978; Stenström, 1984). Whether or not the response provides the information sought by the speaker is not a required criterion to define questioning, rather it is the appearance of an utterance functioning as response or answer that becomes the criterion of a successful questioning move.

Adjacency Pairs

This pairing of certain linguistic features in conversation, such as question-response sequences, is known as “adjacency pairs” (Schegloff & Sacks, 1973, p. 295). Although the pairs may occur at any point in a conversation, they have several unique characteristics: they represent a two-turn sequence of utterances, the utterances are joined in a sequence (“adjacent”) and each turn of the pair is spoken by a different speaker. An additional feature is that the paired utterances also occur in a specific sequence designated as a “first pair part” and a “second pair part” since the first element of the pair never appears in the second slot in the sequence when the pair occurs in an interaction, or vice-versa (p. 296). Because these paired sequences occur regularly in conversation, once the initial or first pair part is spoken, that turn ends and the original speaker waits for another speaker to respond with a turn containing the second pair part. Common examples of adjacency pairs include greetings, leave-takings, initial greetings in telephone calls, etc.

Although a certain type of response is expected, the second part of the exchange may be realized through a variety of syntactical constructions (Sacks et al., 1974; Schegloff et al., 1977; Schiffrin, 1994). Question-answer sequences have been typed as adjacency pairs, although there is some disagreement as to whether these sequences are truly pairs. Goffman (1976) suggests that to define questions in terms of items requiring an answer is not really defining the question except to point out that the two utterances are semantically related to each other. According to Goffman, the distinction is made that all *answers* are not necessarily *responses* to the question, while *responses* can be used to continue the conversation following a question without necessarily answering the question. Although the responses to questions are commonly described as using declarative forms in terms of the question just asked, not all responses occur in declarative form, nor are they automatically topically relevant to the question (Stenström, 1984). In some situations, a temporary interruption occurs when the listener asks another question, while in other conversations, a temporary interruption is caused when the speaker or listener needs to amend, or repair, something just said. However, even if the interruption is resolved through one or more turns, the original question may still remain unanswered. These types of temporary interruptions will be discussed below under "Side-sequences" and "Repairs."

Response + Follow-up:

Stenström suggests that although the function of REQUEST overlaps with QUESTION because the two categories both serve in initiating and maintaining conversational exchanges, questions are distinguishable from requests on the basis of how many turns are required to complete the transaction. In a REQUEST, there are only two turns: the initiating question completed by the response of the second speaker. For Questions, the initial question is addressed by a Response by the second speaker which is then attended to via a Follow-up utterance from the first speaker (Stenström, 1984, p. 68). Stenström argues that the follow-up provides a "reinforcement" or confirmation of a previous response and also serves as a "termination" the original questioning sequence (p. 237), as shown in Figure 2.8.

Figure 2.8 Response or Termination of Question Sequence

a.	[Question]	Has Ann left?
b.	[Response]	Yes
c	[Follow-up]	Oh, I see

(Stenström, 1984, p. 237)

The Follow-up utterance provides "a reaction to the Response," one that will affect the turn-taking process in the next conversational sequence (p. 69). Stenström also argues that declarative statements that convey an acknowledgement do not anticipate a further follow-up response.

Some linguists have also questioned the two-part "adjacency pair" model as a result of research based on classification of classroom interaction by Sinclair and Coulthard (J Sinclair & Coulthard, 1975; Stenström, 1984; Tsui, 2002). This study of classroom discourse revealed that the question-answer (as a paired sequence) model was not absolute. A key finding was that classroom discourse typically incorporated a third turn which allowed the teacher to provide a judgment of the student's answer in an "initiation-response-feedback" sequence (Coulthard & Brazil, 1992, p. 65). The third turn (the teacher's response to the student's answer) specifically functions to evaluate and/or comment upon the second rather than simply provide a speaker follow-up to the response to the question.

Whether the "paired" sequence occurs as a two-part question/answer or as a three-part question/response/follow-up sequence, research has also shown that the sequence may not proceed smoothly in all conversations. As the interaction progresses, there may be interruptions that restructure the location of the answer relative to the corresponding question or delay a response to the question.

Research has also shown that not all conversation or discourse analysts agree that the utterance following a question is inevitably a direct response to the question (Jefferson, 1972b; Stenstrom, 1994). The speaker may be successful in eliciting a verbal response, but the direct response to the question may take a non-verbal form, such as a physical action [see Speech Act theory-request in Section II] (J Sinclair & Coulthard, 1992). Schegloff and Sacks (1973) suggest that location provides the primary clue in whether or not an utterance is "accomplishing the answering…[but] only by consulting its sequential placement…after a question" (p. 299). In other words, utterances following a questioning form may not be the appropriate definition of answering. As noted above in describing features of questioning, responses to questioning are expected by the speaker due to one of the key features of the structure of conversation: sequencing of certain types of utterances, but the precise location of the answer may be found beyond the immediate next utterance.

Side Sequences: Multiple questions within an interaction

Both Schegloff (1972) and Jefferson (1972a) discuss the condition where a questioning sequence can be interrupted by another question designed to not specifically address the topic, but rather present a verbal comment that may or may not relate to the principal topic at hand. Referred to as an "insertion sequence" (Schegloff, 1972, p. 78) or "side sequence" (Jefferson, 1972b, p. 294), these additional exchanges still retain the structure of the adjacency pair, as shown in Figure2.9. These secondary questions within the original question-answer sequence are considered as "embedded" within the original question which cause “a temporary hold-up which is often necessary for the completion of an exchange” (Stenström, 1984, p. 111).

Figure 2.9. Side Sequence

a. A. Would you like to come to the concert?

b. B. What time is it?

c. A. It begins as five.

d. B. OK, I’ll be there.

(example from Stenström, 1984, p. 111)

In Figure 2.9, A’s original question in line a. is not answered until line 4. B’s question in line b. does not directly answer A’s question. Beginning in line 2, the new question represents a “side sequence,” which is answered by A in line c.

The secondary question (line b.) disconnects the original question from the response in line d. (which generally appears soon after the interruption is resolved), these sequences become subsets within the original adjacency pair. The new question has been inserted into the expected *answer* position, so the second *question* is perceived as a response relevant to the ongoing conversation but temporarily halts attention to the broad topic and focuses the conversation on the topic of the new question (Schegloff, 1972, p. 78). Thus, even though the secondary question/answer sequence (lines b.-c.) doesn’t resolve the original information gap, the turn-taking sequence is maintained in an expanded form. As a result, the overall expectation of a response is achieved for both the embedded or side sequence as well as for the original question – although it may take several turns to accomplish the resolution of the original question.

Repairs

In addition to adding information through the interrupting "side sequences," participants may also temporarily halt the flow of a conversation when they recognize that some form of miscommunication has occurred through the use of "repairs" or "repair sequences" (Sacks et al., 1974, p. 724; see also Schegloff et al., 1977). The repair-response pattern follows the side-sequence model by causing a temporary delay in the ongoing interaction. This delay occurs when participants' expectations regarding the conversation are violated in the immediately preceding utterance. In the Figure 2.10, speaker B asks "where?" in order to repair the expectation of a specific location in speaker A's original utterance.

Figure 2.10. Conversational Repair

a. They gotta- a garage sale.
b. Where?
c. On Third Avenue.

(Sacks, Schegloff & Jefferson, 1974, p. 271)

The repair-sequence interruption, created by problems in either prosodic or semantic content, provides an opportunity to correct or clarify a linguistic element of the conversation, not the topic of the conversation (Goffman, 1976).

Either the speaker or listener(s) in a conversation may initiate the repair sequence, but until the repair is resolved, the original topic will not be continued. If the speaker recognizes that an utterance-in-progress has a problem, the speaker will typically stop the interaction and "self-correct" to address the faulty item as soon as it is noticed rather than wait for another participant to make the repair (Goffman, 1976, p. 289; see also Jefferson, 1987; Tannen, 1993). But because the participants continue to work together while repairing the talk, the cooperative function of the conversation is maintained (Crystal & Davy, 1975, in Stenström, 1984, p. 21).

Functions of Questions

These elements of discourse, turn-taking, adjacency pairs, response patterns, side-sequences and repairs are also important features contributing to understanding the functions of questions. The overall function of questions is to provide missing or misunderstood information (Quirk et al., 1985). Questions are used as an opportunity to request additional information, to seek clarification or to simply confirm the accuracy of information provided by the speaker (Moder & Halleck, 1998; Schiffrin, 1994).

Conversation Analysis: Conclusion

In addition to the context and interaction of a particular situation, a conversation is constructed through the sequences of turns and the topics addressed in those turns. In questioning utterances, the question, as a first part pair of an adjacency pair sequence, functions to request missing or unclear information while the answer, as the second part of the adjacency pair, functions to respond and supply the information that is lacking. However, due to conversational strategies such as side sequences, the notion of what constitutes a response may not be located in the turn immediately following the question. In analyzing discourse, the concept of discontinuous adjacency pairs further confirms the need for examining discourse beyond one or two utterances. This broader look at the interaction allows examining a question and determining whether or not the following utterance functions as the "answer" to that specific question and how that response structures the subsequent interaction. Discourse-level analysis moves beyond the immediate next turn to determine where the actual response is located while also considering the effect of any intervening discourse for the overall interaction.

By looking at longer stretches of discourse, conversation analysts discovered that participants organized their interaction through understanding appropriate use of turn-taking and making any needed repairs in order to successfully continue the dialogue. Careful analysis of questions in interactions showed that while question/answer routines are paired in that answers follow questions, the question-answer routine may not appear in sequence, but may be separated in the discourse due to repairs or side sequences that are needed to provide mutual satisfaction for all parties in the interaction.

For the study of questioning, the adjacency pair model provides the foundation for examining the interactive function of questions and their responses, but also points to the importance of taking into account any temporary interruption, through repairs or side sequences, which may sidetrack participants, before the expected answer is provided. Generally speaking, a discourse-based description of questions suggests that the use of a question not only represents a need for information, but also requires that the new or revised/clarified old information be supplied to adequately respond to that question.

Section V. Pragmatics

This preliminary description of questions will be important for the next discussion which addresses pragmatic resources of interaction that include intonation, indirect and polite speech and non-interrogative syntax that are also used in questioning functions. These additional elements contribute to the participant's knowledge that "the utterance is functioning as a question rather than as a statement" whether or not interrogative syntax is used (Weber, 1993, p. 124). Although Leech (1983) argues that context does not always figure into a pragmatic analysis, the literature on pragmatics generally focuses on the role of a specific context to enhance the speaker's meaning (P. Brown & Levinson, 1978; Levinson, 1983; Yule, 1996). In this section, intonation will be considered separately from pragmatics due to the attention given in literature on intonation as an additional resource to convey speaker intent (Couper-Kuhlen & Selting, 1996; Levinson, 1983; Selting, 1992; Weber, 1993; Yule, 1996).

Pragmatics considers the role of social implications of the discourse as "the study of speaker meaning" (Yule, 1996, p. 3), "the study of language usage" (Levinson, 1983, p. 5) or "study of the general conditions of the communicative use of language" (Leech, 1983, p. 10). The functional study of discourse pragmatics projects the analysis beyond the sentence and incorporates the effect of the social context with the individual utterances (Schiffrin, 1994). In other words, the context established through the cooperatively constructed interaction of the participants as well as their verbal choices is keenly affected by their social (i.e., interpersonal) relationship (G. Brown & Yule, 1983; Mey, 1998). An important aspect of a pragmatic analysis is examining how the situational context affects the speakers' intentions in terms of their personal or professional relationship.

Intentions

The participants must not only address literal meaning and social cues within the message, but must also, as suggested by Speech Act theory and the Cooperative Principle, interpret each speaker's *intentions* as the discourse evolves (G. Brown & Yule, 1983; Grice, 1975; Searle, 1969). Brown and Levinson (1978) claim that a speaker uses indirect language to convey a specific relationship between the speaker (self) and the participant(s) (other). By combining lexical structures with carefully chosen intonation and manner of speech, the speaker seeks to successfully achieve his intentions for the interaction relative to the speaker's assessment of what the listener is able to interpret and is willing to do for the speaker. The pragmatic force departs from a speech act interpretation because pragmatics includes the listener's "willingness," not just his/her capacity beyond the illocutionary force. As a consequence, the linguistic strategies employed by the participants are based on their individual understandings of the social relationships of the interaction. Depending on the specific interactional context, these strategies may be realized through combinations of syntactic, semantic or prosodic forms, such as indirect requests or politeness expressions used in questioning to satisfy the gap in the speaker's knowledge.

Indirect Speech Acts

There are numerous ways of addressing the gap of information which invites a response from the listener(s) dictated by the specific context, the persons involved and the immediately preceding utterances. An INDIRECT REQUEST, also categorized as an Indirect Speech Act, takes the form of an overt request which has been modified through syntactic and semantic features to convey a more covert implication or meaning (Levinson, 1983; Searle, 1979; Shapiro & Murphy, 1993; Stenström, 1984; Yule, 1996). Interpreting these indirect requests requires that the hearer recognize not only the invitation to produce information but also to recognize the implicit social rules of language use in order to formulate an acceptable response (Searle, 1975).

Discourse analysts also recognize that speech is not always neatly divisible into the categories discussed in the previous sections. The function or the context of each utterance in the interaction may bridge several categories (such as across the divisions of Speech Acts or types of indirect speech or answer/requests) as the listener interprets the speaker's message (Allan, 1998; Leech, 1983). This is especially true when looking at interrogatives and commands, where speakers add mitigating conditions to the utterance through use of modal constructions (J Sinclair, 1992; J Sinclair & Coulthard, 1975; Yule, 1998). By reducing the directness of the utterance either syntactically or semantically, the discourse acquires characteristics of indirect speech which may more appropriately satisfy the speaker's intentions (Goody, 1978; Stenström, 1984; Tsui, 1994). Modals (which also appear in question forms) help define degrees of uncertainty relative to performing specified actions, granting permission, expressing necessity, or suggesting potential events (Quirk & Greenbaum, 1973; Yule, 1998). Indirect speech realized through modal structures generally indicates that the speaker is uncertain of the listener's knowledge or reaction subsequent to the speaker's utterance (Matthews, 1997; Trask, 1993).

The imprecise categorical boundaries between Imperatives, Declaratives and Interrogatives (see discussion in syntax and speech acts) may also represent varying levels of certainty or truthfulness implicit in the mind of the speaker (Givón, 1993) (see also above in Speech Acts, Section III). Stenström (1984) suggests "variations in intonation for forms [which do questioning also] reflect the speaker's degree of certainty" (p. 151).

Hedges add an uncertain or negative connotation to the speaker's message through intonation or lexical particles to mitigate the overall utterance as shown in Figures 2.11 and 2.12 below (P. Brown & Levinson, 1978; Yule, 1996).

Figure 2.11. Hedges and Mitigation of Utterance

a. I really sort of think …

b. Well my husband sort of, never does anything, you know…

(example from P. Brown & Levinson, 1978, pp. 121-122)

By hedging, the speaker is indicating to the listener that the primary utterance (presented as overtly cooperative) must be reassessed by the listener to accurately interpret the speaker's intentions. Among the techniques used in responding to questions, Smith & Clark noted that subjects "can use rising intonation and hedges to indicate lack of confidence in answers" (V. L. Smith & Clark, 1993, p. 37).

Figure 2.12 Hedges and Pauses in Speech

Q. What was the last name of the first man to run a mile in under four minutes?

a. (3.1 seconds) hmm (2.0 additional seconds) Coe?

b. (1.6 seconds) um (3.0 additional seconds) I don't know.

(Examples from Smith & Clark, 1993, p. 25)

In answer 2.12 a., the speaker used the particle, "hmm" to indicate that the speaker was continuing to search for the correct answer, ultimately realized by stating the name, "Coe." In addition, when uttering "Coe," the speaker used rising intonation to indicate a lack of certainty in the stated answer. In answer 2.12 b., the speaker also stalled for time, used the particle "um" then paused for an additional 3 seconds before admitting, "I don't know." Smith & Clark (1993) identified "*hmm*" and "*um*" as "interjections" which may signal either the speaker is conscious of taking too much time in answering or will need further delay in providing a response (p. 28).

Listeners need to be alert to hedges, modals or other mitigating forms to interpret the true purpose of the question.

Politeness

One of the socially relevant components of indirect speech is characterized through (verbal) *politeness*, a speech accommodation between speakers that factor in such relationships as speaker's age or social position, perceived social distance, or perceived level of obligation inherent in the interaction (Yule, 1996). In general, polite utterances require more complex syntax to accomplish the politeness and indirect speech functions which, on the surface, seem to defy the cooperative principles in which participants seek to avoid ambiguity as well as make their conversation truthful, direct and concise (see Grice, 1967/1975). These polite utterances are generally designed to accomplish the *social* purpose of the interaction in which at least one of the speakers intends for the listener to respond (either verbally or physically) by establishing some level of obligation for the listener to the speaker (Yule, 1996).

Thus, these strategic linguistic choices specifically cue the other participant(s) that something more than the surface meaning of the linguistic structure is being communicated in a particular context (P. Brown & Levinson, 1978, 1987). Goody (1978) claims the most important role for questions is as a "fundamental problem-solving tool" which is accomplished through both the verbal message in the question and the manner in which it appeals to the hearer for some form of response (p. 19). This culturally-sensitive behavior also indicates that the participants are designing their language for the specific social context in order to achieve a particular purpose, that is “acting politely, then is virtually the same as using language appropriately” (Kasper, 1998, p. 678). Leech (1983) notes indirectness combines with politeness strategies to realize the level of obligation the speaker conveys through the utterance in order to encourage the listener to respond in a way favorable to the speaker. Degrees of certainty or truthfulness are also reflected by varying the level of politeness suggested by linguistic and intonational clues by which the listener then frames an appropriate response, incorporating linguistic and intonational structures to address the original speaker’s intentions.

The broad category of requests, in the form of declarative, interrogative or imperative structures, are directly affected by the speaker’s decision to communicate politeness and urgency through syntax, semantics and intonation (Stenström, 1994). Thus, even command-based discourse may be affected through relative degrees of politeness. The asymmetrical level of authority between the speaker (who has the authority to issue a command) and the listener may also affect the degree of politeness when the command or order is issued. Tsui argues that expressions of politeness are used

> “…in settings where the relationship and the duties are well-defined, forms which typically realize requestives are often used instead of those which typically realize directives…in fact, the more power the speaker has over the addressee, the more assured he/she is of the cooperation of the latter, the more polite he/she can afford to be” (Tsui, 1994, p. 109).

The syntactic form of commands may also change when mitigated by "markers of politeness such as *please*…[and] a more tactful form of request can only be arrived at if one *changes the command into a question or a statement*" [italics added] (Quirk & Greenbaum, 1973, p. 201). Being tactful represents the speaker's effort to balance implied benefits or options for the listener (in complying with the request) against the intentions of the speaker to create an obligation for action on the part of the listener (Barry, 2002; Leech, 1983).

Pragmatics: Conclusion

Pragmatics addresses the influence of speaker/listener intentions realized by the variety of available forms to more precisely represent what the speaker intends to convey to the listener through indirect constructions such as indirect requests. Politeness, as a degree of perceived social relationships, is also factored into these utterances. The contributions of these additional features are as important for the interaction as the syntactic and semantic forms that are used by the participants. These features also provide additional insight about how speakers syntactically and lexically modify linguistic forms to achieve specific functions in discourse.

The role of pragmatic features used in aviation phraseology will be discussed further in Chapter III (Aviation Studies) and in Chapter V, Results.

Intonation

In addition to the pragmatic features outlined in the previous section, intonation is another feature of conversation which adds further dimension to the speaker's success in conveying the intended meaning of an utterance. This section discusses the role of intonation as it relates to conveying questioning functions in discourse as a pragmatic feature, rather than associated with specific grammatical forms (as discussed in Section II, Syntax). Pike (1946) also observed from his own data that intonation alone did not always indicate a questioning function from which he concluded that intonation patterns varied within grammatical structures so significantly that syntax and semantics must be considered as only part of the speaker's message. Pike (1946) notes that as early as 1634, certain "interrogative" words were known to correlate with a falling intonation pattern in contrast to the more expected rising intonation (p. 3). Further attempts to correlate questions with only rising intonation or declaratives with only falling intonation could not produce evidence of a one-on-one relationship that could be made in spite of the efforts of various researchers. Instead, variations in intonation seemed to be related to the attitude of the speaker who manipulated intonation to meet the speaker's intentions within the context of a particular interaction (Bolinger, 1957; Halliday, 1973; Pike, 1946).

In a context-based interpretation of intonation, "the discourse functions of intonation are more likely to relate to this kind of "*pragmatic* 'meaning' (situated, inference-based interpretation)" [italics in original] (Couper-Kuhlen & Selting, 1996, p. 21). More recent research has confirmed these findings which show that speakers incorporate a blend of syntax, semantics and phonology rather than using only one feature to indicate the speaker's intention for a specific context (Coulthard, 1992; Selting, 1992; Weber, 1993). The hearer responds to "question-word questions" in an utterance by attending to a combination of cues including "syntactic structure, semantic relation to prior turn, and prosody" (Selting, 1992, p. 315) (see also Weber, 1993). Even though the research data focused on question-word and echo-questions, Selting found that "prosody and especially intonation was shown to vary and to have not sentence structure type, but activity type…" (Selting, 1992, p. 340). If the activity type, the function of the utterance, is associated with the functional use of prosody, then intonation is more closely linked with the overall purpose of the utterance rather than directly coupled with any specific syntactic form.

Rising intonation at the end of utterances, traditionally described as the cue for questioning, has also been examined for its functions in discourse. Bolinger (1982) argues that any upward movement in a speech pattern represents an expression of "incompleteness," which then invites a response to resolve the gap in the speaker's knowledge, whether or not this invitation is phrased in interrogative form (p. 17). This interpretation suggests that the listener requires both the syntactic form and an appropriate intonation pattern to accurately assess the function of the utterance as well as the intention of the speaker. While these features may be redundant in interrogative constructions (form may already indicate interrogative syntax, intonation is less significant), other forms, such as declaratives and imperatives may rely more heavily on intonation to fully convey the speaker's meaning.

Research has shown that the intonation found at the end of an utterance provides the surest cue of the speaker's intention, such as appealing for information or stating facts. In an extensive study of questioning in English, Weber (1993) argues that the meaning derived from any questioning form is not solely determined by its syntactic structure. Intonation also plays a central function within an interaction in the use of questioning, to help direct the establishment of social relationships through "an exchange of information and self-presentation” (V. L. Smith & Clark, 1993, p. 37). Non-structural elements such as intonation and sequential position within a given utterance also influence the form to produce one of many possible functional interpretations by the listener.

Intonation may also modify declarative sentences to acquire questioning functions through use of intonation which is generally expressed through a rising inflection at the end of the clause (Quirk et al., 1985; Stenstrom, 1994). Weber (1993) identified three types of questioning features that mark declarative clauses as doing questioning. Certain “lexical elements appear within the declarative clause,” such as modal verbs or personal pronoun (specifically ‘you’) or WH-words (p. 61-64). In addition, speakers may rely on “some prior discourse marking,” such as use of WH-word or clause or other features adjacent to the current utterance (Weber, 1993, pp. 64-73). Consequently, the speaker conveys questioning (or other functions) in a declarative clause through intonation combined with the sequential location of the utterance to realize a questioning function as an interactive resource (Coulthard & Brazil, 1981; Schegloff, 1978; Weber, 1993).

Intonation: Conclusion

This section has shown that intonation plays a key role in interaction that is not associated directly with a given syntactic form or semantic choice. Research has shown that there is no typical questioning intonation model that is exclusively associated with specific syntactic patterns (Bolinger, 1957; Schiffrin, 1994; Stenström, 1984). Discourse analysis has demonstrated that the speaker coordinates syntax, semantics and intonation to suggest a questioning function, rather than a questioning form. Rising intonation at the end of an utterance is more likely to cue the function as question. In declarative clauses, however, speakers use discourse markings in combination with lexical cues in the clause that presents a sequentially positioned utterance that signals the speaker's intent to create a questioning function.

Markedness

In reviewing the overlapping descriptions of forms and functions of interrogatives, imperatives and declaratives, the formal boundaries seem to weaken when specific discourse contexts are examined (Givón, 1993; J Sinclair & Coulthard, 1992). One means to distinguish the overlapping descriptions is to make a division between "unmarked," the commonly used form, as distinguished from "marked," a less commonly found form of a structure serving an unexpected (or less common) function (Givón, 1993; Moulton, 1987). In the literature, declarative clauses are classified as the "unmarked" or "least marked" grammatical clause form in contrast to interrogatives and imperatives which are considered "marked" because they are variations of the declarative (Matthews, 1997, p. 175; Trask, 1993, p. 72). The declarative clause is generally employed to state facts or truths in contrast to the marked clausal forms, the interrogative, and the imperative, which seek action (Pei & Gaynor, 1954). While direct commands may be an unmarked form of imperative Speech Acts (as the expected or most common form), there are many marked versions that use interrogative, declarative and modal features depending on the situational context. For example, the unmarked imperative clause, "Shut the door," becomes marked as an interrogative form in a construction such as "Can you shut the door?" The unmarked form ("Shut the door") may also become a declarative construction such as, "I wonder if you could shut the door?" which is marked in this context because it is functioning as an indirect interrogative (J Sinclair & Coulthard, 1992, p. 9).

Declarative clauses also become marked through the use of rising intonation to indicate a questioning function. Stenström (1994) argues that since interrogatives (with inverted word order) commonly use a rising intonation while declarative statements occur with a falling intonation, the rising contour in a declarative statement can be understood as a marked feature to indicate the declarative statement is functioning as a questioning clause. These spoken interrogative forms (declarative and imperative) with marked, or unexpected, intonation features will be an essential part of the analysis of the aviation discourse found in the research data.

The concept of Markedness is important to this discussion of questioning because of the role it plays in assisting a listener to decode the speaker's utterance. The novelty, or unique features of an utterance, alert the listener that the utterance may contain additional meanings beyond the syntax and semantics of the particular clause(s).

This discussion on pragmatic issues has focused on how questions are recognized and interpreted through socially constructed interaction. Pragmatic interpretive strategies include the features of politeness, indirect speech and markedness as applied to interrogative as well as declarative and imperative structures. In addition, intonation has been identified as an important feature to mark questioning functions in some declarative and imperative constructions. All of these features will be relevant to the discussion of aviation discourse when analyzing the forms and functions of interactions between pilots and air traffic controllers.

Section VI. Conclusion:

Discourse of Questioning: A Working Definition

In this chapter, there were two objectives in reviewing the literature: to examine existing research on questioning forms and functions and then to develop a working definition of questioning that can be used for analysis of the data in this study. Beginning with a variety of definitions and descriptions, I have shown that questions have been defined in relation to syntactic, discourse and pragmatic features. Further, the interactive role of both speaker and listener has been considered in terms of conversational cooperation and rule-based interchanges. Discussion of pragmatic effects on questioning, incorporating intonation and indirect speech, have also been shown to affect the functional interpretation of both questioning and non-questioning forms. A discussion of non-interrogative structures (declarative and imperative) indicated that questioning functions and the relationship between marked forms of the three clause types and functional definitions must address the variety of non-interrogative forms that can occur in questioning structures.

At what point is an initially declarative utterance assigned a questioning function by the speaker? How do participants recognize the level of modality, politeness, or certainty in the discourse as it contributes to a questioning function? Drawing from the literature, I have shown that the speaker's choices of linguistic and pragmatic elements within specific syntactic structures are recognized as serving specific interactional functions of questioning in a given context. During the process of the interaction, participants rely on available grammatical and intonational resources and combine them in various ways that best serve the developing interactional context (Goody, 1978).

This diverse variety of features indicates that a valid definition of questioning cannot remain exclusive to single categories based in syntax, semantics or prosody. Questioning functions cross all these formal boundaries. A more complete definition may rest in a broader definition of the function realized by questions as Goody's (1978) "fundamental problem solving tool" which can be used to resolve "gaps in information" (Quirk et al., 1985). For purposes of this paper, the interactive nature of questioning will be defined as

> A verbal tool for the interactive and cooperative exchange of necessary information between one who asks for specific information and one who immediately provides that information (unless clarification of the question is needed to provide an appropriate response).

Tsui (1994, 2002) claims that a true characterization for *question* "has never been clearly defined…[it] is sometimes taken as a syntactic category and sometimes a discourse category" (1994, p. 101; 2002, p. 89). As this section has shown, there has been an historic shift from the strictly grammar-based definition of *question* due to the developments in linguistic analysis and the growth of conversation-based studies derived from research that demonstrates the speaker and the listener(s) act in a partnership mutually responsible for the success of the interaction. For linguistic purposes, the term "question" now focuses more accurately on the *syntactic category* which is realized through interrogative features while the term "questioning" more clearly characterizes the discourse *function* that incorporates many of the features described in this section. Broadly interpreted, questioning functions initiate a search for new information, to confirm or clarify old information, in order to resolve a “gap of information” for the speaker (Quirk et al., 1985, p. 1051).

In conclusion, there seems to be no available definition for *question* that meets both grammatical and functional requirements. However, the review above suggests that *questioning* targets a gap in information that directly invites some type of response from another participant in the interaction. The combined questioning-responding interaction then serves as a linguistic tool to resolve issues related to the missing information. For purposes of this paper, the linguistic choices used in the speaker’s search for information (whether seeking new information, confirming or checking the validity of the information) will be defined as *questioning* and the interrogative syntactic form will be referred to as a *question*.

The discussion of questioning will be set aside in Chapter III in order to review the literature in aviation focused on the professional discourse of both pilots and air traffic controllers. In Chapter IV, the methodology for analyzing the research data will be described, followed by Chapter V which will document the results of the research. In Chapter VI, a discussion of the results will address the research questions outlined in Chapter I. Chapter VII will present implications and suggestions for further discourse research as well as suggestions for application of the findings to classroom teaching and professional training.

CHAPTER III

AVIATION CONTEXT

Section I. Introduction

The purpose of this chapter is two-fold. Section II will begin by providing a background in the regulations and structure of aviation communication as it is used in commercial and general (privately-owned) aviation. The first part, regulations and use of aviation language, is briefly outlined with an overview of the regulatory agencies that prescribe the approved forms of the language used by both pilots and controllers. Then, the routine and non-routine features of aviation communication will be described. Although the international language of aviation is English, many international air traffic controllers and pilots use English as their second or third language, not as the language used in their everyday interactions in their own country (International Civil Aviation Organization, 2001b, 2004). The final portion of Section II summarizes features affected by recently adopted international oral language proficiency standards will be discussed in relation to the impact these changes will have on the English used in the professional aviation workplace.

The next portion of this chapter (Section III) will outline major sources of data used in the research of aviation communication. These sources include written reports (ASRS and IATA databases), Cockpit Voice Recorders (CVR) transcripts, mechanical simulator studies (both flight deck and air traffic control), laboratory studies and recordings of live transmissions. For each of these sources, a brief discussion will be presented to assess how these sources contribute to the study of aviation language. In Chapter IV, studies using these sources will be reviewed as they relate to the study of questioning as it is (or is not) used in aviation communication.

Section II. Aviation Background

Although flying is one of the safest modes of transportation, any incident or accident takes on high visibility through media accounts because of the spectacular media images and a significant loss of life. As a result, both government(s) and the airline industry seek to maintain a high standard of safety for everyone involved (pilot, crew and passengers as well as ground personnel, and controllers working at various air traffic control facilities). One of the key components of flight safety is the communication between the pilot(s) and the controllers during every flight. In order to examine the research on aviation communication, it is first necessary to outline the specialized features of this restricted or formulaic discourse. First, a brief discussion of the national and international regulatory agencies will be presented, followed by a discussion of some of the specific rules and regulations that affect aviation operations. Then, a discussion of the routine and non-routine communications will be presented to provide a general background for discussion of aviation language in later sections. The concluding portion of aviation language will describe specific issues related to the recent changes in international standards of English language proficiency. It should be noted that the remainder of the study will focus only on commercial air traffic moving between controlled airports since the data in this study are drawn from regularly scheduled commercial flights.

Aviation Regulatory Agencies

The International Civil Aviation Organization (hereafter identified as ICAO, pronounced eye-kay-oh), an official agency of the United Nations, is responsible for all civil and commercial (but not military) aviation matters throughout the world. ICAO is also the primary authority for establishing and regulating official aviation phraseology for civil and commercial aviation in the airspace of any given country as well as the airspace over all of the world's oceans. ICAO standards are binding upon those nations who have signed an agreement to operate their commercial and general aviation matters within the ICAO framework (International Civil Aviation Organization, 2001a).

Within a given country, or groups of countries (such as the European Union), a regional or national agency also contributes to regulating the language used by pilots and controllers in that area. In the United States, the Federal Aviation Administration (hereafter identified as FAA) is the national agency in charge of aviation matters (Federal Aviation Administration, 2004b); in England, the Civil Aviation Authority, or CAA, takes on this function, etc. (United Kingdom Civil Aviation Authority, 2006). However, any American pilot flying outside the national borders of the United States is expected to follow the local ICAO standards if they differ from FAA regulations as well as observe any local restrictions in another country's air space along the flight path; likewise any pilot from another country flying into the United States must also follow both ICAO and any additional FAA restrictions established for American air space. As will be shown, international language issues are an important aspect of aviation communications since daily flights between many countries contribute to the diversity of the English language used in the skies.

One of the key tasks of ICAO has been to establish and publish an official phraseology to be used as a universal language that minimizes communication problems between pilots and controllers for international flights throughout the world (International Civil Aviation Organization, 2001a).This glossary of terms is found in two volumes that are updated whenever there are significant changes agreed upon by the member nations, or “Contracting States,” (International Civil Aviation Organization, 2001c, p. xii). National aviation agencies, such as the Federal Aviation Administration of the United States (FAA), must include ICAO phraseology in the locally approved phraseology (Federal Aviation Administration, 2004b; International Civil Aviation Organization, 2001a). Because local conditions vary, ICAO has determined that for any national or regional agency it is sufficient for a national pilot/controller glossary to note differences in ICAO usage from the phrases used within national boundaries (International Civil Aviation Organization, 2001a; Mell, 1991). As a result, any additional ICAO phraseology is generally included for reference within a specific country’s published aviation regulations for pilots or controllers who may need to communicate with international controllers or pilots. examples in 3.1 shows two examples of differences in ICAO phraseology as used in the United States and the United Kingdom.

Figure 3.1.a Local Variations of ICAO Phraseology: “Touchdown Zone”

ICAO: “The portion of a runway, beyond the threshold [beginning of runway usable for landing], where it is intended landing aircraft first contact the runway” (Federal Aviation Administration, 2004a, PCG T-3).

United States/FAA: “the first 3,000 feet of the runway beginning at the threshold. The area is used for determination of Touchdown Zone Elevation in the development of straight-in landing minimums for instrument approaches” (Federal Aviation Administration, 2004a, PCG T-3).

In Figure 3.1.a, *Touchdown Zone*, the ICAO terminology is less specific and does not include any further official terminology (shown in capitalized terms), whereas the FAA entry also defines information regarding flight levels and specifies this applies to instrument approaches. Generally, the ICAO definitions are designed to be less specific which allows each nation to provide more precise information that addresses local conditions. The more specific FAA definition might the result of legal issues in American aviation following accidents or emergencies.

Figure 3.1.b. Local Variations Of ICAO Phraseology: "Go Ahead"

ICAO and FAA: "Proceed with your message. Not to be used for any other purpose" (Federal Aviation Administration, 2004a).

United Kingdom: "PASS YOUR MESSAGE: the phrase GO AHEAD (ICAO) is not used in the UK. In the UK, the term PASS YOUR MESSAGE is used" (United Kingdom Civil Aviation Authority, 2006, Appendix 1, p 1).

In Figure 3.1.b, *Go Ahead*, the United Kingdom has changed the message wording, with the explanation that *go ahead* "is not used on safety grounds where some pilots/drivers might confuse *go ahead* with *proceed*" (United Kingdom Civil Aviation Authority, 2006, Appendix 1, p. 1). Again, this change in wording may be the result of legal or phonetic problems that have occurred in aviation communication in the United Kingdom.

Procedures/Regulations

Airspace is divided into controlled and uncontrolled airspace. Controlled airspace, as defined by ICAO, is "an airspace of defined dimensions within which air traffic control service is provided in accordance with the airspace classifications" (International

Civil Aviation Organization, 2001c, p. 1.5). Uncontrolled airspace is any other area not directly under the continuous supervision of an air traffic controller. In the US, airspace in the vicinity of a major airport is generally controlled at all altitudes, while airspace that is not in the vicinity of a major airport is generally uncontrolled up to either 1200 feet above ground level (AGL), or 700 AGL in the vicinity of a small local airport that is served by an instrument approach procedure. In remote areas, uncontrolled airspace may extend up to 14,500 feet above sea level, the base of the so-called "continental control area." All Instrument Flight Rules (IFR) traffic in controlled airspace (whether a commercial jet at a flight level of 30,000 feet or a small privately-owned plane at an altitude of 4,000 feet) operates under ATC control; however, neither IFR or Visual Flight Rules (VFR) traffic in uncontrolled airspace, nor VFR traffic in the controlled airspace that is outside the airspace surrounding a major airport, fall under ATC control.

In addition to altitude boundaries, there are also geographic boundaries of controlled airspace with several areas of air traffic control that affect every commercial flight. At the airport, there is local control, including Ground-Taxi, Tower and Departure which are divided into separate functions at larger airports, but may combined at smaller airports. The Tower/Departure controller handles all clearances (or instructions, see Appendix A) necessary for the pilot to take off and once into the air, the Tower/Departure controller transfers responsibility for the flight to an Enroute controller. The Enroute control facility may be nearby or several hundred miles away from the Tower/Departure location. Once under Enroute control, the plane is one of many which must be carefully separated from other planes in the control area until the plane reaches its target altitude.

If the plane is covering a long flight path, the plane may be sequentially transferred to one or more additional Enroute controllers until the plane is ready to descend to its destination (referred to as "On Final"). At that point in the flight, the Enroute controller will transfer the plane to the appropriate Approach controller who guides the plane down until it is on its final approach and touches down on the runway. Then the pilot will be notified of the appropriate Tower/Ground frequency and given further clearance (instructions) to turn off at a specific taxiway and move toward the assigned gate location. For each of the phases of the flight (Ground, Departure, Enroute and Approach), there are specified phrases that must be used to convey all instructions and responses. The next section will provide an overview of this specialized terminology.

Throughout this process of moving the plane from its point of origin to its destination, the air traffic controller is also responsible for maintaining an orderly flow of traffic in the controller's assigned area of responsibility. Specifically, air traffic control service is "provided for the purpose of preventing collisions between aircraft, on the manoeuvering area between aircraft and obstructions; and expediting and maintaining an orderly flow of air traffic" (International Civil Aviation Organization, 2001c, p. 1.3). For the individual controller, this includes maintaining a mental awareness of planes entering and leaving the assigned area of control, maintaining the required minimum vertical and horizontal airspace separation distances between all planes, unless there is an emergency condition, and attending to any special situations whether related to ground problems (such as animals on the runway prior to take-off), changing weather or emergencies.

However, the controller's instructions are not absolute. Pilots, who are primarily responsible to the airline or for the pilot's own aircraft, have some discretion as to whether or not they will comply with specific instructions. When the pilot or other crew member requests an alternative to a controller's instruction, the controller will advise if the alternative is suitable and issue an "amended" (changed) clearance (ICAO, Section 4.5.1.2). For example, in rapidly changing severe weather that would negatively affect the progress of the flight, the pilot may choose not to accept the controller's instructions. All pilots are also ultimately responsible for the safety of the plane's crew and passengers. According to ICAO, the detailed regulations that cover controller responsibilities also do not "relieve pilots of their responsibility to ensure that any clearances issued by ATC units are safe…" (International Civil Aviation Organization, 2001c, p. 4.4).

> [Section 4.5.1.3] ATC clearances do not constitute authority to violate any applicable regulations for promoting the safety of flight operations or for any other purpose; neither do clearances relieve a pilot-in-command of any responsibility whatsoever in connection with a possible violation of applicable rules and regulations. (International Civil Aviation Organization, 2001c, p. 4.4).

In other words, both the pilot and the controller are responsible for maintaining safety as well as following regulations. The approved phraseology provides an effective, efficient means for communication that allows both parties to recognize and maintain safe flying conditions for everyone in the skies. In the next section, samples of this phraseology will be presented.

Aviation Phraseology

This section will outline basic aviation communication features as well as provide samples of terminology used throughout the remainder of the research project.

In examining aviation discourse, there are two essential constraints on all pilot and controller communications: first, an accurate and efficient transfer of information, and second, the dynamic movement of an aircraft from the point of origin to the point of destination. Through use of the command-based phraseology, the controllers are responsible for organizing and maintaining safe distances between aircraft while keeping alert for unexpected or unusual situations (Sanne, 1999).

The accurate and efficient transfer of information is maintained through a highly specialized, formulaic language. A formulaic language is one that does not use the full syntax of its parent language, rather it is composed of reduced syntactic forms such as phrases and/or jargon-based units. The formulaic language of aviation is generally referred to as "aviation phraseology," also sometimes referred to as "AIRSPEAK," both within and outside of the aviation community (B. Johnson, 1994; Robertson, 1988; Sullivan & Girginer, 2002). Controllers and pilots use this official phraseology, as determined by their national aviation agency in conjunction with ICAO, in their daily transmissions as well as for emergency communications. Each aviation professional is responsible for knowing and understanding the appropriate use of specific phrases and words in order to convey necessary data in concise, meaningful blocks of information.

This highly restricted language has several characteristic features that set it apart from conventional language. First, the operational context creates a special linguistic demand on the participants, in addition to the efficiency/accuracy constraints mentioned above. Controller-pilot communications do not involve any face-to-face contact, thus eliminating important non-verbal cues or gestures that could be incorporated into the interaction. Instead, all communication is done through two-way radio messages. Second, this radio-based operating context also sets aviation phraseology apart from more general language because all air-ground communications takes place in a rapidly changing, 3-dimensional context. Thus, the “radio talk is the…only means of influencing aircraft movements in the sky” (Sanne, 1999).

The key features and the prescribed order of the phraseology demonstrate the specialized nature of the messages in aviation communication. Philips (1991) notes that the phraseology is designed to address

> …the order of priority governing the different types of messages; the spelling code for letters and figures; callsign details for ground stations and aircraft, message structure (callsign followed by content), callsign rules, acknowledgements, corrections, repetitions, and endings; distress and emergency measures…[and] the compulsory skeleton messages for use in ATC exchanges (p. 109).

Philips also points out that linguistically, aviation phraseology is structured differently from “natural English on every major linguistic level: phonology, lexis, semantics, discourse, and syntax” (1991, pp. 109-110).

In more general terms, a review of the standard phrases found in the ICAO *Procedures for Air Navigation*, Chapter 12 “Phraseologies,” do not generally use noun-verb sentence structure, but rather the phraseology is expressed most often through noun phrases (“Gate 36,” “wind 030 at 15 knots”) or verb phrases (“request visual approach,” “confirm flight level one three zero [13,000]”) (International Civil Aviation Organization, 2001c). By eliminating the more conventional syntactic sentences of ordinary conversation, more detailed technical information can be communicated in a much shorter time because both the pilot and the controller are aware of the meaning of the standard phrases. In addition to sharing a common vocabulary, the pilot and controller also share the meaning of the specific context in which they are communicating, thus reducing the need for full sentence syntax.

In addition to syntactic modification, aviation phraseology consists of a series of information blocks to be spoken in a formally prescribed order as established by ICAO and each regional or national aviation agency (Federal Aviation Administration, 2004a; International Civil Aviation Organization, 2001a; United Kingdom Civil Aviation Authority, 2006). From the time an aircraft engine starts, the plane leaves the gate, moves through the enroute airspace (during the flight) and finally descends toward an airport and moves to its assigned gate, all language related to each phase of every flight is clearly prescribed for both pilots and air traffic controllers. Table 3.1 outlines approved phraseology samples for three phases of a commercial flight as provided in the United Kingdom’s Radiotelephony manual, with extended explanations in the following paragraphs.

Table 3.1.
Phraseology During Three Phases of a Flight

Phase of flight	A. Controller's instructions [1,2]	B. Pilot's Readback	C. Purpose of communication
Message 1. Taxi / Pre-Departure Plane is ready to leave	Scorpion 927 via holding point A1 line-up and wait runway 26 one aircraft to depart before you from holding point A2	Via holding point A1 line-up and wait runway 26 number two for departure Scorpion 927	ATC directs pilot/plane to a specific point on the airfield (A1); instructs the pilot to wait at that point for clearance to proceed; ATC gives runway number for take-off (26); informs the pilot of another plane taking off <u>prior</u> to Scorpion 927.
Message 2. Enroute Plane is ready to move into a new ATC sector	Scorpion 927 contact Oxford Control 129.125	Oxford Control 129.125 Scorpion 927	ATC informs pilot of the next point of contact and provides the radio frequency (129.125).
Message 3. Tower Plane is arriving at destination, ready to land	Scorpion 927 runway 34 cleared to land surface wind 270 20	Runway 34 clear to land Scorpion 927	ATC informs pilot of runway to use and clears pilot for landing; provides wind direction (270) degrees, speed (20 knots)

[1] examples from United Kingdom Civil Aviation Authority (CAA), 2006.
[2] From this point, "Controller" will be abbreviated as "ATC" in examples, Tables, and Figures.

Reading across Table 3.1, each column represents one controller's instruction or clearance before the pilot begins to speak. As shown in each sample in Table 3.1, Column A, the ATC directs a pilot by means of either specific instructions or formal clearances. An *instruction* is any direction given by a controller to a pilot while a *clearance* explicitly "authorizes a pilot to proceed to a certain point or to perform a specific maneuver," (Nolan, 2004, p. 183). Without a clearance, the pilot must maintain whatever condition exists at the moment.

The pilot is also responsible for reading the clearance back (the "readback," see Table 3.1, column B) to the controller to confirm that the pilot correctly heard the clearance and will do as the ATC instructed. The lines within the message are separated to highlight the similarity of content between the controller and pilot messages (note: the speakers would not make significant pauses at the end of each phrase). In the Taxi/Pre-departure message (Message 1), the ATC (Controller) addresses the pilot by use of the flight number as the *callsign* (Scorpion 927), then the ATC issues instructions for moving the plane to a point where the pilot must wait for further take-off instructions (for the remainder of this chapter, references to an air traffic controller may be abbreviated as "ATC"). The pilot reads back the information, in the same order except for the callsign, which always is the last segment of the pilot's message and indicates the end of the pilot's transmission. The pilot must now wait for a formal clearance before moving the plane into position for departure.

In the Enroute message (Message 2, Table 3.1), the ATC addresses the plane with the call sign, names the next contact point (another ATC facility, Oxford) and gives the radio frequency to the pilot. In the Enroute sample, the frequency is read as "one two niner decimal two five" (United Kingdom Civil Aviation Authority, 2006, Chapter 2, pp. 3-5).

In the Approach message (Message 3), the pilot is within a few thousand feet of landing. The Tower ATC is clearing the pilot to land on a specific runway, then provides wind conditions (to allow the pilot to make any adjustments to the plane's landing system prior to touching the runway surface). The wind conditions are reported in 10 degree increments using the magnetic compass directions and winds are stated in 5-knot per hour increments. Following the clearance, the Approach ATC gives the pilot the radio frequency for ground control to receive final instructions regarding exiting the runway and moving to the assigned gate area.

Another important feature of the aviation phraseology is the large quantity of numerical digits involved in communications. In Table 3.1, there are four different uses of numbers: call sign (Scorpion 927), runway (26), wind direction (270) and wind speed (20). Other uses of numbers include flight levels, speed (both of the plane and the wind), transponder codes, weather conditions (visibility distances, cloud heights) etc., creating a constant flow of numerical information between pilots and controllers (International Civil Aviation Organization, 2001c). To improve communication accuracy, ICAO and the national aviation agencies have established pronunciation standards. Several numbers have a unique pronunciation to minimize phonetic confusion for the listener(s): 1= “wun,” 3 = “tree,” 4 = “fower,” 5 = “fife,” 9 = “niner” and “tousand" (any digit plus “000”) (Federal Aviation Administration, 2004b; International Civil Aviation Organization, 2001c; UK Civil Aviation Authority, 2006, p. 2.3). Note that nine (9) is pronounced “niner” as a safeguard to prevent confusion with the German “nein” (“no”) and that one (1) is pronounced as “wun” to prevent confusion with French “un, une” (French words for *one*).

The FAA does permit two numbers to be grouped when referring to “airway or jet route numbers,” but carefully specifies that “all other numbers shall be transmitted by pronouncing each digit” (Federal Aviation Administration, 2004a, p. 4.2.6) In the United States, the first number (1) of a radio frequency, such as 129.25, is often dropped since the frequencies always begin with “1” and radio-frequency digits following the decimal point are often grouped into pairs, such as “two niner (point) twenty five” (aviation transcripts, personal collection). This variation in reporting frequencies is one of several issues related to international proficiency standards that will be discussed throughout this study.

Pilot/Controller Standard Communication

Although regulations state that any pilot is the final arbiter of what should be done during a flight, a pilot flying in a (air traffic) controlled airspace expects to work with the controller to maintain safe, efficient flying practices in a busy airspace, as noted in the FAA/AIM Flight Information Publication Policy (Federal Aviation Administration, 2004a). As a result, when the controller gives an instruction, the pilot generally expects to follow this instruction and the controller can likewise expect the pilot to perform accordingly. As noted above, if the pilot feels that the controller’s instruction will or potentially will endanger the aircraft, the pilot may refuse to accept the controller’s instruction, with the pilot offering an alternative to the instruction. Figure 3.2 outlines a simple exchange with a request by the ATC for the pilot to change course. Each of the messages follows prescribed ICAO phraseology and represents a typical exchange when a controller requests that a pilot change the direction of the flight path (“Scorpion” will be used as a generic name for an airline.).

Figure 3.2. Standard Pilot/ATC Communication.

a. ATC: Scorpion 927, change heading left 290 degrees
b. Pilot: Left 290 degrees, Scorpion 927.

Table 3.2
Explanation of Language Used in Figure 3.2

Line	Speaker	Information/ Instruction	Type of information
1	ATC	Scorpion 927	Callsign: Airline name and the flight number of the flight [1]
		Change heading	Instruction for change of flight path
		Left 290 degrees	Identifies specific course the pilot will take
2	Pilot	Left 290 degrees	The pilot repeats the instruction
		Scorpion 927	Repetition of call sign; serves to terminate the pilot's message.

[1] Callsign: see Appendix A, Glossary.

The examples in Table 3.2 show several important elements of a typical pilot-controller exchange. In line 1, the controller addresses the pilot through use of the plane's "callsign:" Scorpion 927, then the controller issues an instruction, "change heading left 290 degrees" [the degrees are based on a magnetic heading with 0/360 representing north]. The word "change" indicates that the pilot will need to alter his present course, "left" means that the change will move the plane to the left of its current course, while "290 degrees" is the target compass direction to accomplish the instruction. The pilot responds in line 2 by repeating the instruction, "Left 290 degrees," and then repeats his call sign, "Scorpion 927," to terminate the exchange.

However, in some situations, the pilot may respond by announcing that the ATC's request may create a problem in the flight path. In Figure 3.3, the underlined verb phrase (indicating formal phraseology) shows a possible situation where the pilot feels that it would be unsafe to make the requested change in the compass heading.

Figure 3.3. Pilot-Originated Request to Change ATC Instructions.

a. ATC: Scorpion 927, turn right heading two niner degrees
b. Pilot: Unable to comply, request heading two six degrees to avoid weather, Scorpion 927.
c. ATC: Roger, Scorpion 927, two six degrees approved.
d. Pilot: Heading two six degrees, Scorpion 927.

In line 1, using standard phraseology, the controller addresses the pilot through use of the callsign, "Scorpion 927." The controller then issues a standard instruction (as in the previous example, Figure 3.2 above), "turn right heading two six degrees." The pilot responds (line b.) that he is "unable" to comply with the controller's instruction. The term "unable" (or "unable to comply," a common variant found in the data used in this study) is standard phraseology used for a variety of situations by either pilots or controllers when the current situation makes it difficult to carry out a request (International Civil Aviation Organization, 2001a, pp. 12.13, 12.21). Figure 3.3 is a typical example of when an ATC initiates an instruction, but the pilot recognizes that he should not follow the instruction due to one or more additional factors affecting the flight that may be unknown to the controller. The pilot, in this example, then offers a modification, "request heading two six degrees" and briefly states the reason that he is unable to comply with the ATC's original instruction, "to avoid weather." The pilot then ends his message with his callsign to inform the controller that his message is complete.

The controller replies (Figure 3.3, line c.) with "Roger" (meaning he understands the pilot's request), followed by repetition of the callsign and issues an approval for the revised heading. The pilot must then acknowledge the new instruction by repeating it back (the "readback") to the ATC. In most cases, the pilot should not change his heading until authorized by the controller in case the controller has another plane in the vicinity that would be affected by the pilot's request.

Although the pilot is unable to follow the controller's instructions, the entire exchange is expressed in *standard*, or *approved*, aviation phraseology. A discussion of the use of non-standard phraseology is presented in the next section.

Pilot/Controller Non-Standard Phraseology

According to both FAA and ICAO manuals, not all situations in aviation operations can be handled by the standard phraseology (Federal Aviation Administration, 2004b; International Civil Aviation Organization, 2001a). There are two broad categories of non-standard transmissions. The first is *unapproved* language, messages that contain deviations from standard phraseology when standard phraseology should have been used in a situation where either the pilot or controller uses words or phrases that are not listed in the approved phraseology lists (Morrow et al., 1994).

examples of unapproved language are shown in Table 3.3, with approved phraseology in the left column, the unapproved language on the right.

Table 3.3
Examples of Unapproved Language in Aviation Communication

Approved phraseology	Same message with unapproved language
1.a. Captain: say again call sign? Pilot: Scorpion one two three four	1.a Captain: so, what's your call sign? 1.b Pilot: you're talking to Scorpion twelve thirty-four
1.b. Controller: say again altitude? Pilot: one four thousand.	2.a Controller: what's your altitude now? 2.b Pilot: one forty's about where I'm at. .

In Table 3.3, the right column shows messages with contain non-standard words and/or phrases (underlined) that occur in the research corpus of aviation communication. Generally, unapproved language is more conversational more informal. This type of language may or may not strictly follow the order of approved phraseology (as in line 1.b, where the pilot uses an entire unapproved clause, "you're talking to…" before providing the necessary information to the controller). For the aviation industry, the issue of 'non-standard' language continues to cause both high concern and high visibility among aviation professionals (for example, Mell, 1991; Prinzo & Britton, 1993). Variations of standard instructions such as "say again," will be presented in Chapter VI, Results.

The second form of non-standard phraseology is a more general language using aviation-related topics, commonly referred to as Aviation English (Douglas, 2004; E Mathews, 2001; Mitsutomi & O'Brien, 2003; Sullivan & Girginer, 2002). Although the communications are tied to aviation vocabulary or topics, Aviation English extends language forms beyond the standard phraseology and incorporates more original structures and expressions related to the aviation context (Mitsutomi & O'Brien, 2003).

In some situations, there is simply no appropriate standard phraseology, therefore, pilots or ATCs employ more general phrases from aviation English to meet the demands of the situation, such as more detailed explanations or descriptions of unusual or unexpected circumstances. The following communication sequence (Figure 3.4) shows a situation where the pilot wants to deviate from the assigned course and makes a request for a new heading:

Figure 3.4. Aviation-Related Non-Standard Communication

a. P [Flight] Alpha Romeo looking for [possible] weather?

b. C [Flight] Alpha Romeo you have weather at sixteen hundred

(Transcript: TC 0427-1030C)

In this situation, the pilot is checking for reports by other pilots concerning any unusual weather ahead in his flight path. Line a. is a request, using a modified imperative form with rising intonation. The controller's response (line b.) employs a full clause, where he responds that there is weather (probably storm or storm-like clouds) at an altitude of 1600 feet.

An extreme situation, such as the discovery of obvious oil pollution in an area below the plane, also requires that the message contain non-standard vocabulary. In this situation, the pilot would report to the ATC facility and would be expected to report facts such as "position and extent of pollution, tide, wind speed and direction, weather conditions…and the characteristics of the pollution" (example from UK Civil Aviation Authority, 2006, p.9.3). Other extreme situations might include an emergency aboard a plane that is enroute to its destination. Although there is a specific reporting procedure, the emergency itself may need to be explained in detail in order to alert ATC facilities (and other planes in the area) of the type of assistance needed, such as explaining the relevant details regarding a passenger with emergency health conditions. Studies examining non-standard transmissions will be discussed in more detail in Chapter IV in the review of aviation literature.

ICAO Proficiency Standards and Aviation English

The frequency and extent to which pilot and/or controllers use non-standard constructions is a major concern in aviation safety research since pilot/controller miscommunication has been identified as a key factor in numerous aviation accidents (International Civil Aviation Organization, 2004; Symer, 1998; Tajima, 2004). The role of questions, as non-standard aviation phraseology, is directly tied to this concern. In this section, the broad issues related to current changes in international English proficiency will be discussed. Following this section, the implications of English as the global language of aviation communication will be presented.

Although English is generally referred to as the language of aviation, in fact, it is required to be used only in non-English speaking countries at international airports and control towers if an international flight crew does not speak the official local language(s) of the tower (P. Smith, 2004). However, in the 12th edition of the *Procedures for Air Navigation Services* (*P.A.N.S.*, 1987), Amendment 2 stipulates "inclusion of English language phraseology in the French, Russian and Spanish editions [of their ICAO phraseology]" (International Civil Aviation Organization, 2001c, p. xvi). As a result, the focus on use of English in aviation has increased the number of non-native English speakers which, in turn, has caused the international aviation community to recognize the need for strengthening English proficiency standards in aviation communication (E Mathews, 2001; Mell, 1991; Mitsutomi & O'Brien, 2004).

To address these concerns, in 2003, ICAO established new oral English proficiency requirements that must be met by all pilots and controllers by the year 2008 (International Civil Aviation Organization, 2004, p. 5-1). The focus of the new standards includes not only improving pronunciation and comprehension of official phraseology, but also specifically targets the more general Aviation English because “it was never intended for phraseologies to fully suffice for all pilot and controller communication needs” (International Civil Aviation Organization, 2004, p. 7-2). The new standards specifically target those miscommunications caused by an inability to use the more versatile Aviation English, not just the memorized phraseology, when it is needed in unusual circumstances. The goal for proficient use of Aviation English, then, is focused not just on improving accuracy in recitation of memorized phrases, but has expanded to integrate “sufficient language facility in the work context to respond to various situations when predetermined phraseologies are not enough” (Mitsutomi & O'Brien, 2003, p. 120).

ICAO stresses that not only do speakers need to have comprehensible speech and command of the phraseology, but that “all speakers have sufficient proficiency in the language used to negotiate for meaning” (International Civil Aviation Organization, 2004, p. 3-8). The specific ratings focus on six categories of language proficiency: pronunciation, structure (grammar), vocabulary, fluency, comprehension and interactions (International Civil Aviation Organization, 2004, p. A-8). In addition, ICAO has targeted six levels of proficiency within each category. The minimum acceptable level for continued work in aviation fields is at “Operational (level 4),” with higher levels of proficiency identified as “Extended (level 5)” and “Expert (level 6)” (International Civil Aviation Organization, 2004, p. A-10). Important features of the Operational level of proficiency include speakers who:

- <u>Pronunciation</u>: May still have a “marked accent, or localized regional variety of English,”

- Structure/Grammar: Can be creative with basic syntactic and sentence structure, but may show localized errors that don't interfere with overall meaning,
- Vocabulary: Can seek clarification for unfamiliar vocabulary, or negotiate meaning in unfamiliar contexts,
- Fluency: Able to communicate at a reasonably natural speed, although more slowly in unfamiliar situations and can speak without annoying fillers (such as humm, errr, etc.),
- Comprehension: Comprehend and reply in unexpected situations, although at a slower rate than for unexpected situations,
- Interaction: Generally comprehends unexpected situations, but must be able to use appropriate strategies for checking, clarification and confirmation, (International Civil Aviation Organization, 2004, pp. A10-A14). A complete list of the ICAO "Operational" language proficiency rating criteria is in Appendix D.

To illustrate why pilots and controllers need more than the formal terminology to be effective in their job, the ICAO manual provides an authentic example which demonstrates how speakers in a rather ordinary situation may employ language not included in the standard phraseology, shown underlined in Figure 3.5:

Figure 3.5. ICAO Example of Non-Standard Phraseology.

a. ATC: Midland five November Zulu. Good morning
b. Radar contact. Proceeding into Kerky vectoring 02.
c. Pilot: Direct Kerky 02 Midland five November Zulu.
d. Can we keep high speed?
e. ATC: For the time, yes.

(International Civil Aviation Organization, 2004, p. 7-3)

The Manual of Implementation (ICAO 9835) points out that the request (shown in bold-face type) presented in line d., “Can we keep high speed?” spoken by the pilot is directly related to his task, although the request is in non-standard form as a question. The pilot’s message is understood by both the pilot and controller as a legitimate request, but represents a special situation relative to this flight context. It should be noted, however, that ICAO stresses “Only when standardized phraseology cannot serve an intended transmission, plain language shall be used” (International Civil Aviation Organization, 2001b, Section 5.1.1.1). A pilot or controller, at the ICAO Operational level should be able to comprehend the pilot’s question in line 4 as a request for clarification, rather than be confused by the non-standard terminology.

A crucial factor in the testing for proficiency is that all aviation professionals need to meet a common standard for “mutual intelligibility” in order to achieve successful interaction (Mitsutomi & O'Brien, 2003, p. 125). The new proficiency rating scale also focuses on the importance of that some native English speakers need to be aware they may speak in a manner that is not intelligible to non-native speakers. As a result, the ICAO proficiency ratings require that *all* international aviation professionals must pass the oral proficiency test in order to continue in their job beyond 2008. ICAO comments

> (T)he burden for improved communications should not be seen as falling solely on non-native speakers. Native speakers of English, too, have a fundamentally important role to play in international efforts to increase communication safety…An ethical obligation arises on the part of native speakers of English, in particular, to increase their linguistic awareness and to take special care in the delivery of messages (International Civil Aviation Organization, 2004, p. 3-2).

The broader scope of the rating scale targeting *all* aviation professionals is also important in recognizing that there are numerous accents and varieties of English spoken around the world. In the next section, the diversity of Englishes spoken around the world will be addressed.

World Englishes: Mutual Intelligibility

Although English is the official language of international aviation, the varieties of English used during radio transmissions represents linguistic input from not only the regulatory agencies (ICAO, FAA, CAA, etc.), but from the way English is more locally used within various geographic or political regions. Thus, just as some Australian idioms and accents are unintelligible to some Americans, the local aviation idioms of a given country and the regional ATC accents may be unintelligible to aviation professionals visiting the area. These numerous accents, dialects and registers contribute to the larger language of English used in a global context. Brutt-Griffler (2002) notes that "speech communities" are defined in more ways than by just political boundaries which are "far from the only large-scale determinant of a community…[as] the world itself has increasingly emerged as a cohesive economic and political unit" (p. 175). Aviation

English, as a common language for international air communication, encompasses local varieties of aviation English, and as such, represents a cohesive speech community employing a "restricted sublanguage" of English (Mell, 1991, unpaginated).

The international community of aviation represents a global speech community, one that is bound by both the local and the international regulations of multiple aviation agencies. The ICAO proficiency standards acknowledge that all aviation professionals (native and non-native speakers of English alike who come in contact with other international members of the aviation community) need to monitor their speech and language to accomplish efficient and accurate communication through mutually comprehensible language. Rather than elevate one or more varieties as the standard model, ICAO has recognized that all varieties of English have value, but that the people speaking each variety must be willing to accommodate others who use a different variety. Brutt-Griffler identifies this acceptance as

> …[T]he whole representing a space that no one speech community controls. This conception [also] does away with hierarchy among speech communities…every speaker has a dual speech community membership or affiliation: the local English speech community and the world English speech community (Brutt-Griffler, 2002, p. 180).

In addition, international aviation creates a shared community in which the localized variety of English also becomes more international through contact with other varieties of English.

While local agencies may expand the ICAO phraseology in order to meet local demands of geography, language and cultural constraints, there also must be consideration for the broader audience of international pilots and controllers. In this global view of English used specifically for aviation communication purposes, appropriate use and pronunciation of the formal ICAO phraseology represents only one element of the language needed to conduct safe flights. The other element of aviation language is the Aviation English, the everyday conversational language about aviation that is needed to address irregular situations that arise during flights. The extent to which pilots and/or controllers use Aviation English during typical daily tasks is one of the driving forces behind the research literature that will be discussed in the following section. The new rating scale suggests that the dichotomy of standard/non-standard language of aviation phraseology may no longer be the sole measure against which aviation professionals are should be evaluated; rather they must also be able to competently use Aviation English that meets the new standards in intelligibility and comprehension.

Conclusion

The previous section discussed the formulaic language used in routine and non-routine aviation communication. In addition, a summary of key issues in assessing overall language proficiency of a global language was discussed. In the following section, the main sources of data used in aviation research will be briefly outlined. Chapter IV contains a review of the literature of aviation discourse.

Section III. Aviation Data Sources

Although a comprehensive list of all aviation research is beyond the scope of this project, the discussion that follows incorporates five common sources of data used to research aviation communication: Aviation Safety Reporting System (ASRS), Cockpit Voice Recorder (CVR – accident transcripts), Simulator studies (mechanical cockpit and controller simulators), Laboratory (simulated environments not using aviation simulators) and Live Data (recordings of real-time transmissions between pilots and controllers). It should also be noted that the body of available research literature predominately focuses on American controllers and/or pilots who are native speakers of English. The findings in most of this literature, derived from the study of speakers of American English, are also generalizable to this research project which focuses on the discourse used in international aviation contexts that also have predominately native speakers of English.

Aviation Safety Reporting System (ASRS) and IATA

The Aviation Safety Reporting System (hereafter, ASRS) is a large database of voluntary reports submitted by pilots, controllers, or anyone wanting to report unusual, non-routine or dangerous situations in commercial or general aviation (private sector) within the United States (National Aeronautics and Space Administration, n.d.). The ASRS has also become a well-used resource for researching various issues in aviation due to a guarantee of anonymity to reporters in order to encourage a more complete report for each event. There is a similar international database, sponsored by the International Air Transport Association (IATA), but little research drawn from these reports has been published to date.

There are several studies based on ASRS data that analyze aviation discourse. In one of the earliest projects using the ASRS database, Billings & Cheaney (1981), examined over 28,000 reports filed with ASRS between 1976-1981, then coded and analyzed the 12,373 reports received between May 1978 and July 1980 (p. 10). The authors noted that more than 70% of all reported problems were related "primarily to voice communication," or "*information transfer*," a term that has become a key phrase in aviation discourse research (p. 1). Summarizing seven related reports within the larger technical report, Billings & Cheaney noted that the critical problem in the aviation industry was the lack of awareness of the "pervasive nature" of information transfer problem[s] (p. 91). This lack of awareness itself could be considered, to some degree, "responsible for nonstandard or inadequate communication practices by controllers and pilots" (p. 91).

An important outcome of Billings and Cheaney's report was the beginning of a series of studies focused specifically on pilot/controller communication. A pair of studies using ASRS data examined more specific types of voice communication problems (Monan, 1983, 1986). This study expanded the ASRS database search to include four years' worth of reports (June 1978-May 1982) to analyze "call sign message deficiencies"(Monan, 1983, p. 2) and "hearback problems" (Monan, 1986, p. 2). "Call signs" are the flight number of a commercial flight, typically composed of the airline name plus the flight number, for example "United 927" (Nolan, 2004, pp. 184-186). The call sign designations are used by both the pilot and controller to identify the plane, as in the examples presented earlier in Section II, (routine and non-routine communications).

Figure 3.6 Call Sign Problem Found in ASRS Report

> Since the controller did not use the manufacturers' prefixes [a name such as Cessna], we had 'SX5' and 'S65' both on the frequency. There was confusion – 'was that for us?' type of thing. It seems that the new controllers are not being trained to recognize the similar call sign problem (Monan, 1983, p. 7).

In this report, the pilot briefly described the problem, pointing out that lack of consistency in using the manufacturer prefix (as outlined in the regulations) created specific information comprehension problems which could be eliminated. In addition, Monan concluded that the pilots' "uncertainty and expectations" also frequently contributed to reported confusions with call signs (p. 8) as pilots were often guilty of acknowledging a "hearback" meant for another plane. "Hearbacks" refer to the process of controller listening for the pilot to correctly readback the controller's instruction (Monan, 1983). Omitting the call sign or failing to provide hearback was an early basis for error analysis of pilot-ATC communications. In these reports, the problems in information transfer were often identified the result of "erratic human-performance limitations," suggesting that performance could be improved and standardized (Monan, 1986, p. 2).

These three studies, Billings & Cheaney (1981) and Monan (1983, 1986) represent the beginning of research that used ASRS reports as the foundation for analyzing pilot and controller voice communication (for example, Cushing, 1994c; Montalvo, 1995). In 1998, a study of more recent ASRS reports (July 1991 through May 1996) commented that although there is "an astonishing low error rate" in pilot and controller communication, additional research has indicated that 'readback' and 'hearback' errors still occur nearly hourly (Cardosi, Falzarano, & Han, 1998, p. vii).

International research on aviation communication is less widely reported perhaps because there are fewer such data sources available for study. A second possibility is that language barriers prevent more collaborative studies between international aviation agencies. One study noted that the reports by international pilots and controllers found in the International Association of Transportation (IATA) database, suggested different types of problems than that found through analysis of the American ASRS database (Orasanu, Davison et al., 1997). A key finding was that the IATA reports did not contain problems related to "language or accent, improper readbacks or dual language switching," all of which were categories found in the ASRS reports submitted by American pilots flying outside the United States (p. 675). The authors speculate that the differences between the two databases may "represent attention to clearer communication or [to] different levels of adaptation to linguistic diversity" on the part of the pilots and controllers in an international environment (p. 675). Both of these factors appear in research discussed below in terms of discourse in *live* aviation communication.

ASRS studies: Discussion

The primary strength of the ASRS database is the large number of reports that are submitted and stored for public research and analysis. The reports are available to the public, either through published summaries in a regularly published bulletin, *Callback* (published monthly by NASA, or available online at http://asrs.arc.nasa.gov/callback_nf.htm). In addition, the research results from these studies are often reported back to the aviation community with specific recommendations for improvement or change. The research reported by Monan (1986) led directly to changes in FAA regulations regarding the communication process between pilots and controllers. By surveying the suggested causes and actions detailed in the reports, researchers can document trends and developments within the aviation industry.

Reports filed with ASRS, however, also are potentially biased by the voluntary nature of the reports. Anyone (pilot, controller, ground crew, non-aviation observer, etc.) may file a report on any given incident or accident, increasing the total number of reports submitted for a single event. As a result, quantitative research may become biased towards those events with more reports on file. Another weakness is the voluntary nature of the reporting. Each report is filed based on the reporter's memory of the event including any dialogue that is included in the report. Since there is no time limit to the delay between the event and the filing of the report, the reports include reconstructed dialogue(s) and "unverified statements of individual, subjective viewpoints and opinions" (Monan, 1983, p. 3). For researchers who use the ASRS as the basis for studying aviation discourse, there may be an additional bias inherent in the data simply because it is not provided from an objective informant or recording.

A second weakness of the information housed in the ASRS database concerns accurately documenting the number of events or problems actually described within the reports. Cardosi, Falzarano & Han (1998) noted that although the ASRS database provides insight into the types of errors that occur in the American national aviation system, "most common errors are corrected on the spot and not reported to the ASRS" (p. viii), suggesting some type of errors may not even be reported. A related issue is that overt problems, such as failure to make a correct readback, typically are reported to a greater extent than "partial readbacks [which] may be less salient and thus reported less often" although they may have the same or even greater impact on safety (Clark, Morrow, & Rodvold, 1990, p. 3). As a result, quantitative analysis based on ASRS data regarding spoken performance error or content may need to be balanced against other sources to provide an accurate description of the event(s) when reporting statistical information.

Cockpit Voice Recorders (CVRs) and Official Accident Transcripts

A second source of aviation discourse studies is drawn from the language found in accident/incident transcriptions made from Cockpit Voice Recorders (the CVR or "Black Box") (National Transportation Safety Board, 2004; Nevile, 2004). The CVR recording is a 30-minute loop of audio-only tape that runs continuously, erasing all previous data as the tape continues to record. As a result, only the final 30 minutes of the flight are captured on the tape. The CVR starts recording when the plane's engine powers up and the recorder runs until the engine powers down either at the end of a successful flight or when the engine's power supply is interrupted as the result of a crash. All audio transmissions between the flight deck crew, anyone entering the flight deck, and any transmissions between the flight deck and the air traffic controller(s) or other sources, such as the aircraft's company dispatcher, are recorded (National Transportation Safety Board, 2004).

Recovery of the CVR is an essential part of any accident investigation since transcription of the CVR tapes is an essential resource to help determine what may have happened to the mechanical as well as human systems on board. Sassen (2005) notes that the CVR "acoustically documents actions undertaken by [the] crew" during non-routine or emergency situations (p. 2). examples from accident transcripts have shown that the CVR is able to capture discussions of malfunctioning equipment or flight crew issues in the final 30 minutes before the event occurs, such as flight crew assessments of options in a low fuel situation or unusual wind conditions ("Aviation Safety Network," 2007). In conjunction with the CVR, the accident investigators also incorporate transcripts from the simultaneous recording of the flight that occurs at any air traffic control center or tower that maintains contact with the flight in progress. These ATC tapes do not run in a timed loop (as with the CVR); instead, they contain all the radio transmissions throughout the entire event as well as the more routine messages involving the subject aircraft prior to the event.

A number of studies of the CVR transcripts have contributed to the understanding of aviation discourse. Several studies examined the language used by the flight crew as a resource for identifying points in the conversation which suggest the kinds of decision-making errors that had occurred while the flight officers or the controller(s) exchanged information during emergency conditions (see Predmore, 1991; Sassen, 2005). Cushing (1994a) used CVR data to demonstrate that repetition, in the form of "ritualization" of standardized aviation phrases or vocabulary, may cause over-dependence on phraseology in an attempt to describe an evolving situation rather than use of more explicit language during an emergency (p. 63).

CVR data from aviation accidents has also been used to analyze flight crew language during emergency events for evidence of specific discourse features. examples include evidence of social interaction in the form of "collaboration in the pursuit of safety" (Symer, 1998, p. 29), to demonstrate "how communicative patterns and actions manifested themselves in talk" when communication effectiveness is reduced by impending danger (Driscoll, 2002, p. 14), or to examine levels of mitigation used between members of flight crews (1983; Linde, 1988). Using CVR data to focus on international aviation crews' messages, Tajima (2004) argued that the lack of English proficiency resulted in several international accidents due to miscommunication caused by use of non-standard aviation language.

CVR studies: Discussion

Unlike ASRS documents which contain reported language, CVR tapes record the language spoken during the aviation event. Protected by a strong, secure metal housing, the tapes are usually recoverable even in the most serious accidents (National Transportation Safety Board, 2004). The data recovered from the tapes are transcribed by experienced accident investigators. Because some of the transcripts are available not only through government agencies (such as NTSB), but also via the Internet (for example, see "Aviation Safety Network," 2007), some or all of the accident transcripts are accessible for public research without formal permission from government agencies.

However, the transcripts also have potential drawbacks for linguistic or discourse studies. With only a 30-minute continuous loop, the limited timeframe creates the potential for missing earlier elements of crew interaction that may have caused or contributed to the accident. Depending on the nature of the emergency, if the flight crew needed to put on oxygen masks, the masks may negatively interfere with the overall audio quality of communication through the aircraft radio system ("Aviation Safety Network: CVR transcript South African Flight 295 - 28 NOV 1987," 2007).

In addition, it is possible for the recorder or the tape itself to be damaged upon impact or during the recovery process, creating a loss of a crucial piece of evidence. Due to confidentiality for government research or pending litigation, the request process for obtaining specific transcripts may extend beyond the available time limits of a given research project. Goguen & Linde (1983) point out that use of only accident transcripts for analysis of aviation communication does not allow for comparison for similar conditions in more routine flights where “some problem arose and was dealt with successfully” (p. 12).

Although final reports of any aviation accident investigation include a section that suggests causes for the accident, Dekker (2001) suggests that CVR transcripts often may fail to provide evidence of “why data was not noticed or why it was interpreted differently” (p. 42). For researchers interested in detailed analysis of the language associated with the event, the inaccessibility of the original tape may interfere with achieving accurate results.

Simulator Studies (mechanical cockpit and controller simulators)

Another commonly-used source of language data in aviation comes from studies conducted in sophisticated mechanical simulators representing the highly technical environment used by either pilots or controllers. Typically, pilots participate (often in small groups representing a normal flight crew) in simulated portions of an authentic flight (for example, representing a flight between San Francisco and Seattle). The flight crew enters a simulator cockpit that contains a variety of gauges, radios, controls and other equipment, in varying degrees of authenticity for a specific aircraft, in order for the flight crew to believe that the flight is actually happening (McGann, Morrow, Rodvold, & Mackintosh, 1998). Changes in FAA training requirements since 1980 now allow a significant amount of training time for pilots to be done solely in “high-fidelity simulators,” thus making the simulator environment highly relevant for a variety of research purposes (Burki-Cohen & Kendra, 2001, p. 230). The recordings of the simulated conversations on the flight deck as well as the crews’ communications with a simulated air traffic controller (a recorded tape or a person outside the simulator taking on that role) allows researchers to analyze the language used to make decisions made by the crew during the simulated flight time (Burki-Cohen & Kendra, 2001; McGann et al., 1998; Veinott & Irwin, 1996).

For this research study, an important product of one simulator study was a linguistic coding scheme developed by Kanki & Foushee to monitor the communications of the simulator crew (Kanki & Foushee, 1989). The detailed coding scheme included 19 categories which allowed for detailed analysis of verbal exchanges made during the simulated flight. This level of detail prompted others to adopt the coding system to subsequent studies of aviation communication (see Seamster et al., 1992). This coding scheme will be discussed in more detail below in relation to taxonomic categorization of aviation discourse.

Simulator Studies: Discussion

By using simulators, aspects of crew performance has been documented and studied through analysis of both audio and, more recently, video recordings. The video recordings have the advantage of showing the corresponding physical as well as verbal context of interactions (Nevile, 2004). A further advantage is that part-task simulations (where crews do not experience a fully simulated flight segment; or use limited flight deck technology) can be designed to examine specific crew communication patterns. The advantages of mechanical simulator studies for linguistic analysis, however, need to be carefully examined against the disadvantages in terms of the trade-off for authenticity as the “very nature of simulation, however, limits [its] generalizability” (Veinott & Irwin, 1996, p. 47). Researchers also need to take into account that simulator studies cannot accurately measure how effectively the participants actually involve themselves in the simulated environment. Knowing that there is no potential for accident or loss of life may subtly affect participating crew communicative and task performance during the simulation.

Laboratory Studies (research not using mechanical aviation simulators)

A relatively small amount of literature on aviation discourse comes from non-aviation laboratory studies, primarily from academic psychological research projects. Unlike the aviation simulator research described above, the laboratory studies typically have college students within an academic department or other college student volunteers as subjects. One group of studies has focused on the linguistic issue of message complexity, defined as the number of propositions expressed in one transmission, through experiments using computer-generated screens to represent the 3-dimensional problems of navigating airspace (Barshi, 1997; Barshi & Healy, 1998). Controller-like instructions are generated through an audio tape that provide the subjects with navigational problems to be executed with a computer mouse moving across a computer screen (see also Lynn, 2004).

Laboratory Studies: Discussion

By isolating the subjects in a non-aviation environment, researchers are able to focus on specific linguistic performance issues, but do not need to directly draw from the domain of aviation. In Barshi's (1997) research, cited above, the focus was on the degree of accurate cognitive processing of instructions rather than on technical or linguistic aviation performance. Laboratory researchers claim that the activities and results are "analogous" to air traffic control instructions and, as such, can be applied to studies of message complexity, to be discussed further under Error-Based Studies, in Chapter IV (Barshi & Healy, 1998, p. 161). It should also be noted that many of these studies have been funded by (US) government agencies to support the investigation of specific problems in aviation communication.

However, results from laboratory studies, like the results of the simulator studies discussed above, cannot fully represent the pilot or controller's environment and are not able to objectively measure the extent the subject(s) identify with the simulated task. In the studies noted above, laboratory subjects are given instructions, but not permitted any verbal response, which takes out the interactive component, a key feature of aviation communication. Because many of these studies used non-aviation subjects, the responses are an additional step away from accurately representing the authentic environment of aviation communication. As a result, these studies may suggest areas of further research, but should not be considered as the sole means to provide accurate data without testing the findings within a more authentic aviation performance environment.

Live Transmission Studies (use of recordings of real-time communications)

Because this research study focuses on discourse analysis and the questioning functions of language, the literature based on real-time recorded aviation discourse most closely relates to the research presented in the later chapters of this study. Until recently, few samples of recorded aviation data were available without consent from the FAA. As a result, most of the earlier studies were products of federal contractor reports with the FAA also selecting and providing the audio tapes. The research using live data falls into several broad categories: description, classification and discourse studies.

1. Descriptive studies include research that focused on aspects of aviation communication, drawn either from live observation or recorded communications: verbal/non-verbal communication (Nevile, 2004), samples of basic ATC language (Santiago, 1988), observations of ATCs in workplace environment (Human Technologies et al., 1992) or evidence of pragmatic language used in communication (Howard, 2003).

2. Classification studies use some samples of live data to investigate specific features of aviation communication. One of the earliest studies simply looked at live air traffic controller transmissions in order to identify the basic elements of messages used in the "highly routine system" of the developing American commercial airline system (Sumby, 1960, p. 69). Further classification studies of (recorded) live transmissions began again in 1989 and continue to be used to expand the understanding of aviation language (e.g., Clark et al., 1990; Golaszewski, 1989; Seamster et al., 1992). Building on Monan's (1983, 1986) studies of "readback" and "hearback" errors found in the ASRS database, other reports focused on (recorded) live transactions between pilots and controllers by investigating the miscommunications occurring in airport terminal operations (Clark et al., 1990; Morrow et al., 1993; Morrow et al., 1994).

Another series of studies targeted errors found in live pilot-controller voice communications in the major phases of flight in which they occurred: TRACON (Terminal Radar Control); Tower/Ground, Enroute and Tower/Local (Bürki-Cohen, 1995; Cardosi, 1993, 1994; Cardosi et al., 1996). A separate analysis of TRACON facilities focused more closely using a separate coding system, discussed further below under Taxonomies (Prinzo, 1996). In all of these studies, errors in use of aviation phraseology were classified and then statistically analyzed. Some actual samples of miscommunication drawn from the recordings were presented, but only as incidental features in the reports.

Rather than a focus on transmission errors, linguists have looked at air-ground communication through the lens of discourse analysis, examining such features as mitigation and sociological patterns in communication between pilots and controllers (Howard, 2003; Simmons, 1978). There are also studies drawing authentic language data from international pilot-controller environments that focus on phraseology variation and linguistic cooperation: Turkey (Sullivan & Girginer, 2002); and Switzerland (Wyss-Bühlmann, 2004), and professional interaction: Australia (Nevile, 2004); Sweden (Sanne, 1999).

Live Transmission Studies: Discussion

With technical advances in audio recording and availability of live transmissions via the Internet, researchers now have more opportunities to record authentic pilot-controller communication. The improved recording process itself, however, is not without problems. Recorder failure or poor radio/audio signals, as with earlier recording equipment, is always a potential weakness in the technical system. In addition, there is still the lack of visual context (physical and situational factors) that may affect the interpretation of the discourse made by the researcher (Nevile, 2004; Sanne, 1999). As with other sources, the time necessary to construct an accurate transcription is also potentially limiting factor in building a large research corpus of authentic aviation discourse.

A separate problem is that various descriptions and classification systems emerging from research using the transcripts often do not identify or code the language with the same classifications. The lack of consistent coding results in a collection of studies not easily compared for similar features or trends of language use.

Aviation Data Studies: Conclusion

This section has presented five sources of language data analyzed in aviation literature focused on communication studies. The literature shows that for over 25 years, data have been collected from the ASRS database, official accident transcripts (CVR data), mechanical simulator environments, laboratory studies and live data recordings. Each source of data was also evaluated for its specific strengths and weaknesses as part of the growing body of research on aviation communications. In addition, research analyzing international aviation communication was given in each of the appropriate categories where it was available.

The varieties of data sources also suggest that each of the sources contributes features that might be otherwise unnoticed or discarded. With the advances in technology available to researchers, live data can be used to document what is actually happening in aviation communication in real time under normal operating conditions, not just in accidents. Further, international data, now also available to a limited degree via web-based links, can be collected to provide a broader picture of how pilots and controllers interact, what kinds of language is used in those interactions, and to what extent accent and non-standard language affect the aviation communication process.

In Chapter IV, a review of aviation discourse literature incorporating the various sources of the data described in this section will be discussed.

CHAPTER IV

REVIEW OF AVIATION DISCOURSE LITERATURE

Section I. Introduction

Chapter III presented an overview of the aviation communication context, including an introduction to the phraseology of routine and variations of non-routine aviation transmissions. This chapter consists of a review of the research of literature analyzing aviation communication. In Section II, the review, will begin with a discussion of two principal forms of classifying aviation discourse: language form (error) and language function (speech act). Section III provides a survey of research that examines questioning functions and pragmatic features found in the language used by pilots and air traffic controllers, specifically politeness and mitigation, collaboration, and socially-shared interaction. The last paragraphs of this chapter will conclude with a summary of the findings related to questioning in aviation.

Section II. Classifications of Aviation Discourse

As shown in Chapter III, there has been a variety of data sources used as the foundation for examining radio communication between pilots and controllers. This section describes those studies in terms of the research objective used to distinguish the various projects. Relevant research on international aviation discourse will be included within each of these areas. In addition, pertinent studies involving non-native speakers of

English will be noted. Unless specifically noted, all research and events described are based on reports concerning flights within the United States. Because there have been few studies of aviation discourse from other countries where English is the primary language, the research described below will be used to build a foundation for the current research project which focuses on aviation English as used in Canada and Ireland.

Error-based Taxonomies

In surveying the literature of voice communications, the primary focus of most research has been quantitative investigations of errors found in verbal performance (both omission of information as well as misspoken information) by pilots and controllers. The focus on errors made in American airspace has been driven by FAA concerns over increasing numbers of serious events involving both non-fatal crashes and accidents with at least one fatality, or other events causing threats to safety. In addition to the increases in traffic by commercial and private aircraft, the American air traffic controller's strike in 1981 was also a source of concern (Morrison & Wright, 1989, p. 902). At that time, the aviation industry lost all of its experienced controllers which caused the public to fly under the direction of newly trained controllers at control towers across the country. The lack of experience and increased traffic loads for these controllers created an industry-wide concern for additional potential problems in aviation safety, prompting a number of research projects funded by the FAA (Morrison & Wright, 1989; Santiago, 1988).

These studies developed a variety of classification systems to document problems perceived to stem from communication between pilots and controllers. Prinzo and Britton (1993) used the term "taxonomic approaches" to identify various classifications of aviation discourse (p. 4). This section describes several classification systems designed to increase the industry's knowledge of aviation communication, often referred to as "communication taxonomies," but which were focused on the categorization of phraseology errors or procedures made in pilot-controller transmissions (Prinzo & Britton, 1993, p. 4).

The concern over safety issues led to projects researching the ASRS reports where "problems in the transfer of information within the aviation system were noted in over 70% of 28,000 reports" between 1976-1981 (Billings & Cheaney, 1981, p. 1). In their contribution to the larger report, Grayson and Billings (1981) devised a classification system targeting "generic types of communication problems" found in voice communications reported in the ASRS database. Included in the categories were descriptive terms and definitions related to the accuracy or completeness of the phraseology or content of the speaker's message as heard by the listener:

- Misinterpretable (phonetic similarity)
- Inaccuracy (transposition of numbers/data)
- Other inaccuracies in context
- Incomplete context
- Ambiguous phraseology
- Untimely transmission
- Garbled phraseology
- Absent message (not sent)
- Absent message (equipment failure)
- Recipient not monitoring (failure to hear a transmission due to inattention to radio) (p. 47).

The research report concluded that pilots and controllers frequently were not providing necessary information in any consistent pattern (i.e. not following the standard phraseology transmission format) which caused both parties to be more likely to fail to accurately decode crucial transmission information. A separate, but long-ranging, conclusion noted that "many of these [reported] communication problems involve *human errors* [italics added] on the part of the sender or receiver of the message" (p. 60). The use of "error" and its related meaning of "blame" seemed to set the pattern for assigning "fault" to specific persons (pilots or controllers) for much of the subsequent research in the 1980-1990s.

Monan's (1983, 1986) analysis of ASRS data also targeted specific errors in verbal performance. Monan's studies focused only on callsign ("readback") errors and "hearback" problems documented in the ASRS database. "Readback" is an international term that describes the procedure where flight crews "shall *read back* to the ATC safety-related parts of ATC clearances and instructions which are transmitted by voice" (italics added) (International Civil Aviation Organization, 2001a, p. 4.5). ICAO specifies the types of information that must be read back, including "[flight] level instructions, heading and speed instructions, and where required by the appropriate ATS authority, transition levels shall always be read back" (International Civil Aviation Organization, 2001a, p. 12-1). A controller may also specifically ask a pilot to "*read back*" certain information, the term being a short form of the request, "repeat my message back to me" (Federal Aviation Administration, 2004b, p. PCG R-4).

"Hearback," a term Monan identified as first appearing in a 1980 issue of *Callback* (the ASRS periodical), referred to "the act of a controller's actively listening to a pilot's readback of an ATC clearance" (Monan, 1986, p. 32). Subsequent research adopted these terms, creating classifications where "readback/hearback errors" were terms applied as either a category or descriptive term in the various classification systems (see Golaszewski, 1989; Prinzo & Britton, 1993). Monan's studies, as well as those by Golaszewski and Prinzo & Britton, represent one of the earliest attempts to quantitatively document specific features of aviation discourse to pinpoint both type and frequency of errors as simply deviations from standard phraseology or procedures. Morrison and Wright (1989), looking specifically at air traffic controller miscommunication, focused on three areas of ATC discourse represented in ASRS reports: controller errors, communication errors and workload performance factors. The 1989 paper also represents an industry shift from identifying a *problem* or *failure* in communication towards identification of miscommunication originating as either pilot- or controller-*errors* [italics added] (Prinzo & Britton, 1993).

In a more theoretical study using a taxonomy based on transformational grammar, Philips (1991) compares features of "natural English with the English used in aviation phraseology" (p. 110). The analysis compares and contrasts elements of the "two variants…the original English-language version…and, in non-English countries, a translated version" (p. 108) to determine potential levels of "syntactic or semantic ambiguity," where non-ambiguous phraseology represents the highest degree, or "Ø" [null] degree of ambiguity (p. 112). He concludes that the formal phraseology, rather than reflecting any repetitive features to insure accurate message transmission, consists of many "elliptical" phrases which depend heavily on the shared context of meaning for both the pilot and controller. Philips drew his data from the prescribed formal phraseology found in the "official English-language version" of the official French phraseology, consequently there is no attention to aviation language from authentic communications (p. 108).

Error-Based Taxonomic Approaches: Discussion

As with any study using classification systems, there are advantages in that data meeting the classification criteria can be easily documented and reported in a quantitative analysis. The studies reported above represent several approaches to identifying key features of aviation discourse. However, there are also disadvantages in using absolute categories for classification systems. The first is that the system itself will limit what data can be accounted for in the analysis. The second drawback is that studies that do not use the same descriptors will not produce the same results, thus eliminating obvious trends or tendencies that can be generalized across several studies. As noted above, in the discussion of sources of data, the taxonomic studies did not always draw from the same sources of data, making the results somewhat inconclusive when combined. The diverse classification systems also prevent generalizing the results across the various studies.

Speech Act Taxonomies

By far, the most common classification, or taxonomic, system used in aviation discourse research has been developed from Searle's (1969) Speech Act theory (see discussion of Speech Act theory in Chapter II). Speech Act theory was adopted as a research tool for aviation discourse because of its focus "on the operational aspect of language – how a particular sentence achieves some effect in the world" as well as its potential to provide "a taxonomy of possible types of speech acts" (Goguen & Linde, 1983, p. 3). Early use of Searle's classification system became a popular analytic tool for subsequent studies of the verb-based instructions used by controllers and pilots (Clark et al., 1990; Goguen & Linde, 1983). Goguen & Linde (1983) also paved the way for researchers who "modified this taxonomy to provide an inclusive listing of the speech acts found in cockpit communication" (p. 3). These modifications included "Requests (including orders, requests, suggestions and questions), Reports, Declarations, and Acknowledgements" (p. 3).

Expanding on Goguen and Linde's classification system, Kanki & Foushee (1989) created a "speech act typology developed for ASRS reports" that included 19 categories to identify flight crew communicative functions that paralleled speech act functional descriptions: Inquiry, Answer, Response, Repeat and Agree/Disagree (Kanki & Foushee, 1989, pp. 404-405). The coding for "Inquiry" addressed any "request for factual, task-related information; not a request for action" (Kanki & Foushee, 1989, p. 405). This approach revised the original speech act definition of "request," (as a call for action) whereas Searle uses the "question" category to function as an appeal for "information" without necessarily any accompanying action (Searle, 1969, pp. 66-67). Kanki & Foushee's coding system has continued to be a research tool in aviation communications studies, although it has been modified, thus diluting the relevance of the original classification for contributing to building a broader foundation of aviation discourse (see Clark et al., 1990; Kanki, Greaud, & Irwin, 1989; Morrow et al., 1993; Prinzo, 1996; Veinott & Irwin, 1996).

The speech act framework has also been used to focus on "thought units," targeting utterances of "single thoughts, intents or actions" found in accident transcripts

(Predmore, 1991). Rather than investigate errors in specific units of phraseology during accidents, the research focused on the function of the utterances. Predmore's classification identified several speech functions: "Command-Advocacy, Inquiry, Incomplete-Interrupted, and Reply-Acknowledgement" (p. 350). However, there was little attention given to the content of specific utterances, making no effort to determine the form or function of questions that might have given insight into how crews structured concerns or requested information during emergency situations.

Further modifying Kanki & Foushee's system, Prinzo, Britton and Hendrix (1996) developed the Aviation Topic-Speech Act Taxonomy (ATSAT) targeting elements drawn from FAA phraseology. The primary purpose of the ATSAT was to use a computer-based application to identify and label those "verbal communications that deviate" from the standard phraseology (Prinzo et al., 1996, p. 105). Rather than a focus on the speech act verbs, this system developed a taxonomy incorporating specific communicative functions and the related aviation topics.

Below, Table 4.1 lists the ATSAT taxonomy categories by Speech Act, or general function, and Aviation Topic, or type of information in the utterance. Table 4.1. Aviation Topics/Speech Act Taxonomy (Prinzo, 1996, p. 7).

Table 4.1.
ATSAT Speech Act Taxonomy.

Speech Act category		Aviation Topics
1.	Address/Addressee	Speaker, Receiver
2.	Courtesy	Thanks, Greetings, Apology
3.	Instruction/Clearance—Readback/Acknowledgement	Heading, Heading Modification, Altitude, Altitude Restriction, Speed, Approach/Departure, Frequency, Holding, Route/Position, Transponder Code, General Acknowledgement.
4.	Advisory/Remark—Readback/Acknowledgement	Heading, Heading Modification, Altitude, Altitude Restriction, Speed, Approach/Departure, Route/Position, NOTAM, ATIS, Weather, Sighting, Traffic, General Acknowledgement.
5.	Request—Readback/Acknowledgement	Heading, Altitude, Approach/Departure, Route/Position, Type, NOTAM, Traffic, Weather, Say Again, General Acknowledgement.
6.	Non-Codable Remarks	Equipment, Delivery, Other

The “address/addressee” (line 1) represents either “an air traffic control facility position/sector or an aircraft” while (in line 2) Courtesy was defined as “often signals the end of a transactional communication set between the air traffic controller and the pilot, in much the same way that a ‘good-bye’ signals the end of a telephone conversation” (Prinzo, 1996, p. 7). This classification system pinpointed locations of errors in various types of information (e.g., headings, speed, weather, etc.) in specific phases of aviation communication. However, the same types of information could fall into more than one Aviation Topic category, such as Heading which is found in Instruction (line 3), Advisory (line 4), or Request (line 5). In addition to the focus on speech acts, there was an additional error-based coding scheme that was used in conjunction with the taxonomy that included 9 separate types of errors. The final analysis of the voice communications included a detailed coding form that pointed to which segment (or phrase) of the communication, the speaker and the exact wording of the message and its accompanying errors. While quantitative results were guaranteed, the heavy focus on errors and deviations did little to demonstrate whether messages were, in fact, successful in accomplishing the communicative goal of the participants.

Speech-related taxonomies have also been developed to investigate more general language problems, such as ambiguity and complexity of language in aviation communication. Cushing (1994b) categorized errors in pilot or controller messages using Speech Acts and general features of language, such as ambiguity, homophony, intonation and speech acts as well as reference (deixis), repetition and interference through misunderstanding of the message content. While his examples are presented as authentic language, the examples were drawn primarily from language reported in the ASRS *Callback* reports (see this chapter, Section II). As a result, several factors limit the validity of his argument that existing aviation phraseology (and communication procedure) is inherently dangerous. First, he rarely points out that the examples he cites are often clarified in the following turn by one of the participants in the interaction. Second, his conclusions to resolve these problems were generally drawn from other sources already in print (usually documented in notes at the end of the book) at the time he published his book; in fact, several problems were already being addressed by various aviation industry agencies and companies (Sanne, 1999), including Monan's (1983, 1986) investigations of the ASRS report database. While Cushing does cite examples, a major weakness in the research methodology is that he provides no supporting quantitative data to document as to the actual frequency of these errors or the relative frequency in proportion to either aviation or normal conversation.

Investigating the "linguistic dimensions of crisis talk," Sassen (2005) uses a speech act approach to investigate features of cockpit interactions taken from two

Cockpit Voice Recorder (CVR) transcripts. Citing Cushing's categories and other sources described above, Sassen notes that the specific classes used to analyze errors in aviation communication can not always be neatly categorized since "the distinction[s] are selective" (p. 12). Using transcripts from two accidents, the data is then subjected to further analysis through a procedure that involves an application of Speech Act theory and extensions of illocutionary logic (drawn from Searle and Vanderveken, 1985). Sassen then developed a computerized annotation system to "tag" the data for analysis which permits identification of "specific stretches of data" from the corpus (see "XML-markup, Sassen, 2005, pp. 77-79). The results suggest that this analytic procedure has potential as an analysis tool although only two transcripts of the 77 available documents were considered appropriate data for this methodology. Although the computer coding system may point to specific elements of the transcribed communications, the effect of interaction or negotiated meaning for clarification, checking or confirmation does not seem to emerge.

The purpose of this section was to review the studies using speech act taxonomies in aviation communication, including identification of questioning forms or functions in pilot-controller voice messages. Many of the classification systems, described in the previous sections focused on analytic labels derived specifically from aviation phraseology or aviation topics. The advantage of these systems is that they can be readily assigned to errors in the technical language, such as information categories (advisories, etc.). However, the disadvantage is also that these taxonomies focused on standardized phraseology with the intent to identify and count only deviations from the phraseology corpus. As a result, many of the non-standard, yet commonly used features of aviation discourse, do not appear and there is no systematic analysis of the degree of frequency or the context in which these non-standard features are used (pilot or ATC speaker roles). Further, the use of questions, since they are considered as a non-standard feature of phraseology, did not emerge as a significant form or function of pilot-controller interactions.

The next section addresses research studies investigating the specific forms and functions of aviation miscommunication or communication *errors*. Beginning with studies that specifically address questioning, the section outlines studies focused on pragmatic-based features of aviation communication.

Section III. Aviation Communication as Discourse

In this section, two broad approaches will be used to examine aviation language. In the first part, the attention will be on studies that focused on pilot/controller communications as a source of error through the incorrect use of standard phraseology. The second part of this section will focus on discourse-based and pragmatic features found in the language used by pilots and air traffic controllers. Beginning with a review of studies that drew attention to questioning forms or functions found in aviation discourse, the remainder of that discussion will look at pragmatic features including politeness and mitigation, cooperation and collaboration and socially-shared cognition. The chapter ends with a summary of the role of questioning in current aviation discourse literature.

Error-Focused Studies

Aviation research has investigated pilot-controller communication as a crucial factor for improving industry safety (for example: Bürki-Cohen, 1996; Clark et al., 1990; Monan, 1983; Sanne, 1999). By continuing the focus on errors as the foundation of the research, whether identified through speech act studies or analysis of transcribed data, investigations have sustained the premise that speaker's use of aviation phraseology is either correct or incorrect, that speakers' utterances are fundamentally right or wrong.

All research using the ATSAT coding system requires that *any* non-standard phraseology or language be counted as an error (Prinzo et al., 1996). For example, if the original controller instruction was to "Say your speed," the instruction is coded for multiple "errors." The correct instruction is "Say airspeed," therefore, the original instruction "contains both an excess verbiage ['your'] and a substitution error [*airspeed* > 'speed']" (Prinzo, 1996, p. 10). The results of analysis using such a coding system will produce a significant number of errors, although the error count may actually be very small relative to the total number of communicative elements recorded for the analysis. While this research builds a foundation for statistical analysis, it does not provide adequate explanation of any trends of the variations found in the data since the actual language is not documented; it is merely assigned to one or more categories of error.

Another major concern for aviation research focuses on the ability of pilots or controllers to effectively utter a message that is both accurate and comprehensible so that the key features of the message can be restated in the readback correctly. Monan (1983, 1986) concluded in his analyses of the ASRS data that lack of explicit confirmation by the controller did not always mean the pilot's readback was correct. That finding coupled with the finding that multiple "speech acts that require different pilot responses (e.g., acknowledging a traffic report and reading back commands)" often led to pilot failure to readback the instructions correctly when the pilot needed to make two or more different types of responses to the controller (Morrow et al., 1993, p. 301).

A common problem noted in the aviation research discussed in this section is the additional time needed for pilots (or controllers) to redirect their communication to attend to correction or clarification of information already presented, primarily through requesting repetition for some or all of the information that should have appeared in the readback messages or to correct information made in a readback (e.g., Bürki-Cohen, 1995; Cardosi, 1994). Pilot requests for repeats were coded as controller errors, where controllers were blamed for not relaying a message clearly enough for the pilot to make a full readback. The result was assigned as a pilot "error" because additional turns were required to clarify or correct the information. This focus on poor transmission and ATC error may also have covered evidence of questioning forms or requesting repetition or additional information to clarify the original transmission.

Building on Monan's data regarding the multiple responses, Morrow (Clark et al., 1990; Morrow et al., 1993; Morrow et al., 1994) coordinated one of the first series of quantitative studies of aviation communication using live communications recorded at four major U.S. airports that investigated the "problems that disrupted this communication" (Morrow et al., 1993, p. 285). Analysis of over 40 hours of taped real-time messages were examined as "units that roughly corresponded to utterances with a specific communication function [which] ranged from one phrase…to several phrases," then subjected to analysis of three features: (1) transaction organization, the group of turns between the same controller and pilot as well as the length of the complete turn "and speech acts;" (2) speech acts and topics categorized by a speech act-based coding scheme "adapted from prior aviation research (e.g., Goguen, et al, 1983; Kanki & Foushee, 1989), and (3) routine or non-routine ("with understanding or information problem") (Morrow et al., 1993, pp. 290-291).

In the studies, communication errors were then classified as either "procedural deviations" or "inaccuracies [of information]" (Morrow et al., 1993, p. 287). Included in the definition of non-routine transactions are the messages where "pilots or controllers interrupt routine information transfer to indicate that they misunderstood all or part of the message (understanding problem) or that the message is incomplete or inaccurate (information problem)" (Morrow et al., 1993, p. 287). The interruptions were rated a second time to examine "how controllers and pilots indicate and repair problems in non-routine transactions" (Morrow et al., 1993, pp. 290-291). Unlike Monan's (1983, 1986) studies which showed pilots reporting (to ASRS) misunderstandings due to controller communications, Morrow et al.'s live data showed that communication deviations by the pilots may have been due to controllers using "speech acts that require different pilot responses (e.g., acknowledging a traffic report and reading back commands)" (Morrow et al., 1993, p. 301). This pairing of cause-effect (controller message with pilot deviations) represented a new analytical approach for aviation discourse since both pilot and controller messages were investigated for their contribution to communication problems.

The discovery of the number of non-routine transactions was addressed in a subsequent study that focused on the “strategies and devices [which] are used to resolve these [common] problems (Morrow et al., 1994, p. 235). Noting that “once a problem occurs, pilots and controllers must collaborate to resolve the problem. To do this, they deviate from the collaborative scheme, producing a non-routine transaction” (Morrow et al., 1994, pp. 237-238). This perspective is notable for the positive connotation of “collaborate,” even in the environment with “deviate,” as it focuses on the aviation communication as an interactive process rather than isolated messages containing errors.

The studies were notable for the attention given to longer stretches of discourse and pragmatic processes involving the features of requesting and repair, Morrow et al.’s (1994) study continues with an analysis based on the dichotomy of right/wrong language. One implication of this study is that it is a communication *error* to stop the interaction to repair the transaction. While there is valid reasoning in accounting for non-routine turns as a result of incorrect communication procedure, an error-based analysis also implies that not stopping to make repairs would be a more “error-free” behavior, which is clearly not always in the best interests of the communicative situation. Errors that created non-routine transactions were identified in categories: “syntactic form of utterance” or “non-standard terminology” or “non-standard abbreviations” or incorporating “referring devices,” such as “pronouns, deictics…and other expressions that require context for interpretation” (Morrow et al., 1994, p. 244).

In both the 1993 and 1994 studies, only data were used that paired the controller with the same pilot for both a routine and non-routine message, a condition that may have reduced the overall frequency of the actual occurrences of the non-routine language.

Results showed that 83% of "understanding problems" involved "collaborative devices" that "indicated [a] problem;" of these problems, 25% used the formal phraseology of "say again" (Morrow et al., 1994, p. 247). One example of an understanding problem is given in Figure 4.1. The pilot did not understand the controller's instructions, so in line b., the pilot inserts a side-sequence to indicate the problem and obtain clarification from the controller (line c.).

Figure 4.1. Problem in Understanding

a.	1.	ATC	Cessna 223, turn left heading 180 Climb and maintain 8000 feet	
b.	2.	P	Cessna 223, <u>say again the heading</u>	[problem indication]
c.	3.	ATC	Cessna 223, turn left heading 180 Climb and maintain 8000 feet	[problem repair]
d.	4.	P	180, 8000 on the altitude, Cessna 223 [Final acceptance]	

(Morrow et al., 1994, p. 239)

Once the controller repeats the instructions, the pilot provides the correct readback and acknowledges the message (line d.).

The findings also showed that of 114 items that "indicated a problem," 35% employed a specific request and an additional 23% which used a partial "repeat with questioning intonation," as shown in Figure 4.2 (Morrow et al., 1994, p. 247).

Figure 4.2. Questioning Used in Non-Routine Situations

a.	Request	P	What was that heading?
b.	Partial repeat	P	That was heading 180?

(Morrow et al., 1994, p. 247)

As these samples show, questioning is clearly used for clarification or checking. The overall frequency of these *non-routine* discourse features also suggest that repair functions (35% question, 23% questioning repeat) are an important, if not necessary, part of pilot/controller interaction, whether or not they may be in the form of approved phraseology. The researchers noted that “when resolving problems, however, controllers and pilots may switch to language and strategies that they normally use in conversation” because the phraseology is lacking in appropriate terminology or because of restrictions on acceptable topics for routine communications (Morrow et al., 1994, pp. 241, 244).

Other findings included understanding problems where “speaker repeats to get evidence of understanding” may have involved questioning intonation, but no precise documentation was provided in the text. Nearly 25% of the speakers self-corrected (self-repair) and 25.0% of the messages contained requests for information not included in original message or requests for additional information relative to the immediate situation. A further 14 items (11.7%) included pilots needing to “ask for a command” (Morrow et al., 1994, p. 246). This study is significant to the current investigation because of it represents early documentation of “requests” as potentially including questioning in addition to specific examples of questioning forms as they occurred.

As a result, one of the key “consequences of non-routine communication” was that “almost half of the speech acts in non-routine transactions were devoted to resolving problems rather than presenting and accepting new information” (Morrow et al., 1994, p. 250). The authors stated that non-routine transactions involve “switching from standard ATC to conversational language may be particularly disruptive when controller and pilot have different native languages, because they may resort to different conversational strategies" (p. 254).

These findings also suggest that the emphasis on error, rather than on communicative success, is only one phase of the issue surrounding non-standard language. The results also suggest at least an implicit acceptance of requesting as an appropriate feature of aviation communication simply due to the frequency of these variations of *requests* identified in the research data.

Associated with non-routine messages, findings from another series of studies focused on tower-plane miscommunication also suggest that errors may be related to the intricate relationship between "the airspace environment, controller/pilot workload and individual style [of communication]" (Cardosi, 1994, p. 1). These studies looked at nearly 50 hours of taped communications from multiple FAA Terminal Radar Control Centers (TRACONs), Tower/Ground, Enroute Tower, Tower/Local facilities for frequency of errors in daily communication (Bürki-Cohen, 1995; Cardosi, 1993, 1994; Cardosi et al., 1996). All four reports specifically noted that pilots should "ask for repeats" and "question [any] call sign discrepancies" (Bürki-Cohen, 1995, p. 24; Cardosi, 1993, p. 17, 1994, p. 17; Cardosi et al., 1996, p. 17). Cardosi (1993) summarized the need for pilots to more carefully monitor their attention to safer practices, both in their own messages and when listening for clearances from a controller:

> "Clearly it is safer to *directly ask for clarification* [italics added] than to 'play the odds' on a clearance…Pilots [also] need to be encouraged to *ask for clarification* [italics added] rather than expect the controller to catch readback errors…such increased awareness can further reduce the

> probability of communication problems and further increase the margin of safety" (Cardosi, 1993, p. 17).

However, in all four reports, only one or two specific examples of questioning were presented as examples for specific categories of analysis.

In these same reports, the data also showed that one to as many as eight or ten elements of information (not including the callsign) were contained in the same controller's instructions to any given pilot. As the complexity (expressed as "number of separate elements in a single transmission") of the message increased, there was a corresponding increase in readback errors when the message contained more than three separate pieces of information (Cardosi, 1993, p. 3). In response to the findings on message complexity indicating specific limits to message content, laboratory studies were designed to investigate the cognitive limits of message complexity. Results from these studies statistically showed that more than three informational or instructional items within a single communicative turn can significantly reduce the listener's ability to respond with an accurate message, thus causing errors in readbacks (Barshi, 1997; Barshi & Healy, 1998; Lynn, 2004). A direct result of these studies was the training recommendation that controllers present no more than three items in a single message to improve pilot processing of the information (Barshi, 1997). A more implicit finding may be that when more complex messages are relayed, training should also be added to address strategies for confirming, clarifying or correcting information.

Error-Focused Studies: Conclusion

Error-based studies in aviation performance suggest that aviation communication is a dichotomy where transmissions are either correct or incorrect. Further, all messages deviating from standard phraseology are viewed as a negative impact on not only accurate as well as successful communication. Although asking for clarification or verification of accuracy of information are covered by the formal phraseology item, “say again” (Federal Aviation Administration, 2004a, pp. PCG S-1; United Kingdom Civil Aviation Authority, 2006, p. 2.6), the literature provides evidence that pilots and controllers frequently modify the standard phraseology while still maintaining efficient and accurate communication.

Symer notes that J. Reason (in *Human Error*, 1991), “defines error as any human activity that fails to accomplish the intended outcome” (Symer, 1998, p. 24). If this is so, then the errors found through speech act and error-based taxonomies may need to be more broadly defined. If the task is, in fact, accomplished within the communication sequence, Reason’s definition suggests these communicative sequences are *error-free*, although they clearly involve non-standard language.

Counting errors is a concrete, clearly-defined methodology to analyze language which is non-standard or non-routine. In a similar vein, Symer (1998) points out that accident investigation reports (by the US-NTSB) that attribute the accident to “crew error” may be due more to investigators who more directly focus on discovering mechanical and engineering errors which appear in the final reports (pp. 29-30). However, a discourse approach to examining these “errors” as functional language variations allows for discovery of patterns of language that are used in non-routine situations, to look at whether the language is merely a minor (one or two word) variation or contains completely different form (such as questioning syntax) from the standard phraseology. In addition, the role of intonation, only incidentally mentioned in the studies examined above, is generally unexplained.

In the next section, research focused on aviation language variations, rather than communication errors, will be discussed in relation to collaborative functions and pragmatic issues found in aviation discourse.

Questioning Addressed in Aviation Research

As discussed Chapter II, questioning occurs in a variety of syntactic and semantic forms. This diversity of features indicates that definitions of questioning need to encompass broad linguistic territory. In an aviation environment, there are few examples found in the formal phraseology that use syntactic interrogative forms. However, the expressed gap in the speaker's knowledge represented by requests found in the aviation discourse studies suggests that these aviation utterances do meet the criteria within the classification of speech act "questions" (Searle, 1969, p. 66) Although the lack of focus on questioning implies that questions are not recognized as a measurable component of aviation discourse, the appearance of questions, just in the examples from the corpus presented here, described in the literature suggests that questions are used and serve an important function in aviation communication

Aviation communication relies on a restricted number of approved phrases and abbreviations to convey routine messages including generic phrases to initiate requests or repetitions as distinguished from instructions and formal clearances (see ICAO *Procedures for Air Navigation Services* (ATM-PANS), *Airman's Information Manual* (FAA-AIM), United Kingdom *Civil Aviation Procedures 413* (CAP), listed in

References). Figure 4.3 demonstrates approved forms for three communicative functions related to a change in flight level:

Figure 4.3. Approved Phraseology for Flight Level Changes

1. [ATC] Instruction:	Climb (to) flight level 350 (35,000 feet)
2. [Pilot] Request:	Request flight level 250
3. [Pilot] Repetition:	Say again flight level

(samples taken from research data).

Lexical substitutions or additions to standard phraseology are the basis for many of the errors cited in studies described above. As noted in the research discussed in the previous section, if a pilot or controller chooses to use a questioning form, expressed by syntax, intonation, or both, any such form is generally viewed as non-standard. However, findings in these studies also demonstrate that pilots and controllers frequently modify or significantly alter the wording of standard phraseology with these expressions.

Aviation Communication Discourse

Aviation studies defined by speech acts generally analyze the discourse using a category identified as *requests* (Cardosi, 1993, 1994; Cardosi et al., 1996; Goguen & Linde, 1983; Seamster et al., 1992; Sullivan & Girginer, 2002). While the category of analysis successfully targets those phraseology items that begin with "Request…," there is no indication that any other form of linguistic expression that was functioning as a question may have been included in the data (Bürki-Cohen, 1995). Prinzo provides a broad definition of "requests" as functioning "to ask something," but she only names specific aviation topics (i.e., altitude, speed, etc.) that are requested (Prinzo, 1996, p. 7; Prinzo et al., 1996, p. 107). In one of the few projects to discuss questioning functions, a flight deck simulator study specifically addressed the use of questions, defined as "an intentional disclosure of an information deficit, while an answer is a public means of providing the information requested" (Veinott & Irwin, 1996, p. 46). Results showed that in 29 hours and 30 minutes, 1,173 questions were asked and coded for "function: information-seeking, verification"…and answer: yes/no, information, no answer" (Veinott & Irwin, 1996, p. 46). But no further analysis nor samples were provided, again suggesting that the focus on methodology and the error-based dichotomy supersedes the actual language being used.

Kanki and Foushee's (1989) taxonomy used the classification *inquiry* as a "request for factual, task-related information, not a request for action;" while items classified as a response *uncertainty* were classified as " statement indicating uncertainty or lack of information with which to respond to a speech act;" (Kanki & Foushee, 1989, p. 405). Although these definitions suggest a questioning element may be inherent in some of these aviation messages, questions are not clearly identified as a linguistic or syntactic component in the research data.

References to questioning syntax have occasionally been included in discussions of errors suggesting that because of the error, interrogatives may be used to clarify or suggest corrections to messages (see Simmons, 1978, p. 152). One example cited evidence of flight crews being reluctant "to question a controller or seek clarification of a clearance" when the radio frequency is busy with multiple calls (Connell, 1996, p. 26). Although a controller or pilot may have made a mistake or an omission in the message, questioning the accuracy or asking for clarification of an item represents an interactive, problem-solving tool to immediately address the transaction, allowing the participants to immediately repair the miscommunication rather than wait for an *un*intended outcome as evidence of a communication error.

Prinzo (1996) noted that ‘requests’ represent only 2% of the most common elements of aviation discourse made by pilots and controllers at three (U.S.) Approach Control facilities. From 12,184 speech acts examined, only 286 were coded as “requests” (2.34%) (Prinzo, 1996, p. A3). The report also noted that requests made by pilots and controllers generally became “more conversational and verbose when their transmissions included Advisory or Request speech acts” (Prinzo, 1996, p. 29), which also supports findings by Clark et al. (1990). An example of communication request “error” using both additional words (verbosity) and (incorrect) grouping of numbers to state a speed might be expressed as: “…and ah just verify that you’re at a hundred and ninety on the speed” [in contrast to the more succinct phraseology: “verify speed one niner zero,” AIM, 2004, PCG V-1] (p. 19).

While deviations from standard phraseology are countable, the report does not explain whether the error contained a syntactic question or merely extra word(s). In messages containing standard phrases such as ‘verify,’ ‘request,’ and ‘say again,’ the phraseology, Prinzo’s discussion of requests suggests that all messages containing the word “request” were counted, but does not clarify whether other syntactic or lexical forms that ask for information were included in the data. Without describing the form of the error, it is difficult to determine if the pilot or controller was merely using bad phraseology or choosing other lexical or syntactic forms, such as questions, to resolve the information problem.

Clark, Morrow & Rodvold (1990) used Kanki and Foushee's 1989 taxonomy to investigate routine communications in air traffic control. Problems in the communication were defined as utterances that cause "participants to focus on the communicative process itself" (p. 4). The authors concluded that problem transactions caused speakers to become less fluent, produced "more complex utterances … and [were] less able to rely on conventional ATC language when negotiating problems" (Clark et al., 1990, p. 10). Here, the study points to joint strategies ("participants focus") used in the interaction rather than to document the error represented by or created by a deviation from the phraseology. In addition, they concluded that the aviation phraseology itself is not sufficient to supply terminology for every occasion.

In the only extensive study of directly addressing questioning and non-standard aviation phraseology as "variations," (as opposed to *errors* or *deviations*) Wyss-Bühlmann (2004) investigated the discourse of international pilots and air traffic controllers using Swiss airspace. The study is also notable in that the pilots and controllers cited in the examples generally do not speak English as a first language, a context which enhances the need for clarity as well as efficiency in message transmission. These variations in pilot and controller messages, as represented through the non-standard aviation language described in the text, are used intentionally "in order to clarify their speech intent" (p. 17). Rather than attributing aviation language deviations to "substitutions" and "verbosity" (Prinzo, 1996, p. 29), Wyss-Bühlmann hypothesizes that there are three factors associated with use of non-standard messages (Figure 4.4):

Figure 4.4. Factors Attributed to Non-Standard Messages

a. When a communicative problem occurs (lack of adequate vocabulary);

b. When the meaning of a specific word needs to be clarified;

c. When one of the speakers [either the pilot or controller] is in need of additional pieces of information (p. 65).

These variations are employed as “communication strategies [used] in the most effective and economical way possible…[and are] not employed to compensate for lexical problems” (Wyss-Bühlmann, p. 18). This descriptive approach shifts the research perspective from non-standard language to a focus on possible reasons *why* speakers choose these other linguistic forms.

Using four “basic ATC speech situations,” Wyss-Bühlmann examines the variations in language used for clearances, instructions, confirmations and requests as found in message sequences for take-off, landing, departure and approach procedures (pp. 55-63). These procedural sequences, taped at a Swiss control tower, were then subdivided to show variations of formal phraseology in three contexts: omissions, confirmations, and requests accompanied by transcript samples from the recorded corpus. Although there is no quantitative data related to the frequency of these forms in the corpus, clearly there are examples to be found for every context and in some cases, three to four examples are presented and discussed.

Of interest for the present study are two specific aviation discourse features chosen by Wyss-Bühlmann, Confirmations and Requests. The category of *Confirmations* includes either the use of questioning syntax or questioning intonation (or both) used to form an inquiry regarding the accuracy of information. Figure 4.5 represents Clearance

Delivery messages, showing both the request for confirmation of information and the subsequent agreement by the listener.

Figure 4.5. Confirmations. (Wyss-Bühlmann, 2005).

A.1. Confirmation using only intonation.
a. ATC: Lufthansa 5373, *confirm*? [all italics in original]
b. Aircraft: Affirm, at ah Bravo 37.

B. 2. Confirmation using interrogative syntax.
a. ATC: Heron 8656, good afternoon, ah I'm missing your flight plan. What is your time of departure?

b. Aircraft: We understand it's ah we have a slot delay until 1631 Zulu, [international time] can you confirm that, please…"

(both examples, p. 73)

In both examples, the italicized elements were spoken with a questioning intonation (italics in original text). In example A.1, the controller is asking the pilot to confirm previously given information, which the pilot provides as well as more formally confirms the information with the approved phraseology, "Affirm" (p. 73) In example B.2, both the controller and pilot use full sentences with interrogative syntax as well as questioning intonation to obtain specific information, rather than the formal "[ATC] confirm departure time" and "[pilot] "delay until 1631 Zulu"] (pp. 72-73). Further, the pilot's use of "please" (example B) is not formal phraseology, but is "employed with a specific communicative intention" to smooth the way for acceptance of the request (p. 73). These two examples also show that the speakers clearly understand the non-standard use of intonation as a request for information. Further, the second example also suggests that use of full-sentence syntax implies that the speakers may consider that the information may be more clearly understood in this format.

Requests are also a component of the standard phraseology; however, like the confirmations noted in the example above, requests also are expressed in a variety of forms to meet the speaker's needs in a particular situation (p. 162). Throughout the text, Wyss-Bühlmann argues that "requests…often show lexemes that originate from the speakers' own repertoire of English vocabulary…[and] are formed like standard English questions" (p. 102). Examples in Figure 4.6 show Requests not using the formal phraseology beginning with the verb, *request*:

Figure 4.6. Non-Standard Requests Using Interrogative Syntax (Wyss-Bühlmann, 2005)

a. Aircraft: Ah, Lufthansa 3727, is it ah due to the wind you're using [runway] 16
or is there any chance to get the [runway] 28?

ATC: It's ah due to the outbound [departing] traffic (p. 74).

b. ATC: Are you able to turn right by 10 degrees?

Aircraft: Yes, we can do that, 3694 (p. 101).

In Example a., the correct phraseology would be "request runway 28," while the correct phraseology for Example b. would be "are you able right turn 10 degrees" since the controller was asking whether or not Lufthansa 3694 was capable of making a turn requested in the previous transmission.

Since requests appear to violate the purpose of "clarity and economy" underlying standard phraseology, Wyss-Bühlmann argues that requests using non-standard formulas serve a particular "underlying strategy" to obtain information or to seek permission to modify a certain procedure (typically a clearance for a specific action) (p. 162). These non-standard phraseology strategies fall into two classifications. The first classification is based on speaker needs: “strategic variations…[which] serve the purpose of illustrating the participants’ speech intentions,” such as adding extra words to standard phraseology: “are you *fully* ready?” or omitting certain pieces of information: “Kilo Whiskey [*tail number omitted*] hold position” (p. 88). The second strategic type is related to speaker’s individual English variety or linguistic style which produces “non-strategic variations…[which are] a result of the speakers’ linguistic freedom and occur without any communicative intent at all” (p. 88). Wyss-Bühlmann concludes, “co-operative communication strategies do not impede ATC communication, even if they contain elements of non-standard phraseology…these speakers seek to formulate their messages in the best way possible, in order to clarify content to their interlocutors” (p. 185). This suggests that speakers are focused on the message content needed to accomplish the task as a separate task from the functional purpose of the message, which supports claims made by Clark et al., (1990) and Morrow, Rodvold & Lee (1994).

Wyss-Bühlmann admits that attributing the variations to one or the other strategic categories “is sometimes difficult to determine exactly…” (p. 185). In some of the examples, the argument for why a speaker used a particular word or phrase is not always clear from the brief context in which it is presented. However, from the perspective of discourse analysis rather than error-analysis, the data suggests evidence to consider these variations as a regular part of daily aviation discourse, forms that are being used by both native and non-native speakers of English.

Baharuddin (1993), discussing language training for personnel of international airlines, specifically mentions the need for not only explicit instruction but extensive practice in asking and answering questions as an “essential part of the process of communication" (Baharuddin, 1993, pp. 48-49). Gunarwan (1993), in the same volume on aviation training issues, stresses the need for training that includes gathering information "on particular varieties or registers of the target language, language usage in specific contexts and settings" (p. 29).

In conclusion, if pilots and controllers are regularly using non-standard language, then the data described in this section on questioning underscores the need for more training in non-standard phraseology and plain language as readily available resources for aviation communication. In addition, there are implications for training aviation professionals, both native and non-native speakers, regarding how to interpret unexpected but more conversational language from a controller or pilot.

Pragmatic Issues

In Chapter II, Discourse, several pragmatic issues relevant to the present study were discussed: indirect requests, politeness, collaboration/cooperation and intonation. In this section, the studies of aviation discourse that relate to these topics will be examined as they relate to questioning functions as an interactive process. Mell (1991) notes that aviation transmissions, in addition to clearly communicating factual information, are also satisfying the needs of the speakers to accomplish a variety of social functions, including "being polite…and displaying group membership" (unpaginated).

Indirect requests

Of the pragmatic issues presented in Chapter II, both indirect requests and politeness address the speaker's intention toward the listener to accomplish a specific purpose or to motivate the listener to perform some specific task. Indirect requests seem as though they would have no place in aviation since aviation communication is built around direct, command-based requests and responses. Discourse-based research has shown that, as in casual conversation, aviation communication contains indirect requests as part of ordinary task accomplishment by pilots and controllers (Goguen & Linde, 1983; Linde, 1988; Mell, 1991; Nevile, 2004; Wyss-Bühlmann, 2004). Indirect requests, as an aviation topic of research, have not been formally investigated. Instead, they have been used as evidence to support the use of both politeness and mitigation strategies in aviation discourse.

Politeness

Although the emphasis on standard phraseology is based on the dual requirements of efficiency and accuracy, research has noted that both pilots and ATCs routinely use polite greetings when entering/leaving airspace, albeit in somewhat abbreviated forms (Howard, 2003; Mell, 1991). In many routine situations, the use of politeness may draw from a socially-determined feature of everyday conversation that is adapted to aviation communication. In the interactions between flightdeck crews, communication between members of a flight crew were found to need more "polite assertiveness…a skill frequently ignored in communication training" (Kanki & Palmer, 1993, p. 130). Since communication is both "interactive, with personal style, tasks, goals," while it "serves many functions simultaneously, both technically and interpersonally," the use of politeness strategies (such as thanking) addresses the interpersonal needs of the individual (p. 133). More importantly, communication alone does not guarantee flight safety because variations in communication (routine/non-routine language) arise due to the dynamics of each situation and the context changes over time. Thus speakers need to recognize the degree of politeness appropriate to the specific situation in order to more effectively frame a message or comment.

Politeness, expressed through greetings and leave-takings, is used by both pilots and controllers when flights are entering/leaving any controlled airspace. In addition, the greetings and leave-takings often use the home language of the pilot, as determined by the origin of the aircraft, when that language was not the official language being used on the ground (Sanne, 1999; Sullivan & Girginer, 2002; Wyss-Bühlmann, 2004). In an international setting, research has also shown that the politeness, greetings and leave-takings as used by both pilots and controllers serves to ratify and maintain social relationships between pilots and ATCs (Mell, 1991; Nevile, 2004).

Mitigation

Goguen & Linde (1983) focused on levels of mitigation in the flight deck interaction in accident reports. Investigating requests made by crew members to the pilot, the requests were rated for levels of mitigation, measured as "the degree of politeness or indirectness of the utterance" (p. 5). Using the Speech Act classification as a foundation for their coding, transcripts were analyzed for degrees of mitigation by a group of retired pilots who were given training to evaluate mitigation on a four-point scale. Requests and commands were the speech acts most centrally involved with mitigation, according to Goguen & Linde, since requests and commands always have the potential for face-threatening action (see P. Brown & Levinson, 1978, 1987; Levinson, 1983). Linde (1988) redefines *mitigation* as the "negative politeness" described by Brown & Levinson (1978). An important finding was that there seemed to be "regional differences in interpreting mitigation" (the raters came from different regions within the United States) and that "[flight] crews can and do vary their mitigation" depending on both context and the rank of the crew members involved (Goguen & Linde, 1983, p. 11).

Using the same data as the 1983 study, regional differences were most pronounced in rating items addressing "wants" framed as indirect requests. All the items for which there was over 50% disagreement between the linguistic analysts and the aviation community members involved a request using the form *want*" (Linde, 1988, p. 384). In the samples shown in Figure 4.7, the raters ranked all three interrogative items as "direct," while the analysts considered them as "low-mitigated:"

Figure 4.7 "Want" as an Indirect Request

a. <u>Want</u> to wake everybody up and get 'em in here please?
b. Do you <u>want</u> to run everything but the flaps?
c. You <u>want</u> me to fly it Bob? (Linde, 1988, p. 384).

Linde concluded that the use of indirect requests "has become so conventionalized [in the aviation community] that its social force is direct even though its form is indirect and hence mitigated" (p. 384).

Investigating the relationship between mitigation and pilot- controller miscommunication, Howard (2003) found that specific mitigating strategies included use of "qualifiers (modals), hedges (questioning occurrence of events), tag questions, hesitations, titles and honorifics and minimizers (such as 'a little,' 'a little bit')" as well as more conventional politeness strategies such as "greetings, sign-offs and apologies" (pp. 42-45). Mitigation features were found in at least one-third of all ATC/pilot interactions in his research data, from which Howard concluded "aviation communication <u>is</u> polite communication" (p. 115). The data also showed that out of 1800 turns, there were 123 requests for information [6.8% of all turns] and 128 requests for repetition [7.1%], with "427 [23.7%] statements that provided opportunities to be worded as *tag questions* [italics added]" (p. 116). However, since the study did not provide examples which limit his findings labeled "requests for information," it is not clear if these requests were standard phraseology or in an interrogative format.

This evidence of questioning done in either indirect requests or through tag questions also provides important resource for obtaining information as well as maintaining a positive relationship between speakers. These studies show that the experienced pilots trained as raters did not view these forms as errors, but as an additional form of interaction.

Variation in phraseology and aviation language

The focus on *variations* in aviation communication, as a discourse phenomenon rather than as an error in phraseology, allows for a broader analysis of aviation messages. Nevile points out that Australian pilots (communicating within a flight deck) frequently use non-standard terms with each other as well as non-routine language with the ATCs. Nevile (2004) points out that analysis of discourse by Australian pilots shows "numerous instances of talk that is not prescribed in any manual of standard operating procedures" (p. 195). Examining communication between Final Approach Controllers and incoming commercial airliners, Simmons (1978) suggests that these variations represent a form of code-switching "between formal and informal registers of ATC speech" (Simmons, 1978, pp. 27-28).

Internationally, variations in the approved language take on added significance due to potential disparities in English language comprehension and pronunciation. Yet, the international data suggests that variations are viewed more tolerantly. Even within a single country at a single airport (Ataturk International Airport, Turkey), pilots and controllers showed "variation from the [ICAO] rules in the way numbers were pronounced [and] in the use of greetings and closings" (Sullivan & Girginer, 2002, p. 400). These variations may result from "ease of communication; i.e. it seems easier to say 'triple six' than 'six six six,' " or that pronunciation modifications may be influenced by the way a specific language permits grouping of the digits (p. 401). The use of "greetings and leave-takings" are found throughout the data set, spoken in either English, or more commonly, in the pilot's "native language or the language of the country they are flying in" (p. 401). As noted above in the discussion of politeness, ICAO does not require or even suggest that these discourse features are approved for aviation communications.

These non-standard phrases and more conventional language "do important interactional work [that demonstrates] prescribed and conventional wordings are adapted to meet the demands" of the flight (Nevile, 2004, p. 195). These comments suggest that a broader interpretation of linguistic expansions and variations of aviation phraseology may be needed to more fully understand why well-trained professionals (ATCs and pilots) regularly choose alternative forms of the prescribed formulas assigned to all phases of flight.

Beneke (1993), discussing the role of English as the common language of aviation, refers to Hymes' (1986) definition of a "speech community…a social, rather than a linguistic entity…tentatively defined as a community sharing rules for the conduct and interpretation of speech, and rules for the interpretation of at least one linguistic variety" (Beneke, 1993, p. 88). Harper & Hughes (1993) suggest that use of rules (such as aviation phraseology formulas) are developed through social agreement, rather than "disembodied regulations 'mindlessly' applied" (Harper & Hughes, 1993, p. 128).

Cooperation/Collaboration

Research has also investigated various collaborative models shared by pilots and ATCs which provide a framework in which they understand the abbreviated language structures of phraseology. Collaborative negotiation occurs when speakers "work with their partners in repairing [problems]" (Clark, 1996, p. 17). The negotiation of meaning in unexpected or problematic situations requires "joint strategies" for resolving linguistic issues (Clark, 1996; Morrow, Lee, & Rodvold, 1991; see also Wyss-Bühlmann, 2004). An important finding by Morrow et al. was that controllers may "produce longer messages to reduce transaction and turn-taking time…" but that "this strategy may increase collaborative effort" as the pilot frequently does not understand the message and must ask for some or all of the message to be repeated in order to understand "how well they [controllers and pilots] collaborate to accept messages as mutually understood" (Morrow et al., 1991, p. 282). Similar findings were reported by Bürki-Cohen (1995), Cardosi, (1993, 1994), and Cardosi et al., 1996, discussed under Error-Based studies at the beginning of this chapter. The stress on maintaining collaborative interaction was also the basis for the laboratory studies related to message complexity reported by Barshi (1997) and Barshi & Healy (1998).

Both pilots and controllers have commented favorably on the use of politeness during interactions as a way to build mutually positive, or collaborative relationships in the United States (Simmons, 1978) and in Australia (Nevile, 2004). Some controllers reported to Simmons (1978) that formal phraseology was not conducive to achieving "better rapport" with the pilots; furthermore, the survey data showed "there is not one single case of a controller following the book's [FAA/ATC manual] speed control phraseology exactly although many instances are very close" (pp. 256-257). Further, Simmons noted "members of both groups speak of 'getting the job done' as their primary goal…thus it can be argued that there is an element of self-interest in maintaining at least non-conflicting norms of interaction between the two groups, because not only is one's 'attitude' a factor in job performance, but 'getting the job done' may also be affected" (pp. 104-105). This process of getting the job done is shared through "a shared set of speech rules and the existence of more than one language variety" (p. 402).

Socially Shared/Socially Distributed Cognition

An important feature of pilot-controller interaction is the mutual dependence on each other for maintaining a safe flight and providing additional information as needed during that flight. Hutchins & Klausen (1998) have shown that pilots sitting in the same flight deck do not have equal, but "distributed" access to all information relative to the flight, thus creating a shared body of knowledge that represents a "system of distributed cognition" (pp. 21-22). As shared expectations are formed and confirmed, coordinated actions can be planned and executed creating an understanding which supports a more efficient communication system. An analogy could be made between pilots and the controller, each sharing important information which, when combined, serves to represent a more complete picture of the airspace and traffic of the specific flight; in other words, a shared understanding that is more than the sum of the information available to the individuals involved (see also Hutchins, 1991; Schegloff, 1991).

In order to accomplish this understanding, the use of collaborative strategies and mutually intelligible language must be used, whether standard or non-standard language is employed by the speakers. In order to accomplish the task of flying, pilots need to not only inform but also collaborate with, controllers in order to perform their duties, thus creating the shared understanding of the flight both within the flightdeck and between the flightdeck and the control tower. Nevile argues that collaborative interaction facilitates the workplace setting, where activities are prescribed but "that the order, and hence the overall shape of certain institutional interactions, may also be the product of locally managed routines" (quoting Drew & Sorjonen, 1997, p. 110).

This collaborative, interactive work, even with non-standard language such as questioning and pragmatic features, emerges through the regular transmissions that characterize much of the daily interactions between pilots and air traffic controllers. As such, rather than identify the interaction only in terms of its deviance or erroneous content, aviation communication also needs to be examined for what is being said, what form it takes and the function that the communication is designed to accomplish.

Conclusion

Maurino argues that addressing errors should represent "the starting rather than stopping point of safety" (Maurino, 2000, p. 956). In addition, although the goal of aviation communication is to make every effort to convey an accurate, comprehensible message, speakers should also be sure to "clarify any confusion or doubt by suitably querying the information" (Monan, 1986, p. 29). This approach is best summed up as "When in doubt, ask" (Cardosi et al., 1998, p. 10).

When combined with the evidence from the literature described in this chapter, these comments suggest that questioning represents an essential, useful resource for aviation communication, even though questioning is currently not an approved form in the standard phraseology at regional, national or international levels. Rather than treat questioning functions as excess verbiage or non-standard phraseology, “every ‘say again’ and request for a repeat of part of a transmission is a readback and hearback error averted” (Cardosi, 1994, p. 13). Wyss-Bühlmann notes that variations, represented by requests and confirmations in non-standard form, rather than contributing to miscommunication, serve to “clarify meaning and in solving problems of understanding” (2004, p. 76).

The evidence of questioning, even in the limited numbers as shown in these studies, suggests that questions (as a syntactic form) are not a careless variation of aviation phraseology, but a specific syntactic resource employed to accomplish tasks in aviation communication. Further, questions used in aviation discourse as well as in more conversational interactions, serve to build the social and cooperative functions of the talk between the speakers. The examples cited throughout the chapter demonstrate the role of questioning as an important as well as frequent function in daily aviation communication.

The next chapter (Chapter V) outlines the methodology used in this research study to examine both the form and function of questioning in aviation communication. Following the methodology, Chapter VI will describe the results of the investigation of pilot-controller communications from both Toronto and Dublin. Chapter VII will discuss the results in relation to the linguistic features outlined in both Discourse (Chapter II) and Aviation Discourse (this chapter). The final chapter will present implications and limitations of the research and concluding remarks on the subject of questioning in aviation communication.

[Questioning]…is an essential part of the process of communication.

(Baharuddin, 1993, p. 49)

CHAPTER V

METHODOLOGY

Section I. Introduction

This Chapter describes the methodology used to obtain, transcribe and analyze the data reported in this study to determine answers to the research questions outlined in Chapter I. In this chapter, Section II outlines how the data were collected. Section III describes how the data were transcribed, followed by Section IV which details the coding of the question forms and Section V which describes coding of the questioning functions. In order to avoid any suggestion of fault or error by pilots or controllers in a specific location, when providing examples that originally contained commercial airline names in the data, the airline will be generically designated "Scorpion Air," but the locations will retain their original names (Dublin and Toronto).

Section II. Obtaining the Data

Data Collection

The research data consist of over 14 hours of digitally recorded communication from air traffic control towers in Toronto, Ontario, Canada (international airport designation: CYYZ) and just over 10 hours of recordings from Dublin, Ireland (international airport designation: EIDW)representing a total recording time of 24.5 hours. The recordings were made using a digital hand-held recorder connected to a laptop computer. The recordings were live transmissions from each of the above airports broadcast on websites devoted to air traffic control. The Toronto frequency is available at www.squawkident.com/livefeed.html and Dublin is available through the audio feed at http://www.liveatc.net/feedindex.php.

The messages between the pilots and controllers are broadcast by low-frequency radio signals that are received by radio scanners in the vicinity of the airport. The radio scanners systematically search for one or more frequencies in use, then the scanner remains on the frequency until a pause in transmission is sufficient to allow the scanner to move on to another frequency. The scanner sends the transmission via a “feeder” computer which then sends the transmission through audio servers via the internet to the listener (LiveATC, 2006). These computer transmissions can be recorded and saved as a digital computer file. Once the recordings are saved in a digital format, they can be uploaded and transcribed. For this project, the author transcribed all of the recordings.

Data Background: Locations

The two air traffic control systems that were recorded for this study are located in Dublin, Ireland, and Toronto, Canada. These two cities were chosen because to provide an international sample of aviation English, rather than only cities in the United States. Second, these two control frequencies received a high volume of air traffic control messages throughout the recording times with strong signals to assist in transcribing the messages. Third, because pilots and controllers in both cities were predominantly native speakers of English, they provided samples of the kinds language used on a daily basis in the aviation environment.

As shown in Table 5.1, the two locations have distinctive patterns of local aviation traffic and operations. Dublin Tower oversees over daily arrival and departures for 88 airlines, divided evenly between scheduled airlines and charter flights. The planes use three runways, 73 gates and one terminal. During the calendar year for 2005, there were more than 186,000 operations (same plane takeoff + landing = 2 operations) at Dublin. More than 18 million passengers have used the airport facilities in the last year. Although the home page for the Dublin airport claims the airport is the "5th fastest growing airport in Europe" (Dublin Airport Authority, n.d.), the busiest Irish airport is Shannon, Dublin's neighbor to the southwest.

Table 5.1
Location Background Information

Category	Dublin, Ireland	Toronto, Canada
Airport Name	Dublin Airport	Toronto Pearson International Airport
Operated by	Dublin Airport Authority	Greater Toronto Airports Authority (GTAA)
ICAO Designation	EIDW	CYYZ
Operations/year	186,000/year	383,000 (2005)
Passengers/year	18.4 million	29.9 million
Airport employees	13,000	70,000
Tower frequencies and positions	6 frequencies: Ground, Clearance, Tower, Approach/Departure, South Area & North Area	8 frequencies 3 Tower (1 serves backup) 3 Arrival 2 Departure
Principal runways	3	5
Terminals/gates	1 terminal/73 gates	3 terminals with 82 aircraft gates; 22 commuter gates
# Airlines serving airport	88+, split 50% each between scheduled and charter carriers	65+
Ranking	5th fastest growing in Europe; 66th busiest airport of 100 in Europe	In the top 30 internationally for both aircraft movements and passenger traffic (2005)

Source: (Airport Council International Inc., 2004; Dublin Airport Authority, n.d.; Greater Toronto Airport Authority, n.d.).

In 2004, although Dublin was listed as the 23rd busiest airport in Europe, in general, Irish airports have become part of the growing number of European airports outside the major cities which handle "over 2,000 movements/day more than the average airports" (EUROCONTROL, 2004).

In Canada, Toronto Pearson International Airport has significantly more passenger and aircraft traffic than does Dublin. In 2005, nearly 30 million passengers used the airport facilities. Toronto Pearson has 3 terminals with 82 aircraft gates, plus an additional 22 gates available for commuter aircraft. With 5 paved runways and 30 taxiways, more than 383,000 operations were recorded in 2005 by 65 airlines using the facilities (Greater Toronto Airport Authority, n.d.).

Toronto Pearson has been consistently listed in the top 30 international airports for both traffic (29th for take-offs and landing) and passenger activity (23rd) for the past several years (Airport Council International Inc., 2004). With 29,914,000 passengers in 2005, the passenger traffic increased over 4% from the previous year. Toronto Pearson ranked 23rd, placing it behind number 15, New York's Kennedy (JFK) airport with over 41,885,000 passengers, or compared to London Heathrow at number 3, which had nearly 68 million passengers moving through the aerodrome during the same year (Airport Council International Inc., 2004).

The differences in traffic and size between the two international airports suggest that there may be differences in the results that are affected by these variations. As a result, results by city will be reported only for an initial overview of the findings at the beginning of Chapter VI; the majority of the results will be reported by speaker role (Pilots and Controllers) in order to address the issues presented in the research questions.

Controller Responsibilities

Operational size also is reflected in the type of controller-position assignments that are used at each location. The scanner receiving the communications may be picking up Approach and Departure communications from an air traffic control tower located on the airport site, or the controllers may be located in a "control tower" some distance from the physical airport. At any time, one or more controllers may be working positions in one of three general areas related to air traffic control services depending on their assignments during the work shift.

- Ground and Tower Control (aircraft movement on the ground at the aerodrome),
- Approach Control: service for arriving and departing controlled flights (within the vicinity of the aerodrome), or
- Area Control Center: also referred to as Enroute Control, responsible for IFR/VFR [Instrument Flight Rules and Visual Flight Rules, see Appendix A] services for aircraft between departure and destination terminal areas; corresponds to the FAA service, Air Route Traffic Control Center (abbreviated as ARTCC) (ICAO, 2001).

Controlled Airspace

The International Civil Aviation Organization (ICAO) has designated different types of airspace in order to ensure safety for aircraft passing through a given geographic area. The purpose of establishing controlled airspace is to avoid aircraft from becoming too close as well as to expedite and maintain "an orderly flow of air traffic" (ICAO, 2001, pp. 1-3). All airspace has a designation, even if it is considered uncontrolled, so that pilots and controllers are aware of what kind of air traffic control will be offered for each plane within the airspace boundary. Altitude and IFR/VFR services are the key features that distinguish the restrictions placed on any given airspace.

> Classes [of airspace] A, B, C, D, E and F are controlled (or regulated) airspace, where controllers have certain duties and responsibilities and where the airspace is subject to a number of rules...Controllers never refer to the airspace classification system. Instead, their messages will only mention 'controlled' or 'uncontrolled' airspace (Duke, 2005, p. 10).

The regulations applied to the various airspace classifications also determine what kind of messages are typically exchanged between the pilots and controller(s) during that portion of the flight. The focus of this study is not specific to a specific class of airspace; therefore, identifying the airspace classification for each flight is not included in the analysis of the discourse.

Universal Time

In addition to international airspace classifications, aviation uses internationally coordinated time zones to facilitate aircraft movement across national and geographic boundaries. The aviation community uses a common time designation based on Universal Coordinated Time or "Zulu" time, equivalent to Greenwich Mean Time, which allows all international airports and aviation carriers to be able to identify both local and international times accurately ("Greenwich Mean Time," n.d.). Recordings of the corpus used in this project were made between 8 – 11am, Central Daylight Time (in the United States), or 2pm Zulu time. For Toronto, the local recording time would be 9am-12 noon (one hour later than CDT). Dublin Daylight time is one hour behind the Zulu time, so the recordings were made between 1-4pm Irish local time.

Section III. Transcribing the Recordings

Transcript Formatting

Each digital recording was transcribed as a single file. Due to variations in the recording sessions, some files are 30 minutes in length; others may be as long as 90-100 minutes. All recordings were entered into a table with columns listing the time the communication took place, the speaker (pilot or controller) and the transcribed message, dividing the spoken message into units of aviation information (see Figure 5.1). Periods or commas were not used for punctuation to divide components within the message to avoid possible confusion of the functions within the utterances.

Questions were identified through either lexical or syntactic forms (such as WH-words or inverted subject-verb) or through intonation cues (rising intonation). Question marks were used to indicate when the speaker used a rising intonation suggesting a question function incorporated within the message. Bold-face type was used to highlight the question form within the message.

Transcript Coding

Each individual transcript was analyzed for questions and speaker role. Every transcript was analyzed as an individual unit, then the total results combined in a larger spreadsheet. The data for individual transcripts are summarized below in Table 5.2.

Table 5.2.
Sample Chart Tabulating Transcript Results

1	Total recording time: 53:00 mins				
2	Total questions: 39		# Pilot questions: 15		# ATC questions: 24
3	Average: one question occurs every 1.54 minutes or 38.3 questions per hour				
4	Speakers		Pilots: 75		ATCs: 69

The chart in Table 5.2 shows a sample of the initial summary of data created for each transcript. A chart was created to provide the information in consistent format for each of the transcriptions. The total elapsed time of each recording was noted in minutes (Table 5.2, Row 1). In each recording, the transmissions were examined for questions in the message (either interrogative syntax or intonation). Each question was assigned an individual number within the transcript, and then the total number of questions was calculated as well as total number of questions by speaker role (Row 2). The average number of questions per minute was calculated, shown in Row 3 (Table 5.2 shows questions occurred at the rate of 1.54 questions per minute). The fourth row represents the total number of speakers by role within the transcript. Speakers were identified as either Pilots (P) or Controllers (C), see Row 4. For each speaker role, the count addressed only the number of questions by that speaker role, not the length of any message or the number of turns that may have occurred within the recording sequence.

The transcripts were combined and then analyzed for results by location, including the total minutes of recording time for that location, the total number of questions in the combined recordings for that location, the total questions for pilots and for controllers in the combined recordings, and an average frequency of questions per hour. The frequency count includes the total for the location as well as frequencies for both pilots and controllers. A final count, combining all the transcript information, was calculated using the same process of analysis as for individual transcripts. In Chapter VI, these data will be subdivided to more clearly identify what types of questioning are represented at both locations.

Speaker role

Transcript dialogs were divided into speaker roles, pilots and controllers. The total number of pilot/controller turns was counted for each transcript and then totaled for the entire transcript by location. For each recording, pilots and controllers are simply identified as "P" or "C." This use of "P" and "C" will be used throughout the remainder of the study in figures and tables to identify the respective speaker roles. In all transcripts, a change in speaker was signaled by the use of the abbreviations as well as the message transcription for the next speaker was moved to the next line of the chart.

While some controller voices are distinctive enough to be recognized throughout a given recording, others are not unique and thus an accurate identification of individual controller-speakers was not attempted. A similar situation occurs when the pilots are speaking to the controllers. A given flight may have one or more pilots doing the radio work (Nevile, 2004). Generally the pilot who is not actively flying the aircraft will be reporting and recording any navigational data received from the controller (as well as any information received from the airline's own operations office). By dividing the duties of the flight, the pilot who is in command attends to the operations related to flying the airplane. The pilots, therefore, typically identify the flight by the use of a callsign (usually the airline name and flight number for commercial flights, aircraft model and tail numbers for private or business aircraft), as some aircraft may have more than one pilot working the radio during different phases of the flight. The use of a callsign identification also permits controllers with radar screens to identify the flight more quickly because the radar screen also shows the flight number as reported by the pilot (Howard, 2003).

For each question (syntactic or intonational) identified in the transcript, the question was written in bold letters followed by a question mark. Table 5.3, the time (line 1) represents the point in the recording (00:53:59 of recording time) when the example was heard. The number "28" (line 2) refers to the question number for the individual transcript.

Table 5.3
Transcription for TI 0503

1.	00:53:59		3.	C	Scorpion Air nine twelve Taxi into position and hold
2.	28		4.	P	**Say again**?
			5.	C	Three three left
			6.	P	Scorpion Air nine twelve

The numerals (in the left column of the table) are used only for the identification of the sample text boxes and do not appear in the original transcription coding sheets. The bold letters + question mark (**Say again?**) represent the question appearing in the dialog (line 4). Table 5.4, shown below, provides an expanded description of the communication sequence in this example.

Table 5.4
Expanded Transcript and Explanation of Recording Shown in Table 5.3

1.		00:53:59 minutes into the recording		
2.	28	Question "28" in the recording sequence		
			Transcribed Discourse	*Explanation of Message*
3.a 3.b		Controller addresses flight Controller instructs pilot	"Scorpion Air nine twelve," "…Taxi into position and hold"	call sign: company and flight number Instruction for Pilot to taxi the aircraft to the designated location and wait for further instructions from the controller.
4.		Pilot asks for repeat of the instructions	**Say again**?	1. written in **bold** to indicate questioning function 2. question mark indicates *rising intonation* for non-interrogative structures.
5.		Controller repeats the instructions	"Three three left"	33-L: the runway assigned to the aircraft
6.		Pilot acknowledges instruction and ends the transmission sequence with the flight call sign	"Scorpion Air nine twelve"	Ends of transmission sequence

Recording Time Analysis

In each transcript, all questioning segments were marked for beginning and ending time on the original transcription. In Table 5.3 (transcript TI 0503), the beginning time of the transmission is noted in the first column. Extended message sequences with more than one question were marked to show the time when each question was initiated.

Interference and Blocked Transmissions

When communications were not clear or cut off by another microphone key, typographic symbols were used to indicate several common problems. There were three types of communication problems that affected the transcription process.

First, microphones in aviation communication are designed so that only one person can use the frequency at a given moment. In order to gain access to the frequency, the speaker must press a key (button) on the microphone. However, this causes the frequency to be blocked for all other speakers (pilots and controllers) and may inadvertently cut off another speaker already in the process of sending a message. There are audible 'clicks' of keys being pressed when this occurs. This was shown in the transcripts by use of "kkk," representing one or more clicks heard during the recording (see Table 5.5).

Table 5.5
Transcription Coding: Microphone Key Interference

Recording Time	Speaker	Transcription	Explanation of coding
01:16:40	P	Ok, not above kkkk//	*kkkk//* = one or more microphone keys being pressed in rapid sequence, cutting off the message

Second, problems with static, or muffled and garbled transmissions which originate within the speaker's environment. The main portion of the message remains clear, but some part of the speaker's message is muffled (i.e., speaker turned away from microphone or microphone moved out of range for good transmission), indistinct or otherwise unclear as shown in Table 5.6. These problems were coded as follows: parentheses with "muffled" in italics (Table 5.6.A), "sss ssss" as static interference (Table 5.6.B) or "xxx" for unclear word or phrase (Table 5.6.C).

Table 5.6
Transcription Coding: Poor Message Reception

	Recording Time	Speaker	Transcription	Explanation of coding
A.	01:16:40	P	Ok not above (*muffled*)	*(muffled)* = message is indistinct, unclear
B.	01:42:34	P	Sss ssss sss ssss **Alpha November Delta?**	(*static*) = static interference during message; may include very loud engine whine in background
C.	00:41:06	P	**…**// degrees direct xxxx Scorpion Air four zero six nine	*xxx* = unclear or garbled transmission, due to either speaker turning away from microphone or to interference by other noises.

Third, a frequent problem was caused by the scanner rapidly shifting frequencies, which omitted the beginning portions of some transmissions until the frequency was cleared and the scanner was able to pick up the signal. This problem was coded as "…//" (missing information transmitted before scanner picked up the frequency (Table 5.7).

Table 5.7
Transcription Coding: Incomplete Message

Recording Time	Speaker	Transcription	Explanation of coding
00:01:05	C	…// continue heading downwind for vector one zero Descend flight level seven zero	*Ellipsis plus //* = partial transmission; only a portion of pilot's message was audible
	P	Descend flight level seven zero **Any idea of any flight plan you've planned for us**? Scorpion one six seven	

Spelling and Symbols Used in Transcriptions

Throughout the transcripts, all numbers spoken by either the pilots or the controllers are spelled out rather than using numerals (Figure 5.1). Numbers are a significant portion of aviation communication and are found in many of the transmissions, indicating heading directions, flight levels and radio frequencies. This transcription convention provides a more accurate report of what was being said by the speakers. [Note: from this point forward, the recording time listed on the transcripts will no longer be used since it provides no information necessary for this study.]

Figure 5.1. Transcription Coding: Spoken Numbers.

a.	TI02	P	uh….<u>thirty two forty seven</u> on that?
b.		C	Three two four seven
c.		P	OK three two four seven

In Figure 5.1, the pilot (line a.) originally asked if the radio frequency digits were “thirty two” and “forty seven.” However, the controller (line b.) responded by stating each digit individually, clarifying the digits for the pilot. In his second message, the pilot repeated the numbers individually to acknowledge he understood the controller’s message.

In the case of unfamiliar position markers or locations that were not on available aviation charts, spellings were approximated based on the speaker’s pronunciation, such as “Kerr-key,” later found on a map with the spelling Kerky. Throughout the transcription process, unfamiliarity with the geographic locations of local navigation points did not present problems when analyzing the transcripts.

In individual messages where the speaker hesitated, fillers were transcribed as 'uh' (approximately 1 second) or 'uhhh' (1-2 seconds) to designate relative length of the sound (see Figure 5.2).

Figure 5.2. Transcription Coding: Fillers.

TB01	C	Cleared to land two four left Number uh two on the approach …?

In some situations, speakers paused during their message without using any fillers. Pauses shown in the text by ellipsis marks represent a short pause in transmission followed by the same speaker continuing the message. In Figure 5.3, the ellipsis marks are shown connecting the pause to the words preceding and following the silence(s).

Figure 5.3. Transcription Coding: Pauses.

a.	TG25	P	Well…they've got…an "X" marked…on the previous part…so there you go
b.		C	OK…land after the "X"?
c.		P	All right, sounds good to me

In Figure 5.4, there is a potential confusion as to the speaker's meaning because there is no written phraseology that corresponds to this message. When homonyms are possible, italic print was used to note possible ambiguities in the transcript.

Figure 5.4. Transcription Coding: Ambiguity.

TM34	C	are you *for/four* on that bypass or ILS two four Right?

Identifying Questions

Once all the transcription was completed, each transcript was assigned a coded label using the city name and the sequence of the transcript in the collection of recordings. Then each transcript was reviewed to identify the sequence of questions. This sequence number was then transferred to a separate coding sheet for coding both form and function. Table 5.8 shows a sample of the transcript with all of the initial coding elements.

Table 5.8
Transcription Coding: Question Numbers in Transcript

Transcript ID		DC	D = Dublin, C = 3rd transcript in Dublin recording sequence
Time	Q #	Role	Transcribed data
01:07:04		C	Ryanair seven seven eight Climb flight level one seven zero Turn left heading one eight zero
	12	P	Climb flight to one seven zero **And uhh say again heading?**
		C	Left heading zero eight zero Ryan seven seven eight
- - -	- - -	- - -	(No questioning items occurred during this time)
01:21:11	13	C	X-ray Tango, Roger **How long will you be on the ground?**
		P	Ohh about uhh forty five minutes

In Table 5.8, Column "Q#" represents the sequential identification of two questions within transcript DC. On subsequent coding sheets or when used as examples in this paper, these two items would be identified as "DC12" and "DC13" (Dublin C transcript, question 12 and question 13, respectively).

Section IV: Coding Questioning Functions

The questions found in the transcripts were initially coded based on classifying the questions into one of three functional categories as described in Chapter II: information seeking, information checking, or information clarification. These categories allowed the data to be coded to support the argument that the individual item represents a question function whether or not the item employs an interrogative form. Aviation phraseology does not rely on intonation to convey meaning, rather declarative and imperative structures are endorsed when not otherwise specified by regulation phraseology (see also Chapter IV, Aviation Discourse). However, any use of intonation as a cue to convey questioning in imperative or declarative syntactic forms becomes useful for this research. Therefore, identifying these utterances may add to the overall picture of not only if, but how, questioning is done in daily aviation discourse.

Table 5.9 provides samples of questions coded by the three functional categories: information-seeking, information clarification, and information checking.

Table 5.9
Transcription Coding: Question Functions in Interrogative Syntax

		Pilot	ATC		info seek	info check	Info clarify		WH-	tag/ y-n	req confirm	modal	indirect	other	Message
Question	**01**														**Could we move left**
pilot		1			1							1			**about thirty degrees**
ATC															**for a short while?**
Question	**02**														You said five thousand,
pilot		1				1				1					**is that correct**?
ATC															
Question	**03**														You said five thousand
pilot		1					1		1						**What was that frequency again?**
ATC															

In Question 01 (Table 5.9 above), the pilot *seeks* new information from the controller: permission to temporarily alter the current flight path of the plane.

Figure 5.5. Information-Seeking Question

DA0502 P Could we move left about thirty degrees for a short while?

Seeking new information in this situation is common when a pilot notices evidence of bad weather ahead and requests to shift the route to avoid poor or deteriorating weather conditions.

In Question 02, the pilot uses a question to *check* whether he correctly understood the altitude (5000 feet) provided by the controller in a previous message (Table 5.9).

Figure 5.6. Information-Checking Question

DA0502 P You said five thousand, <u>is that correct?</u>

In Question 03, the pilot may have misunderstood or simply not heard all of the radio frequency provided by the controller, so the pilot asks a question to *clarify* the original message by repeating a specific portion of the message (Table 5.9).

Figure 5.7. Information-Clarification Question

DA0502 P What was <u>that frequency</u> again?

The function of this question is to let the controller know that the pilot received most of the transmission, but the pilot needs the frequency explicitly restated.

At the same time the questions were assigned to one of the three broad functional categories, questions were also divided into three syntactic groups (WH-questions, TAG-YES/NO questions and MODAL Questions) plus two additional groups to identify either Indirect questions or Other (questions that could not be placed into any of the four groups just identified).

The category of “Indirect” was assigned to identify those utterances which did not use an interrogative form, but did incorporate rising intonation in the speaker’s message (Table 5.10 below). This category provided a means to account for the question functions for all questions (without interrogative syntax). In Table 5.10, Question 04, the pilot seeks permission to alter the flight path to avoid weather ahead. However, the syntactic form of the inquiry is not in interrogative form. Instead, the pilot is using only rising intonation at the end of the message, indicated by the question mark (see Figure 5.8).

Figure 5.8. Indirect: Information-Seeking, Intonation Question.

DA0502 P And we’d like to come right two seven (degrees) for weather?

Table 5.10.
Question Functions Using Intonation Syntax

Transcript	Q #	Pilot	ATC		info seek	info check	Info clarify		WH-	tag/ y-n	req confirm	modal	indirect	other	Message
Question	**04**														we'd like to come right two seven for weather?
pilot		1			1								1		
ATC															
Question	**05**														and that is confirmed two **three** zero?
pilot		1				1							1		
ATC															
Question	**06**														remind me…how many miles you will require?
pilot															
ATC			1				1						1		

In Question 05, the pilot used rising intonation to *check* the accuracy of the numbers spoken in the previous message.

Figure 5.9. Indirect: Information-Checking, Intonation Question.

TG0429 P And that is confirmed two <u>three</u> zero (degrees)?

Instead of using an interrogative form, the pilot restates the information placing stress on “three” and uses rising intonation to obtain the controller’s confirmation of the direction.

In Table 5.10, Question 06, the controller used rising intonation to request clarification of the information spoken in an earlier message by the pilot.

Figure 5.10. Indirect: Information-Clarification, Intonation Question.

DH0512 C And remind me of the <u>miles</u> you will require?

Instead of using an interrogative form, the controller restates the information placing stress on “miles” and uses rising intonation to gain the pilot’s verification of the distance.

Figure 5.11 shows a sample of questions classified as “Other,” those questions which did not fit into the subcategories of functions described above. In this example, lines a.-c. are the controller’s landing instructions to the pilot using declarative intonation. However, in line d., the shift to rising intonation indicates that the controller is checking whether the pilot is aware of other aircraft behind (“traffic following” – 5.11b., e.g., “number two on approach”) the plane identified as Scorpion 699. Through the change in intonation, the controller’s final statement, using declarative syntax, becomes a statement functioning as a question to check the pilot’s awareness of the situation.

Figure 5.11. Terminal Phrase Doing Questioning at End of Message.

a.	TB01	C	Cleared to land two four left
b.			Number uh two on the approach now
c.			Wind speed at twenty at fourteen
d.			Traffic following?
e.		P	Cleared to land runway 24L
f.			Scorpion six nine nine

In aviation phraseology, the *checking* function is often done through use of the verb "confirm" which would appear at the beginning of the message. However, in some cases, these verbs occur at the end of a message to check that the listener did understand the information or instruction. Figure 5.12 shows use of "confirm" used in standard phraseology. The controller asks the pilot to push a transponder button that automatically sends an electronic message to the controller's station confirming the plane is in the controller's area of operation.

Figure 5.12. Standard Phraseology: Example of "Confirm."

TI09 C Scorpion Air
Confirm squawk ident* [flight] thirty two eleven

(*see Glossary, Appendix A)

Although the transponder signal (the "squawk" see Appendix A) shows on a controller's radar screen, the controller may still ask a pilot to press the transponder button to update the plane's location. In Figure 5.13, the controller, line 3, explicitly states, in declarative form, the transponder signal that he expects from the Scorpion Air flight. Then the controller simply says "confirm" (line 4) to ask the pilot to verify that the signal number is actually the signal from his plane. This use of "confirm" as a single word-question is assigned to the subcategory, "Other."

Figure 5.13. Single Word Question: "Confirm."

a. TM06

1.	C	Scorpion Air
2.		Squawk ident
3.		You're squawking thirty two eleven
4.		**Confirm?**
b.	P	That's affirmative

In Figure 5.13, "Confirm" (line 4.) is only one word within an otherwise declarative utterance, but the controller ended this message with a rising intonation on the word "confirm." While the use of "confirm" by itself would ordinarily be interpreted as a (declarative) instruction for the pilot to confirm his transponder frequency, this item was counted as a questioning these function due to the use of the rising intonation.

Section V: Coding Questioning Forms

The three broad function categories of questions were then classified by form, identified as either Syntactic-Interrogatives (syntactic classification) or Intonation-Questions (identified by intonation, without interrogative syntax). These two broad classifications addressed the various interrogative and declarative forms discussed in Chapter II. This more detailed classification system yielded 57 subcategories in eight general categories of features. The coding system to identify question forms is described in this section.

Syntactic-Interrogative Categories

Utterances using an interrogative form were assigned to five main Syntactic-Interrogative Categories using combinations of syntax and interrogative forms further subdivided by specific syntactic or lexical features (see Table 5.11 for an overview of the categories). Within each category, several subdivisions were created to document specific variations, as noted in the following description of these categories.

Table 5.11.
Coding Categories: A-E, Syntactic-Interrogatives

Original code	**Syntactic-Interrogatives** General categories
A	WH-questions
B.1 B.2	YES/NO and TAG questions Tag questions
C	"Request" and "Confirm"
D	Modals
E	Politeness Features
F	Compound/Complex Questions

Samples of a coding chart (for WH-words) and a transcript (Dublin) appear in Appendix B and Appendix C, respectively. In the examples within this section, the categories will be identified as simply "Interrogatives."

Interrogatives, Category A: WH-word questions

Syntactic-Interrogative category A classified all messages containing "WH-questions," those that used who, what, when, where, what, which, why or how at the beginning of the message clause (Figure 5.14, a.-c.).

Figure 5.14. Interrogatives: WH-questions

a. DE C How long will you be on the ground?

b. DF C What's your maximum altitude?

c. DH C Which way would you like to face?

Interrogatives, Category B: YES/NO and TAG questions

Interrogative category B was assigned to questions that could be answered with either "yes" or "no." There were two subdivisions within this category. The first included questions with auxiliary verbs or with the addition of an auxiliary to create the interrogative syntax, specifically "is/are," "do/does," and "have/has" as the initial verb in the message (see Figure 5.15, a.-c.).

Figure 5.15. Interrogatives: YES/NO Questions.

a. TC C Is that [altitude] good enough for you?

b. TI P Do you still want us on a two forty heading?

c. TP C Has company assigned you a time?

d. TM C Are you *able* [to move to] runway two three from Hotel three intersection?

Within the yes/no group, a separate subdivision was established for questions that incorporated use of "are you *able* …?" which is one of the few permitted interrogatives in aviation phraseology (see Figure 5.15, d.). This phrase can be used by the controller to determine if the pilot can physically perform a particular maneuver as requested by the controller. As a separate group, this form could be tracked independently of the use of "is/are" as an auxiliary verb for question constructions.

A second subdivision was available for constructions with the tag itself in interrogative or inverted form. In order to fulfill this classification, the tag was in an interrogative form, as in the following Figure (5.16).

Figure 5.16. Interrogatives: TAGS.

a.	TH	P	and uhh…one two nine point nine two, <u>was it</u>?
b.	DA	P	We'll be holding with those beacons for noise, <u>is that ok</u>?

Interrogatives, Category C: Requesting and Confirming

Aviation phraseology specifies the verbs "request" and "confirm" as acceptable verbs permitted for obtaining permission ("request") or information ("confirm"), but the phraseology does not approve of these verbs in interrogative constructions (see Figure 5.15). A category was assigned to any questions that explicitly used either "request," "verify," or "confirm" as the principal verb of the question. Within this category, a further subdivision was made to identify any explicit use of the verb "request" to explicitly ask for repetition of one or more pieces of information expressed in interrogative syntax rather than the approved form "say again." Another subdivision was added to include any interrogative construction that contained a repair, or rephrasing within the message, as in Figure 5.17.d.

Figure 5.17. Examples of Request and Confirm Subdivisions.

a.	Request	C	Are you requesting lower [altitude]?
b.	Confirm	P	Was Tango Mike <u>confirmed</u>?
c.	Request repetition	P	What was the distance <u>again</u>?
d.	Repair	P	uhh, <u>is…is</u> that the right way?

Interrogatives, Category D: Modals

A separate classification within Interrogatives was assigned to use of modal verbs. These constructions add meaning to a clause, such as to express possibility or asking for permission. Subdivisions were created to account for separate use of "can/could," "will/would," and "may/might" in interrogative constructions to determine if there was a pattern of use of these forms in interrogatives by speaker roles or by location. examples of these constructions are shown in Figure 5.18.

Figure 5.18. Examples of Modal Constructions.

Can/could	TI	P	Can we get a northerly heading there?
Will/would	TL	C	Would you prefer to follow the shore to Kerwin?
May/might	DK	P	May we maintain that speed?

Interrogatives, Category E: Politeness Features

The separate category for Interrogative constructions addressed the use of politeness within questions. Aviation phraseology does not provide for any forms of politeness expressions to be used by either pilots or controllers. However, it is not uncommon to hear pilots and controllers use simple greetings and farewells at the beginning or end of a transmission (Sanne, 1999; Sullivan & Girginer, 2002; Wyss-Bühlmann, 2004). Subdivisions within this category addressed the explicit use of "please" as part of a question asking for permission to initiate a change. In Figure 5.19, shows "please" in conjunction with "again" used to modify a direct question asking for a repetition of information.

Figure 5.19. Politeness Features in Interrogative Clauses

a. Explicit use of “please”

C	DH	What’s your speed again, please?

As shown in Figure 5.20, b.-d., a separate subdivision was created to allow a category to include forms of politeness in questions that did not explicitly use “please,” such as the verb construction, “do you want to…?” (typically spoken by controllers) or “do you want me/us to…?” (typically spoken by pilots). As noted in Chapter II, Linde (1988) examined the use of “want” as a form of politeness in flight deck interactions.

Figure 5.20. Other Markers for Politeness

a.	C	DD	How high do you want to go, sir?
b.	P	DD	Could you just confirm there’s no air activity?
c.	P, C	TC	What altitude do you want to start at?
d.	P	TL	Do you mind if we slow it up now?

Interrogatives, Category F: Compound and Complex Questions

A category was assigned to compound and complex question utterances (see above, Table 5.11, Coding Categories, Categories, Category F). These items were defined by compound or complex clauses containing interrogative syntax. The purpose of this category was to identify those items with multiple questioning phrases or clauses within a single turn. Since aviation phraseology is designed as an economical, formulaic language, any use of interrogative syntax is of interest in research focused on the discourse. The use of multiple-phrase or multiple-clause interrogative forms, which clearly violate this design, highlight the use of more conventional language within the aviation context.

These compound or complex clauses were coded as one question if they followed the pattern of compound sentence structures which contain two noun phrases with one verb phrase or a single noun phrase with two or more verb phrases. However, questions which contained two separate clauses joined by a conjunction (or complex questions) were coded as two separate questions (see Figure 5.21).

Figure 5.21. Compound and Complex Questions.

a. Compound question

TN	C	What do you prefer 23 <u>or</u> 24 right?

b. Complex question:

DJ	P	Is it three miles and … direct to Tralee? <u>or</u> is it straight in approach to runway one six?

In Figure 5.21.a., the controller is offering a choice, but expresses it as a compound question, joining the noun phrase of choices of available runways by a conjunction, coded as one question. In Figure5.21.b., the pilot is using two full clauses joined by a conjunction to clarify which route the pilot should take for landing, coded as two separate question forms but serving only one question function: clarification.

Repair

In the interrogative subcategory Repair, certain items contained utterances where the speaker made a conscious correction to the questioning form in mid-sentence. In Figure 5.22, “maintain” and “turn left” do not have the same meaning for the direction of flight. “Maintain” means to “remain at the altitude/flight level specified” (Federal Aviation Administration, 2004a, p. PCG M-1). The controller realized in the middle of his message that the pilot must adjust the plane's direction rather than continue, or "maintain," his present flight path.

Figure 5.22. Repair.

TM30 C Can you maintain uhh …can you turn left ten degrees to maintain that heading?

The controller (in Figure 5.22) is trying to accomplish one function (getting the pilot on a specific flight path) but makes an error in his choice of terminology. The controller then self-repairs his message by restarting his question as "can you turn left" to more accurately express what the controller wants the pilot to do.

Intonation Questions

Categories G through H were used for utterances that did not use the Syntactic-Interrogative form; instead, the items functioned as a question expressed through the speaker's use of rising intonation, referred to as "intonation questions" in the text (see general outline in Table 5.12).

Once the speaker began a message, any restarts or repairs were assigned to the appropriate form subdivisions, either as Syntactic-Interrogative or Intonation-Question items with a Repair. Figure 5.23 was coded as Intonation-Question form with a Repair since the entire message was in declarative syntax but used rising intonation.

Figure 5.23. Repair with Rising Intonation.

DB P We'd like to work south of …uhh…towards this area?

Other Intonation-Questions, Category G-H

Category G addressed the same features as the Syntactic Interrogative Category C (use of "request," "confirm," "verify," and "requests for repetition" and "repairs"), and Category E (politeness markers).

Table 5.12
Coding Category G: Intonation-Based Questions

G	Intonation: Using rising intonation only ▪ Other: Speaker-Recognition, ▪ Request/Confirm, Verify ▪ Politeness: 'please' ▪ Politeness: other markers

This category of intonation question structures was expanded to include a category for "speaker-recognition," for short phrases or single words frequently used by both pilots and controllers to verbally recognize the speaker and to invite further communication. (Note: The term, "Acknowledge" is not available as it has a formal meaning in aviation phraseology that does not coincide with this usage.) These phrases function in the same way as saying "Hello?" when a person answers a ringing telephone (see discussion in Chapter II). Such items use a rising intonation, therefore were included in the coding to investigate whether they represent items that should be examined further. Making these items a separate category indicates their relative frequency. Examples were found of single-word as well as multiple word speaker-recognitions, shown in Figure 5.24.

Figure 5.24. Intonation-Question: Speaker-Recognition.

TA09	P	Toronto, Scorpion two eight three six…
	C	Scorpion uh two eight three six - <u>Toronto</u>?

In the example, the pilot has called the tower, identifying his flight through use of the flight's callsign (Scorpion 2836). The controller recognizes the pilot's presence by repeating the call sign, then the controller uses rising intonation on only the location name, Toronto, to invite the pilot to continue with his message.

Other vocabulary related to politeness in non-interrogative structures were coded within the subclass of Politeness markers (Figures 5.22-5.23). These items included use of modal-requesting (Figure 5.25) and verb phrases using "just," (Figure 5.26).

Figure 5.25. Intonation-Question: Modal-Requesting.

TC12	P	We <u>would like</u> to go direct… ?

Figure 5.26. Intonation-Question: Use of "Just…"

TQ12	P	We'd like to get <u>just</u> a little lower?

Two category G subclasses were set up for Intonation-Question forms using of "request" and "confirm" (see Figure 5.27). This decision can be justified in two ways. First, the use of "request" or "confirm" is an aviation-approved phraseology that is used in checking or clarifying situations. Second, since requests are a form of seeking or clarifying information, these verbs are used as another means to check the speaker's receipt of a message.

Figure 5.27. Intonation-Questions: "Request" and "Confirm."

DE23	P	Scorpion Air <u>requesting</u> stand/push approval?
DJ46	C	Just <u>confirming</u> your request about being in position for runway one six?

By including these forms, the coding can account for aviation-related uses of "request" in intonation-questions to look at this word choice functioning as a question compared to uses found in the interrogative category.

A subdivision was used to count the number of times the pilot used standard phraseology to request the controllers to repeat of the previous message ("say again"), but with the use of rising intonation to determine if standard phraseology was altered by intonation.

Figure 5.28. Intonation-Question: "Request" (asking for repetition)

TA P <u>Say again</u>?

Both "confirm" and "verify" are verbs included in the official phraseology, so a separate subdivision was assigned to them to investigate their use with intonation that could be compared with the use of these verbs in interrogative constructions (Figure 5.29).

Figure 5.29. Intonation-Question: "Confirm" or "Verify" (explicit use as a verb)

a. TA C …<u>confirm</u> your level at seven [thousand]?

b. TL P We want to <u>verify</u> the altitude at eight thousand?

In addition, the pilot (in Figure 5.29.b) constructs his message with a full declarative clause rather than the shorter approved form, "verify altitude at 8000."

Category H focused on use of the auxiliary verbs found in Interrogative Category B ("is/are," "do/does," and "have/has"), but only in those clauses using declarative or imperative syntax (see description in Table 5.11). In addition, this category documented any use of “If-” clauses (with modals/no-modals) to determine whether speakers used the conditional when discussing aviation matters.

Table 5.13
Coding Category H: Intonation-Question Descriptions

H	Phrases/Clauses - not in interrogative syntax ▪ Auxiliary verbs: ‘is/are”, “do/does,” “have/has” ▪ Modals: “can/could,” “may/might,” “will/would” ▪ ‘IF’ with modal verb / ‘IF’ with no modal verb ▪ Statements/full clause, rising intonation ▪ Incomplete statements (phrases or words) with rising intonation

Some speakers’ statements were assigned as intonation-question forms as full clauses or phrases. These divisions accounted for both the form of an utterance that was not classifiable in other groupings and for identifying any pattern of phrases that were used to seek or confirm information using a rising intonation pattern (Figures 5.30, 5.31).

Figure 5.30. Intonation-Question: Other Clauses, Rising Intonation.

TA06	P	Toronto Center, this is *Scorpion Air* 315 Just reconfirm…<u>that was</u> one six thousand?

This item was coded as a non-interrogative *clause* with subject and verb.

Figure 5.31. Intonation-Question: Other Phrases, Rising Intonation.

TB07	P	We’d like to talk to Center enroute to Dominion [We’re] looking for two thousand?

In Figure 5.31, this item (Pilot’s message: “looking for two thousand,”) was coded as a non-interrogative *phrase* since there is no explicit construction to identify it as an interrogative structure, but the audio file clearly presents rising intonation. Phrases with rising intonation are of interest to determine whether speakers use phrases as a resource for questioning.

Each of the subclass classifications was not considered as absolute; that is, many of the utterances were assigned to more than one category. The example shown in Figure 5.32 was classified as a non-interrogative form in two separate class-subcategory codes:

Figure 5.32. Intonation-Question: Other Clauses: IS/ARE, Multiple Coding.

TH08	C	That **was one six** thousand?

Coding for this item was assigned to (verb) "is/are" as well as **"**statement/full clause, rising intonation only**.**"

AUXILIARIES

This category investigated the three auxiliary verbs (outlined in Interrogative Category B) in order to examine if they were used to construct question functions. Figure 5.33 shows samples of these constructions.

Figure 5.33: Intonation-Question: Auxiliary Verbs

a.	TG	C	and you <u>are</u> [sic] ready two one six [callsign]?
b.	TK	C	I <u>have</u> already given you that?

In Figure 5.33, line a., the controller expresses his question in declarative syntax rather than stating that the pilot should confirm that the aircraft is ready to depart. In line b., the controller is checking whether he has provided information to the pilot through use of rising intonation in combination with the auxiliary *have*.

MODALS

Intonation-Question uses of modal verbs were investigated to compare with occurrences of modals in interrogative Category D (Interrogative: Modals). Figure 5.34 lists samples from the data containing these forms.

Figure 5.34. Intonation-Question: Modals

a.	TB	C	And you understand you'll have to cancel your flight plan at that time?
b.	TK	C	I may have already given you that?

In these examples, the speakers added modal verbs to modify the direct meaning of the declarative statement. In Figure 5.34.a., the controller emphasized that the pilot's flight plan must be cancelled by a specific point in the flight. In Figure 5.34.b., the controller expresses uncertainty through use of the modal combined with rising intonation.

IF-clauses

If-clauses (interrogative Category B) were further subdivided into two categories, use of If-statements with modal verbs and those If-statements without modal verbs. Figure 5.35 shows both constructions.

Figure 5.35. Intonation-Question: IF- clauses.

a. Modal

TC	P	Actually…uhh if...if we…if we could now turn right?

b. No modal verb

DE	C	If you wish to keep your speed up?

In both samples, the conditional statement is further mitigated by use of the modal verb, “could” suggesting that the pilot is rather unsure if he can make the right turn.

In line b., a direct question, “do you want to keep up your speed,” is modified by the controller’s use of the If-statement to attract the pilot’s attention to conditions that will be required for keeping the aircraft at its present speed.

Numerical Analysis: Conclusion

Once all the transcripts had been coded for these subcategories, the transcripts were combined and totals for each of the subcategories were calculated. Because the second coding created a new analytical structure which allowed more than one code for a given utterance, there are many more items in the Form categories than there are individual questions. Items were discarded if they were not complete enough to determine whether they could be assigned to interrogative or intonation-based categories.

Collating the Data

After all the individual transcripts were coded for the 57 subcategories, the individual transcripts were combined for all recordings from Toronto and all from Dublin, creating a larger data set representing each location. The overall total of items for each city was analyzed as well as the items by speaker role. Then the two sets were combined to build a single framework to analyze the patterns of questions used in all of the recordings in the data set. The results of this analysis will be discussed in Chapter VI. Chapter VII discusses these findings; the Limitations and Implications of this project and a final conclusion will be presented in Chapter VIII.

CHAPTER VI

RESULTS

Section I: Introduction

In the previous chapter, I outlined the classification system used to analyze each of the transcripts. I then provided examples and itemized the items that called for additional categories not covered in the original classification system. In this chapter I will present results and samples from the data. The findings of this study will be divided into an analysis of the results of overall totals of items found in the transcripts described in Section II. Section III will present the results of the analysis for the three question "Function" categories. Section IV focuses on results in the major "Form" classifications which will report both Syntactic-Interrogative and Intonation-Question forms. Each section describing results of the study will be arranged to focus on the broad category and the results reported by the roles of pilots and controllers then describe the specific outcomes of each category subdivision. The final section, Section V, will summarize the findings. Discussion of the findings will be presented in Chapter VII, followed by the Limitations, Implications and Conclusions of the study in Chapter VIII.

Section II: Overall Results

The primary objective of this study was to determine if pilots and controllers used questions in the data (Research Question 1). As shown in Table 6.1, there were many questions found in the recordings. The pilots and controllers in this study used a total of 677 items that involved either Syntactic-Interrogative or Intonation-Question structures as described in Chapter V found in the 24.52 hours of recordings. The pilots employed 219 questions while the controllers used just over double that number, a total of 458 questions.

Table 6.1
Total Question Items

Location	Pilot Questions	ATC[1] Questions	Total Questions	Recording time (mins)	Recording time (hours)
Dublin	115	245	360	609.70	10.16 hrs
Toronto	104	213	317	861.63	14.36 hrs
Total	219	458	677	1471.33	24.52 hrs

[1] Note: throughout this chapter, the contents of the Tables and Figures referring to air traffic controllers will use the abbreviation 'ATC.'

A total of 677 questions were found in the data during the total recording time of 24.52 hours (both locations combined). Even though there were more recorded hours from Toronto, (4 hours and 50 minutes, more questions were found in the 10 hours 10 minutes recorded from Dublin. The transcripts yielded 360 questions in the recordings from Dublin while only 317 questions were found in the Toronto recordings.

Research Question 2 was designed to investigate whether pilots or controllers used questions occurred more often. The data showed that in both locations, the Air

Traffic Controllers (ATCs) used slightly more than twice as many questions as did the Pilots.

The overall number of turns (change of speaker) was nearly the same between the two locations: Dublin, 1313 turns compared with Toronto pilots who used 1301 turns (see Table 6.2). Pilots in Dublin used 679 turns compared to 634 turns used by Toronto pilots. The controllers in Dublin used slightly fewer turns than the controllers in Toronto (632-669). The overall count of turns at each location showed only a few more turns for Dublin in just over 10 hours of recorded data (1311) than for Toronto with more than 14 hours of recorded data (1303).

Table 6.2
Total Question Turns

	Pilot Turns		**ATC Turns**		**Total Speaker Turns**	
Location	Count	Percent	Count	Percent	Count	Percent
Dublin	679	50.2%	632	51.7%	1311	48.6%
Toronto	634	49.8%	669	48.3%	1303	51.4%
Total	1313	100%	1301	100%	2604	100%

The rate of question use emphasizes the difference in use of questions by pilots and controllers. When averaged, the data shows an average of 27.6 turns incorporating questions in every hour of recorded communication (Table 6.3). The pilots used questions just under nine times per hour (8.9 times) in their messages. The controllers used more than twice as many questions per hour, 18.0 questions on average.

Table 6.3
Question Frequencies by Speaker

Total Recording Time	24.52 hrs		
	Pilots	Controllers	Total
Total Questions in Data	219	458	677
Questions per hour (average)	8.9 qu/hr	18.0 qu/hr	27.6 qu/hr

As shown in Table 6.4, the Dublin recordings produced a total of 360 questions within 10.16 hours (609.70 minutes). The number of Pilot questions totaled 115 compared to more than twice as many questions (245) used by the Controllers. Overall, questions occurred in Dublin on average of 38.3 questions uttered per hour (total questions divided by total hours). The Pilots used only 11.3 questions per hour, while the controllers used questions 24.1 questions per hour.

Table 6.4
Question Frequencies: Dublin

Total Recording Time	10.16 hrs		
	Pilots	Controllers	Total
Questions in Dublin data	115	245	360
Questions per hour (average)	11.3 qu/hr	24.1 qu/hr	35.4 qu/hr

For Toronto, a total of 317 questions occurred within the recording time of 861.63 minutes (14 hours 36 minutes (see Table 6.5 below). Toronto. The Pilots used 104 questions, less than half as many questions (213) used by the Toronto controllers as shown below in Table 6.5. Questions in the Toronto data occurred at the rate of 25.1 questions per hour (total questions divided by total hours). The controllers used 14.9 questions per hour, while the Pilots used 7.2 questions per hour.

Table 6.5
Question Frequencies Toronto

Total Recording Time	14.36 hrs		
	Pilots	Controllers	Total
Questions in Toronto data	104	213	317
Questions per hour (average)	7.2 qu/hr	14.9 qu/hr	22.2 qu/hr

Although there were nearly as many questions in the Toronto data (317) as in the Dublin data (360), the percent of questions occurring within an average hour is higher for Dublin because of the shorter recording time. As a result, the lower number of Toronto questions per hour may reflect the difference in recording time as well as a difference in speaking style.

In order for a message to be counted as a question, the message had to meet three requirements:

1. The message must be intelligible enough to provide a phrase or clause that can be identified as functioning as a question (either through syntax or intonation).

Figure 6.1. Discarded Questions: Intelligibility.

TI14 C (Call sign unintelligible) - **Flight Level**?

In Figure 6.1, the complete question not intelligible although there was definite rising intonation on “flight level?”

2. Words within the question clause or phrase must be intelligible (no more than one word should be indecipherable within the message clause or phrase).

Figure 6.2. Discarded Questions: Indecipherable Words/Phrases.

DK02 P-1 Mike Echo Sierra
Request clearance to leave the uh flight xxxx route to
Xxx/kkk xxx/kkk
[several audible microphone keys interrupted transmission]

C-1 Mike Echo Sierra
Cleared on track to Blanchard town
Traffic information for Hotel Lima departing West
Point
For City Center

P-2 Cleared to Blanchard Town
Copy Hotel Lima
Echo Echo Sierra

In Figure 6.2, the Pilot's original message is relatively clear, but enough words or phrases were unclear due to audible microphone keys being pressed, making the overall message not clear to the listener, although the controller clearly understood the message (line C-1) as given in the information in his response.

3. The message must have a response that is intelligible enough to indicate that the listener understood the message as a question.

Figure 6.3. Discarded Questions: Response Inaudible

TF09 P So, **still fly** the zero seven nine radial then?
X [speaker response not audible]

In Figure 6.3, the pilot's message was clear, but there was no audible response on the frequency.

A total of 75 items were discarded because of one of these parameters. Included in this total were complete interrogative structures that had no intelligible response (due to interference or change of frequency by the scanner) as well as nearly complete messages missing a few lexical items but clearly containing rising intonation and an appropriate response by the listener. Discarding these items reduced the overall total, but provided communication clearly functioning as questions.

The total number of questions found in the data indicates that pilots and controllers do use questions frequently as a discourse resource in daily communications. The higher number of questions used by controllers may reflect the nature of their position as they issue the instructions directing the pilots to specific headings, altitudes or approach and departure procedures. In addition, the controllers are responsible for monitoring and alerting any pilot of potential problems when planes become too close or when the plane must deviate from a flight path due to unexpected events. Because the controller coordinates the flight activities of many planes, the controller is more likely to seek information current conditions or unusual circumstances from individual pilots.

Section III: Questioning Functions

Research Question 3 was designed to investigate the functions of the questions used in the aviation recordings. Throughout the 677 questions, speakers used the questions most heavily for Information Seeking, for a total of 415 items or 61% of all questions. The Information Checking category was used much less frequently, for only 22% of all questions (149 items). The least commonly used category was for Information Clarification which was used for only 17%, or 113 items, of the total aviation messages functioning as questions.

Table 6.6
Question Functions by Speaker

Functions	Pilots		ATCs		Total Functions	
	Count	Percent	Count	Percent	Count	Percent
Info Seek	133	61%	282	62%	415	61%
Info Check	42	19%	107	23%	149	22%
Info Clarify	44	20%	69	15%	113	17%
Total	219	100%	458	100%	677	100%

The pilots used Information-Seeking functions for nearly two-thirds of all the questions, while Information-Checking and Information-Clarifying functions were employed at nearly the same rate (19%-20%). The controllers used Information-Seeking functions at nearly the same rate as the pilots; however, the controllers relied almost 10% more often on Information-Checking questions than for Information Clarifying functions.

Each of the three categories of question functions was subdivided into two additional categories (see Table 6.7). The first category documented use of Syntactic-Interrogative question forms within the question functions while the second category of items were assigned to the Intonation-Question category (items using only rising intonation).

Table 6.7
Total Question Functions

Question Form	Question Functions	
	Items	Percent of Total Items
Syntactic-Interrogatives	434	64%
Intonation-Questions	243	36%
Total Function Items	677	100%

The Syntactic-Interrogative category, with 434 items, represents 64% of the total questions in the data, while the Intonation-Question items (n=243) occurred in only 36% of the total items functioning as questions.

The speakers clearly used both Syntactic-Interrogatives and Intonation-Questions on a frequent basis to convey their need for information. All items functioning as questions received an appropriate response. However, the content of the responses to the questions found in this study was not analyzed. Both speaker roles relied heavily on Information Seeking functions rather than needing to have information repeated or clarified. The high percentage of Syntactic-Interrogative questions indicates that interrogative constructions, although not approved as standard phraseology, are an important resource for aviation professionals when they need information.

Section IV: Results by Question Form

This section will describe the findings reported by Question Form. This classification was designed to address the Research Questions 4-7 to investigate the specific forms and frequency of lexical and syntactic items, intonation cues and other features found in the questions used by the pilots and controllers. Results shown in Table 6.8 present the major Form categories analyzed by Syntactic-Interrogative and Intonation-Question forms used in the aviation corpus. The data reported in the Intonation-Question forms identified utterances using a terminal rising intonation in conjunction with declarative or imperative syntax.

A total of 793 items emerged from the eight major categories showing specific choices made by the pilots and controllers outlined below in Tables 6.9-6.10. The

Syntactic-Interrogative category was used in just under one-third of the total messages than the Intonation-Question items (32-68%).

Table 6.8
Total Forms by Speaker

Form	Pilots		ATCs		Total Use	
	Count	Percent	Count	Percent	Count	Percent
Syntactic-Interrogatives	111	44%	299	55%	410	52%
Intonation-Questions	143	56%	240	45%	383	48%
Total	254	100%	539	100%	793	100%

The pilots showed a preference for Intonation-Question forms over the Syntactic-Interrogative forms (54-46%). The pilots also used more Intonation-Questions forms more than 10% as often as the controllers. The controllers used 72% of all the forms found in the data. The controllers used 12% more Intonation-Question forms as they did Syntactic-Interrogative Questions (56-44%).

Syntactic-Interrogative Category

The six Syntactic-Interrogative categories (Table 6.9) included: WH-words, Auxiliary Verbs and TAGS, Requesting, Modals, Politeness (Features) and Compound-Complex questions. The Intonation-Question categories were divided between Requesting/Politeness and Auxiliary Verbs and Tag Questions (Table 6.9).

Table 6.9
Syntactic-Interrogative Forms

	Use of Forms by Pilots		Use of Forms by ATCs		Total Use of Forms	
Form	Count	Percent*	Count	Percent	Count	Percent
WH-words	23	21%	93	31%	116	28%
Aux-Verb & Tags	21	19%	52	17%	73	18%
Modals	26	23%	58	19%	84	20%
Requesting	7	6%	7	2%	14	3%
Politeness	21	19%	55	18%	76	19%
Compound and Complex QU's	3	3%	23	8%	26	6%
Repairs	10	9%	11	4%	21	5%
TOTAL	111	100%	299	100%	410	100%

*Rounding prevents some columns from adding to 100%.

Of the seven categories identified in Table 6.9, only WH-words and Compound/Complex questions were used at a higher rate by the controllers. The controllers used Compound/Complex forms more than twice as often as the pilots although this is a small number of total items (6%). The WH-words category, with a total of 127 items, demonstrated a preference by the controllers who employed the WH-word structures more often than did the pilots (31-20%). However, the other categories were more nearly matched between the two speaker roles. Across the categories, the pilots used slightly more Modals (+4%), Requesting (+4%), Politeness (+1%), and Repair (+5%) features, although these are relatively slight differences for each category.

Intonation-Question Forms

In interrogatives, every structure is counted because it contains one or more of the specific interrogative form features in Table 6.9; however, this is not true when looking at Intonation-Questions (Table 6.10). The Intonation-Questions showed a greater variety of syntactic, clausal or phrasal forms: more variety of verbs and phrasing or some incomplete phrases (with neither subjects nor verbs).

Table 6.10
Intonation-Question Messages

	Use by Pilots		Use by ATCs		Total Use	
Form	Count	Percent*	Count	Percent	Count	Percent
Complete statements	57	53%	152	71%	209	65%
Incomplete statements	51	47%	61	29%	112	35%
TOTAL	108	100%	213	100%	321	100%

*Rounding prevents some columns from adding to 100%.

The corpus contained 209 syntactically complete statements that did not use any additional features described in Table 6.10, representing 65% of the total Intonation-Question messages. While just over half of the pilots' messages were syntactically complete, more than 70% of the controllers' messages used a complete declarative or imperative syntactic form. There were just under half as many syntactically incomplete messages, composed of phrases or clauses functioning as questions. The pilots relied on incomplete clause structures for just under half of their messages, but less than 30% of the controllers' messages represented syntactically incomplete constructions.

The total number of complete and incomplete statements is larger than the number of forms because many of the Intonation-Question forms did not exhibit any of the specific features identified in Table 6.11 below. Of these features which approximately matched to the same features found in the interrogative categories, just over 127 statements did not use any of the features identified in Table 6.10. These statements functioning as questions can be identified only as “Other,” or unclassifiable by the other parameters. While pilots used 46 such statements which accounted for 33% of all Intonation-Question forms, the controllers used “Other” statements about twice as often although the overall rate of use was the same as for the pilots.

Table 6.11
Intonation-Question Forms

	Use of Forms by Pilots		Use of Forms by ATCs		Total Use of Forms	
Form	Count	Per-cent*	Count	Percent	Count	Percent
Aux-Verbs + Tags	20	14 %	37	15%	57	15%
Modals	9	6%	11	5%	20	5%
Requesting	42	29%	75	31%	117	31%
Politeness	17	12%	28	12%	45	12%
Repairs	7	5%	6	3%	13	3%
Compound and Complex QUs	2	1%	2	1%	4	1%
“Other” (no distinguishing features)	46	32%	81	34%	127	33%
TOTAL	143	100%	240	100%	383	100%

*Rounding prevents some columns from adding to 100%.

In the Intonation-Question categories, the controllers used declarative syntax with auxiliary verb constructions as a major form in communications that had a questioning function (Table 6.11). However, for both Pilots and Controllers, the most common form of non-interrogative questioning was the general category, “other,” with no additional features except that of rising intonation (34%). The next most common category was use of the Requesting category, including messages containing the use of the words (such as "request," "confirm," "verify," and "report") found in standard phraseology, representing just under 30% of all Intonation-Question forms (see also Requesting, discussed in detail below). Use of Modals in Intonation-Question forms (less than 12% for both speakers combined) occurred less than half as often as used in Syntactic-Interrogative forms (about 20% for both speakers). Politeness features occurred slightly less than 12% in messages of all the speakers.

Pilots used the Other and Requesting categories most often, at nearly the same rate (33-30%), but used the Politeness category in only 12% of all their Intonation-Question utterances. Together, Modals and Repairs accounted for only 11% of all features found in Pilot messages. Controllers also used the Other and Requesting categories for 66% of all their Intonation-Question utterances (34+32%). The Auxiliary/Tag category was the next most common feature at 16% while the controllers used Politeness forms in about 12% of their messages. Even though the controllers had almost two-thirds more items, the various features occurred at nearly the same rate for both speaker roles.

Question Frequency by Speaker

Research question 3 was designed to determine how frequently Pilots and controllers use specific syntactic and lexical forms to frame their questions. Although all of the major categories were used by both speakers, not all of the subdivisions were used by both sets of speakers. The results reported in the following sections will show that for some Forms, the pilots or controllers used a specific subclass to a greater extent than did the other group of speakers. Speaker use of these categories will be discussed in more detail in the following sections.

Section VI: Findings within the Form Categories

The following section describes the findings within the two main form categories, beginning with the Syntactic-Interrogative forms. Within each category, the general forms will be discussed and key examples presented.

Syntactic-Interrogatives

WH-words

In the WH-word classification, 128 utterances used one of the seven WH-words in the Syntactic-Interrogative category but none were found in the Intonation-Question category (see Table 6.12). The controllers used these forms more than four times as often as did the pilots. This is a higher rate of usage than the overall three times more messages by controller than pilots. Not only were the speakers using questions, but the asymmetrical balance in favor of the controllers suggests that they actively use direct Syntactic-Interrogative form to obtain information from the pilots.

Table 6.12
Interrogative Question Forms

Question Form	Pilots		ATCs		Total Use	
Interrogative Words	Count	%	Count	%	Count	%
Syntactic-Interrogatives	23	100%	93	100%	116	100%
Intonation-Questions	0	0%	0	0%	0	0%
Total Interrogatives	24	100%	104	100%	128	100%

The WH-word category was subdivided into individual lexical items or "WH-words." As shown in Table 6.13, "What" was the most commonly used WH-word in the data, occurring in over half of all WH-word items (n=68, or 54%). The two next commonly used words were “Where” and “How,” each occurring in over 14% of the messages. “Who” was used almost as frequently, occurring just under 12% of the total messages in this category.

Table 6.13
WH-Word Distribution

WH-words	Pilots		ATCs		Totals Use	
	Count	Percent	Count	Percent	Count	Percent
What	11	48%	53	57%	64	55%
How	2	9%	15	16%	17	15%
Where	2	9%	12	13%	14	12%
Who	5	22%	9	10%	14	12%
Which	3	13%	2	2%	5	4%
Why	0	0%	2	2%	2	2%
When	0	0%	0	0%	0	0%
Totals	23	100%	93	100%	116	100%

*Rounding prevents columns from adding to 100%.

Looking at the data for WH-words by speaker (Table 6.13), the pilots used only a total of 23 WH –word constructions, the pilots did not use either “When” or “Why” in their questions. Overall controllers used the WH-words “How” and “Where” at least twice as often as the pilots. Only “Which” was used slightly more by the Pilots, although the overall use of this lexical item was quite small (n=5). The least frequently used WH –word was “Why,” used only by the controllers in only two messages. “When” was the only WH-word that did not occur in the data for either speaker role.

The pilots relied heavily on “What” constructions, representing 48% of all WH-words used by this group, with the next most frequently used form, “Who” which was used in just over 20% of the questions (see Table 6.13).

Figure 6.4. WH-words: Pilots.

TK P and..uh..what was the altitude for twenty two ninety?

TL P Who's that for?

The controllers' use of WH-words, like the pilots, was heavily based on use of "What" (53%) constructions. The next most frequent WH-words used were "How" and "Where" 15 and 12 times, respectively (16% and 13%) followed by "Who," which was used 9 times (10%). "Which" and "Why" only occurred twice in the controllers' data set, or just 4% of all WH-words used by the controllers.

Figure 6.5. WH-words: Controllers.

a. TI C What speed do you need to do?

b. TJ C Where are you parked?

c. TF C How many more miles before you turn?

d. TG C Who'd you file with sir?

The data confirms WH –words as one form of Interrogative syntax used by both speakers as an important resource for obtaining information in aviation discourse with a preference for "What" as the primary lexical question form. The use of WH –words, which are not approved phraseology, may be a result of unanticipated changes to speakers' expectations of routine events or tasks, thus prompting the speakers to use a direct question to provide additional information in order to continue with the tasks at hand.

Auxiliary verbs

The auxiliary verb in English is used heavily in forming questions, thus the patterns of use of auxiliary verbs is relevant to the investigation of question syntax and semantics used in aviation discourse.

Syntactic-Interrogatives

Overall, the Is/Are verbs in questions were used in 51% of the total occurrences of all Syntactic-Interrogative items (Table 6.14). The Do/Does forms were nearly as frequently used in more than one-third of all interrogative forms (39%). Have/Has was used in only 9% of all interrogative constructions by both speakers.

Table 6.14
Syntactic-Interrogative Auxiliary Verbs

	Pilots		ATCs		Total Use	
AUX-Verbs	Count	%*	Count	%	Count	%
Is-Are	12	57%	25	48%	37	51%
Do-Does	7	33%	23	44%	30	41%
Have-Has	2	10%	4	5%	6	8%
Total	21	100%	52	100%	73	100%

*Rounding prevents columns from adding to 100%.

A distinct preference for Is/Are auxiliary forms appears in the data (37 items). The use of the verb Do/Does (30 items) outweighed the use of Have/Has (6 items) by appearing four times more frequently in the data.

As shown in Table 6.14, pilots clearly chose the verb “Is/Are” for just over half of the Syntactic-Interrogative forms, while they employed Do/Does in 40% of their questions and Have/Has was used in only 8% of pilot utterances. The controllers used Is/Are about half of the time (48% of all questions), but used Do/Does for 44% of their other Syntactic-Interrogative messages. The controllers employed Have/Has at about the same frequency as the pilots' rate of use (8-10%).

As shown in Figure 6.6, speakers employed the auxiliary verbs in the corpus using inverted form found in interrogative syntax.

Figure 6.6. Use of Syntactic-Interrogative Verbs.

TC17	C	Is that good enough for you?
TC03	P	Do you have the 1611 weather for [Next City]?
TP05	C	Has company assigned you a time [for departure]?

In each sample, the response indicated that the listener clearly understood the question framed in interrogative syntax and did not ask to have it rephrased in standard phraseology.

In the Syntactic-Interrogative data, there were no uses of negative statements in the auxiliary verb categories and only two examples of negative statements in the Intonation-Question structures, as shown in Figure 6.7.

Figure 6.7. Negative Syntactic-Interrogatives.

a.	TC09	P	I don't know what heading?
b.	TJ 02	C	I'm sorry, I didn't get that?

The negative constructions used with Do/Did + negative particle represent more conversational structures incorporated into the aviation message. In 6.7.b., the speaker has also began with the apologetic phrase, "I'm sorry," an additional clause not found in phraseology.

Auxiliary Verbs: Intonation-Questions

A category for auxiliary verb use was created in the Intonation-Question classification in order to investigate whether the speakers used auxiliary forms in declarative statements. There were only two examples of these verbs used in syntactically correct forms used in "IF-" clauses, discussed below, using Is/Are and Can/Could, both in the Toronto data.

Figure 6.8. Intonation-Questions with Auxiliary Verbs.

a. TL29 P Terminal, Bravo Alpha Quebec
Depart City Center via VFR flight plan to Next City
Wondered if we could fly Main City?

b. TA01 C If you're unable to cancel at City Center then I'll have to turn you out at some point?

Is/Are appeared frequently as an auxiliary with *–ing* verb forms (vocabulary from standard phraseology) in combination with a subject pronoun. In addition, the auxiliary form was contracted as it would be in general conversation. This use of Is/Are was found most frequently in the Dublin data suggesting that it may be a regional pattern of aviation discourse. Similar constructions with *–ing* employing either Do/Does or Have/Had were not found in the data. examples of auxiliary verbs used in this manner are shown in Figure 6.9.

Figure 6.9. Intonation-Questions: Auxiliary Verbs + *-ing*.

a. TQ04 P He's landing on two three sir?

b. TD03 C You're saying your release time of one nine five nine, is that correct?

c. DK07 C Confirm you're doing two five zero knots?

In Figure 6.9.b., the controller could have phrased his inquiry as “Confirm release time at one nine five nine.” In Figure 6.9.c., the correct phraseology would have been simple, “Confirm speed two five zero knots.” In each of the examples above, the speaker chose to construct the question rather than use available phraseology. The use of non-standard phraseology as well as rising intonation suggests that speakers draw from available conversational resources when clarifying or checking information.

Combined Auxiliary Verbs: Comparison Summary

By combining the verb forms in the Syntactic-Interrogative and Intonation-Question categories, a more complete pattern emerges indicating how aviation professionals use English question forms with inverted subject-verb syntax composed of auxiliary verbs. Since these verbs used as auxiliaries are not part of the routine aviation phraseology, their appearance provides additional evidence of interrogative forms being used for more conversational aviation discourse.

The use of 120 inverted subject-verb forms is nearly equal to the use of WH-word questions (127). Both WH-word and inverted subject-verb forms are closely associated with interrogative uses (lexical or syntactic). This represents 36% of all questions asked in the data (n=677). Both forms also violate standard phraseology in both form and vocabulary constructions. The high percentage of these two forms indicates that both pilots and controllers find these constructions to be a useful resource in their daily communications.

TAGS and YES/NO forms

In addition to the auxiliary verb category described in the previous section, use of tag questions as well as questions which anticipate a Yes/No answer were also investigated due to the use of the auxiliaries in these forms. Several subclasses indicate various forms of Tag and Yes/No interrogative structures were used, although no one structure was used exclusively. Syntactic-Interrogative Tag/Yes/No structures (with tag containing the verb placed before the subject) typically take the syntactic form: Statement + Syntactic-Interrogative Tag (Figure 6.10). There were 12 examples of this construction which represent 67% of all the tag forms found in the data (see Table 6.15).

Figure 6.10. Syntactic-Interrogative: "YES-TAG."

TH05 P and uhh… one two nine point nine two **<u>was it</u>**?
Statement + *Tag*

Intonation-Question Tags (tag containing all other lexical forms, shown in Table 6.15) appeared in less than 30% of the combined Tag structures, somewhat evenly used in 25% of pilot and controller messages.

Table 6.15
TAG Constructions

TAG Forms		Pilots		ATCs		Total	
Description		Count	%	Count	%	Count	%
Syntactic-Interrogative	Yes Tag	6	75%	6	50%	12	67%
	Other Forms	0	0%	1	8%	1	6%
Subtotal		*6*	*75%*	*7*	*58%*	*13*	*72%*
Intonation-Question	All Forms	2	25%	3	25%	5	28%
	Total	8	100%	12	100%	18	100%

The use of the tags at the end of declarative clauses generally functions to request a confirmation or clarification. In the following example (Figure 6.11), "got that" suggests an abbreviated form of a more complete clause representing the form "have you got that information?" In this example, however, the pilot originally read back the three letter airport code designation (GDM) but spoke the wrong letter, "Mike" (M). In his reply, the controller has already emphasized "*Golf* Delta Mike" and then places rising intonation on the phrase, "got that," to reinforce the correction and invite a response to confirm the pilot understood the correct sequence of letters for the flight path.

Figure 6.11. Example of Abbreviated Tag Form.

TE02	P	After Main City, its Mike Delta Mike
	C	*Golf* Delta Mike <u>got that</u>?
		(additional controller stress on "Golf")

But there were other examples of tags incorporating different types of tag-forms, as shown in Figure 6.12, found in the Intonation-Question category. Figure 6.12 a. shows a clausal tag (see Weber, 1993) in with a verb-subject inversion, serving as a request for repetition or ("did you say…?"). In Figure 6.12 b., "or not" is a phrasal tag, functioning for the controller to obtain for clarification from the pilot.

Figure 6.12. Intonation-Question: TAG Variations.

a. TD12	P	Let's see, that's one forty-seven <u>you say</u>?
b. TD06	C	That's your discretion <u>or not</u>?
	P	Roger, our discretion.
c. TF01	C	Apron* is one two uh two two seven **when ready, <u>OK</u>**?
		(*see Glossary, Appendix A)

In Figure 6.12.c., the controller is giving the pilot additional information about the radio frequency (to be used to contact the Apron Controller), but adds "when ready" because the pilot is not yet in a position to need the information. The use of "OK" as a word/particle tag functions to re-emphasize the "when ready" portion of the message and

"OK" is stressed more heavily with rising intonation that began with "when" in the message.

There are few tags in the corpus, less than 4% of all the question forms discussed above (18/449). The limited use of these tags suggests that speakers are self-checking or clarifying information and explicitly expecting a response. It is also possible that speakers have relied heavily on other, direct, question forms with auxiliary subject-verb inversions and WH-words.

"Are you able?"

Aviation phraseology specifies the phrase "is/are + you able" or "when able" to indicate a limited discretionary time frame to perform a change in flight activity such as an altitude or speed change (ICAO, 2004). This phrase occurred only five times in the combined categories (Table 6.16). While the data showed the phrase used by both pilots and controllers, the controllers used "are you able" more often.

Table 6.16
IS/ARE + ABLE as TAG Questions (Toronto only)

QUESTION-Form	Pilots	ATCs	Total
Syntactic-Interrogative	0	5	5
Intonation-Question	1	0	1
Total Tags	1	5	6

Two examples from the data are shown in Figure 6.13. The first example from the Syntactic-Interrogative category shows the interrogative syntax as it is found in the phraseology. The abbreviated form in Figure 6.13.a., "are you able" is the predicate with no further verb to describe what the controller wants the pilot to do (for example, *to go* *to…*, or *to move from…*the runway). In Figure 6.13.b., the pilot has taken the approved phrase, “when able,” and added it to the end of a full clause, spoken with rising intonation on the “when able” phrase.

Figure 6.13. “IS+ABLE” Forms

a. Syntactic-Interrogative

TM20	C	<u>are you able</u> runway 23 from Hotel 3?

b. Intonation-Question

TK10	P	I was just wondering if we could fly up to sixty five hundred <u>when</u> <u>able</u>?

Use of “when able” is one of few conditional phrases available in aviation phraseology. The examples found in the corpus are incorporated into longer messages that convey the same meaning but used more conversational vocabulary.

Intonation Question Forms

“IF-” clauses

The use of “IF”-clauses was investigated to see if these conditional statements were used to mitigate a request. Any use of an “IF-” clause represents a longer utterance diverging from the aviation focus on concise, economical phraseology. ‘IF’-clauses appeared only one time in the Syntactic-Interrogative forms, but appeared a total of 15 times in the Intonation-Question messages (Table 6.17).

Table 6.17
IF-Clauses by Speaker Role

	Pilots		ATCs		Pilots + ATCs	
IF-Clause type	Count	Percent	Count	Percent	Count	Percent
IF - in Syntactic-Interrogatives	1	10%	0	0%	1	4%
IF -, with modal, Intonation-Question	4	40%	8	62%	12	46%
IF - no modal, Intonation-Question	5	50%	5	38%	10	38%
Total	10	100%	13	100%	26	100%

*There were no If + modal forms in Syntactic-Interrogative structures.

A Pilot used the only Syntactic-Interrogative form of the 26 total occurrences (4%), with no "IF + modal" form employed by any speaker (Figure 6.14). Use of "IF-" clauses was rare in Syntactic-Interrogatives; in fact, the Pilots used the construction only once and the controllers did not use it at all.

Figure 6.14. Syntactic-Interrogative 'IF'-clauses.

TL17 P OK, do you mind if we slow up so we'll be ready?

In the Intonation-Question forms, the controllers employed twice as many "IF with modal" forms than the pilots (8-4); but they were matched in their use of "IF without modal" in the Intonation-Question constructions (5-5). The examples below (Figure 6.15) show how pilots employed the construction with modals (Figures 6.15.a.-b.). Figure 6.15.a. shows the If-clause as the main portion of this pilot's turn; and in Figure 6.15.b. the controller is using the If-clause at the beginning of his question. In Figure 6.15.c., the pilot has read back the instructions from the controller and then adds his request to change his original destination ("Next City") to an alternate location ("Main City").

Figure 6.15. Intonation-Question 'IF' clauses.

a. TL29	P	Terminal, Bravo Alpha Quebec Depart City Center via VFR flight plan to Next City Wondered <u>if we could fly</u> Next City?
b. DB11	C	<u>If you can keep that up</u> for me for fifteen miles, I'll make you number one straight in.
c. TA01	C	<u>If you're unable to cancel</u> at City Center then I'll have to turn you out at some point?

In Figure 6.15 C, The controller is informing the pilot of a potential problem in procedure ("*If you're unable* to cancel at City Center"), and uses rising intonation to clarify the consequences of that problem in the principal clause.

The uses of "If-" clauses varied but provide evidence of conditional statements used to mitigate a request or a potential course of action. These clauses are further evidence that non-standard phraseology is being used in more conversational form as an alternate to the more formal phraseology constructions.

Request/Confirm/Verify/Report

Requests

In aviation phraseology, the words "request" or "report" are approved for use to ask for new information or flight activity, while "confirm" and "verify" are used to establish the accuracy of a specific item of information (ICAO, 2004). Any messages incorporating "request," "confirm," or "verify" as the principal verbs were assigned categories in order to document their use in the Syntactic-Interrogative or Intonation-Question forms. In the data set, there were no uses of 'request' (other than as a request for repetition) or "verify" in explicit form in any of the Syntactic-Interrogative items by either pilots or controllers (Table 6.18, below). Figure 6.16 shows hypothetical forms of these verbs that could have been found in aviation discourse. However, none were found in the data.

Figure 6.16. Hypothetical "Request" as Explicit Verb in Questions.

a. C *"Are you requesting a lower altitude at this time?"

b. C * "Can you verify your altitude at 30,000?

Table 6.18
Requesting: All Forms

Requests	Pilots		ATCs		Total Use	
	Count	Percent*	Count	Percent	Count	Percent
Syntactic-Interrogatives						
Request, explicit use	0	0%	0	0%	0	0%
Confirm, explicit use	3	6%	3	4%	6	4%
Verify, explicit use	0	0%	0	0%	0	0%
Report, explicit use	0	0%	0	0%	0	0%
Request, repetition (includes "say again")	4	8%	4	5%	8	6%
Subtotal	*7*	*14%*	*7*	*9%*	*14*	*17%*
Intonation-Questions						
Request, explicit use	13	27%	3	4%	16	12%
Confirm, explicit use	12	24%	44	54%	56	43%
Verify, explicit use	2	4%	5	7%	7	5%
Report, explicit use	0	0%	8	10%	8	6%
Request, repetition (includes "say again")	15	31%	15	18%	30	23%
Subtotal	*42*	*86%*	*67*	*82%*	*109*	*83%*
Total all forms	49	100%	82	100%	131	100%

*Rounding prevents some columns from adding to 100%.

There were only 4 Syntactic-Interrogative uses of "request" as a verb for asking for a repetition spoken by the pilots and controllers, with all examples incorporating the approved phrase, “say again.” The two groups also used the word “confirm” as an explicit Syntactic-Interrogative request for information 3 times for each set of speakers. This even distribution of the three features suggests a limited number of uses in Syntactic-Interrogative constructions.

No occurrences of the verbs “Request” or “Verify” were found in Syntactic-Interrogative structures (see Table 6.18). With only 14 total occurrences of these verb features in Syntactic-Interrogative forms, the distribution of these lexical items suggest that pilots and controllers are not relying on these verbs as a primary means for constructing Syntactic-Interrogative clauses.

For the Intonation-Question structures, in contrast, there were a total of 109 occurrences of Requests throughout the data, 42 by pilots and 67 by controllers as shown in Table 6.18. The distribution of more “requests” by pilots is not unexpected, as the pilots are expected to “request” changes in altitudes, headings, routings, or other aspects of the flight although the use with rising intonation is not standard. The controllers’ use of the verb “confirm” is also part of their routine phraseology, as controllers are authorized to “confirm” requests made by pilots. However, as the predominant form of their questions, like “request,” used in routine communications, this lexical item would not be expected to exhibit rising intonation. In Figure 6.17 A, the pilot is using “request” in the routine form found in the phraseology, although the “-*ing*” is not an approved suffix. The controller’s response in B, with the imperative use of “confirm,” is standard except for the rising intonation suggesting it is functioning as a question.

Figure 6.17. Intonation-Question "Requests."

a. TM11 P requesting direct to *Main City*?

b. DH32 C confirm you're landing in Main City today?

c. DB07 C verify you'll be four thousand feet?

In standard phraseology, "report" is used for an instruction by controllers to ask for specific information (often the flight speed or the flight level) from a pilot. The verb functions as a form of request which is relevant to this study. As shown in Table 6.18, only the controllers used this construction within the corpus with rising intonation. Figure 6.18 demonstrates the variations that occurred in the data.

Figure 6.18. Intonation-Question: "Report."

a. DD38 C Report speed? (official phraseology)

b. DB34 C Report your speed?

c. DJ31 C Report level eight zero?

Figure 6.18 C is an example of "report" used by the controller to request that a pilot informs the controller when the plane reaches a certain altitude (or other designated task), at which time the controller may provide additional instructions. This form allows the controller to attend to other planes until the pilot completes the assigned task.

Request for Repetition

A subclass of Requests was assigned to any request specifically targeting a repetition of information. There were only 8 instances where either the pilots or controllers made a Syntactic-Interrogative request for repetition of information by the previous speaker. However, in the Intonation-Question forms, nearly four times as many total requests for repetition were made (8-30). Because standard phraseology for such a request is “say again,” this phrase was analyzed separately for patterns of usage (see Appendix A, Glossary).

Although both Pilots and ATCs had identical totals in Syntactic-Interrogative Requests (n=8), the percentage of request forms in the combined Syntactic-Interrogative and Intonation-Question categories is different due to the variations in the Intonation-Question category.

In the examples shown in Figure 6.19 (below), the variations of use of the standard phrase, “Say again” provide samples of how pilots and controllers use and adapt the formal phraseology with more general conversation. The data shown in Table 6.19 show both speakers used slightly more “say again” phrases than other forms of Requests in Syntactic-Interrogative forms. In Intonation-Question forms, however, there was a greater difference in how the requests were constructed. The controllers only used “Request” three times with rising intonation, while the pilots used the verb form 13 times (see above, Table 6.19). The use of “Say again” appeared in a variety of forms, as shown in Figure 6.19.

Figure 6.19. Requests: "Say Again" (Request for Repetition).

Syntactic-Interrogative

a.	TP08	P	What was that first distance <u>again</u>?
b.	DJ39	P	Can you give the full flight plan <u>again</u>?
c.	DH02	C	What's your speed <u>again</u> please?
d.	DJ28	C	And can you <u>say again</u> the stand number?

Intonation-Question

e.	TA05	P	Say <u>again</u>?
f.	DI18	P	Cleared to … uh <u>say again</u>?
g.	DI19	P	<u>Say again</u> Midland two zero Scorpion?
h.	DJ34	C	Just confirm that stand number <u>again</u>?
h.1	DJ37	C	Bravo eight <u>say again</u>?

In summary, requests, using the approved phraseology ("say again") or by other expressions incorporating the word "Request," two-thirds of the structures were used by pilots for obtaining clarification. Yet, they represent only just over half (53%) of all the questions in the data set for Requests (see above, Table 6.18).

Confirmation/Verification

As with "Request," the use of either "Confirm" or "Verify" has specific meaning in aviation phraseology (see Appendix A, Glossary). Only "Confirm" was used in Syntactic-Interrogative forms, but both words did appear in Intonation-Question structures. In several messages, "confirm" was used at the end of the controller's message more as a question tag representing the controller's request for the pilot's confirmation of a specific piece of information (see Figure 6.20).

Figure 6.20. "Confirm" as a Tag.

a. DK25	C	Have you found [runway] three nine, <u>confirm</u>?"
b. DB25	C	Niner one seven Golf, as published, <u>confirm</u>?
c. TM06	C	Squawk ident…you're squawking thirty two eleven, <u>confirm</u>?

The verb "Verify" was included in the data analysis since "Verify" is specified in the international phraseology for confirming information (Appendix A: Glossary). As shown in Table 6.19, there were no examples of "Verify" in Syntactic-Interrogative structures.

Of the seven occurrences in Intonation-Question structures, five were found in controller data (7%) of total uses, while pilots used "Verify" in only two questions as shown in Figure 6.21.

Figure 6.21. Intonation-Question: Explicit Use of "Verify."

TL05	P	We want to <u>verify</u> the altitude with eight thousand?
DB07	C	<u>Verify</u> you'll be four thousand feet?

An additional subclass was assigned to Syntactic-Interrogatives and in Intonation-Questions for utterances that did not specifically use the words, "Request" or "Confirm" in the utterance. Only two pilots used this form, adding only slightly to the overall frequency of confirmations and verifications, shown in Figure 6.22.

Figure 6.22. Confirmation/Verification Expressed in Plain Language.

TD03	C	But you're saying your release time is one nine five nine, is that correct?

Again, this is a small total number of items compared to the number of question forms found in the data set even though aviation phraseology approves of the specific vocabulary items for routine communications. These items do not appear in any uses in Intonation-Question messages.

Repairs

During the communication transactions, both pilots and controllers occasionally self-corrected, or "repaired" themselves during a speaking turn. Both the controllers (n=65%) and the pilots (n=59%) made repairs slightly more frequently in Syntactic-Interrogative forms than in the Intonation-Questions, as shown in Table 6.19. Overall, the pilots repaired their communications slightly more than 60% of the time, with the controllers making slightly fewer than 40% of the repairs.

Table 6.19
Repairs by Speaker Role

Repair type	Pilots		ATCs		Total Use	
	Count	Percent	Count	Percent	Count	Percent
Repairs, Syntactic-Interrogative	10	59%	11	65%	21	62%
Repairs, Intonation-Question	7	41%	6	35%	13	38%
Total	17	100%	17	100%	34	100%

In the data, repairs typically consisted of short repeat or revising of one or two words spoken within the same message, as shown in Figure 6.23.

Figure 6.23. Repairs.

Syntactic-Interrogative

a. TM24 P Is that uhh...is that instruction approved?

b. TM14 C Do you want uh did you want us uh to cancel that?

Intonation-Question

c. TM01 C That's…you got them (the wheels) up all right?

d. TA04 C Jet seven three…sorry Jet seven eight nine three?

However, there were also examples of individuals making repairs that occurred which addressed preceding words within the same utterance (Figure 6.24).

Figure 6.24. Repairs Embedded within Clauses.

a. DH38 C Can you get your ground crew to keep you pushing back…push back around back to your right hand side and to the tower area so you can taxi out on…to the Apron to taxiway three.

b. TC13 C Do you want to…to work between then ten uh between ten and fourteen thousand?

Figure 6.24.a. shows the controller modifying his speech to rephrase "pushing back" to more closely match the succinct approved phraseology, "push back." The lengthy explanation also indicates that the phraseology needs to be supplemented in order for the controller to clearly express what he wants the pilot to do. Figure 6.24.b. shows that the controller clearly knows the altitude, but he seems to have made a minor slip of the tongue when he said, "then" rather than the number "ten." Both of these examples also illustrate situations where the controllers self-corrected their speech rather than interrupt their message with the appropriate phraseology, "correction," and then restate the correct information (International Civil Aviation Organization, 2001b).

Acknowledgments

A subclass was designed for the identification of "acknowledgements," lexical forms of recognizing another speaker who requested attention, spoken by either a Pilot or a Controller (Table 6.20).

Table 6.20
Acknowledgments

Acknowledgements	Pilots		ATCs		Total Use	
	Count	Percent	Count	Percent	Count	Percent
Syntactic-Interrogative	0	0%	0	0%	0	0%
Intonation-Question	8	100%	14	100%	22	100%
Total	8	100%	14	100%	22	100%

These structures were recognizable only through the speaker's intonation and the placement of the utterance at the initial position of communication. The acknowledgements were sometimes a greeting (Figure 6.25) or used in the same manner as a telephone response, "Hello?" spoken by the recipient of the call. Only those acknowledgements spoken with a rising tone were included in the data. While these are not formal Syntactic-Interrogative structures, these items serve as a form of request for attention and inviting further communication. These items were identified as Intonation-Question forms since there was no other evidence of interrogative syntax or lexical clues included in the utterance.

Figure 6.25. Acknowledgments.

TA04	P	uhh Flagship uh twenty eight thirty six Toronto**?**
TD01	C	Good afternoon?

Politeness Features: Modals

Modal forms were investigated because they offer speakers an opportunity to modify the directness of a statement or question. Aviation phraseology, with the emphasis on direct commands and instructions, does not provide any modal verb forms for speakers. However, in the recordings made for this study, modal forms were clearly used by both groups of speakers, although the use of “May/Might” was limited to only a total of six occurrences in the corpus. This distribution follows the overall distribution in the transcripts showing twice as many Controller questions compared to questions uttered by Pilots. Although a category was assigned for “modal + negative” for each of the verb forms shown in Table 6.21, there were no examples found in the data.

Table 6.21
Modal Use for All Speakers (Syntactic-Interrogative + Intonation-Question)

All Modals	Pilots		ATCs		Total Use	
	Count	Percent	Count	Percent	Count	Percent
Can/could	17	49%	44	64%	61	59%
Will/would	14	40%	23	33%	37	36%
May/might	4	11%	2	3%	6	6%
Total	35	100%	69	100%	104	100%

When looking more closely at the various forms of modals occurring in the data, the three verbs were not used in the same proportion by the speakers, especially when looking at differences between Syntactic-Interrogative and Intonation-Question uses.

“Can/Could” was used in Syntactic-Interrogative forms far more often than in Intonation-Question forms (56-5), and never as a negative.

Table 6.22
Modals: ‘Can/Could’

Modals	Pilots		ATCs		Total Use	
	Count	Percent	Count	Percent	Count	Percent
Can/could Syntactic-Interrogatives	17	100%	39	89%	56	92%
Can/could Intonation-Questions	0	0%	5	11%	5	8%
Total	17	100%	44	100%	61	100%

In the Intonation-Question examples, the speakers are asking permission or mitigating the request. In Figure 6.26 a., the pilot is asking permission for a change in his flight direction, while in Figure 6.26 b.-c., the controller is making his request somewhat more polite than if he had used standard phraseology, “confirm…frequency,” or “confirm QNA.” In Figure 6.26.d., the controller is offering the pilot an option (to have a less restricted “free” speed at this point in the flight. In Figure 6.26.e., the controller is mitigating his request for the squawk information not only with the modal, but the modal in combination with “if” (see also previous section on “IF-clauses”).

Figure 6.26. Politeness Modals: Can/Could.

Syntactic-Interrogative

a. TB35 P Could we head two eight zero [degrees]?

b. TB31 C Could you confirm you have the uhh frequency when airborne?

c. DA03 C Can I just confirm your QNA number with your heading clearance?

Intonation-Question

d. DJ53 C We can give you free speed? (free speed = speed at pilot's discretion)

e. DG01 C If you could squawk ident please?

The forms Will/Would appeared less frequently in the Pilot messages, although some Pilots did use this construction in Intonation-Questions (9 times, Table 6.24). As with Can/Could, this form did not appear with any negative constructions.

Table 6.23
Modals: 'WILL/WOULD'

Modals	Pilots		ATCs		Total Use	
	Count	Percent	Count	Percent	Count	Percent
Will-Would Syntactic-Interrogatives	5	36%	19	83%	24	65%
Will-Would Intonation-Questions	9	64%	4	17%	13	35%
Total	14	100%	23	100%	37	100%

In all the messages shown in Figure 6.27, Will/Would are used to mitigate requests. In Figures 6.27.a.-d., the speaker is creating a yes/no option for the response, but avoiding making a direct instruction or inquiry.

Figure 6.27. Politeness Modals: Will/Would.

Syntactic-Interrogative

a. DE44 C You can actually go over up in Next City, will that do it?

b. DE27 C Would that be you?

c. TE05 P Would you just repeat that?

d. TG13 C Would you give me a call about two minutes prior to the push[back]…?

In Figure 6.27.e., the speaker is making a declarative request by specifying his intentions ("come right") and the reason for the request ("for uhh weather").

Figure 6.27. Politeness Modal: Intonation-Question

e. DA06 P We'd like to come right two seven zero for uhh weather?

Figure 6.27.f shows the speaker requesting an action, but mitigating it with the polite phrase, "if you would…"

Figure 6.27. Politeness Modal: Intonation-Question.

f. TC06 C Scorpion Air, if you would…come up on my other ILS frequency please?

One example suggests the Pilot is adapting the imperative-syntax formula for presenting his request, while also mitigating the formal request through use of "would + like" shown in Figure 6.28.

Figure 6.28. Abbreviated Intonation-Question Request.

DE15 P Would like approval for a flight plan straight through City Center?

May/Might appeared only six times in the data, four times in a question by pilots, and twice in a non-interrogative form used by controllers.

Table 6.24
Modals: "MAY/MIGHT"

Modals	Pilots		ATCs		Total Use	
	Count	Percent	Count	Percent	Count	Percent
May/Might Syntactic-Interrogatives	4	100%	0	0%	4	67%
May/Might Intonation-Questions	0	0%	2	100%	2	33%
Total	4	100%	2	100%	6	100%

The small number of occurrences overall (n=6) suggest that this form is not commonly used in aviation communication (see Figure 6.29).

Figure 6.29. Politeness Modals: "May/Might."

Syntactic-Interrogative
a. DK05 P May we maintain that speed?

b. TE09 P May we turn about ten to fifteen degrees right?

Intonation-Question
c.. TK01 C I may have already given you that?

As with the inverted auxiliary operator forms described earlier, there many examples that show pilots and controllers use modal auxiliaries to establish conditions that frame a more polite request. With just over 104 uses of modals, these constructions represent 37% of the use of all auxiliary verb operators in both interrogative and non-interrogative constructions (n=281) used in questioning functions.

Politeness Features

In addition to documenting the specific syntactic forms used to construct questions and the use of rising intonation to indicate an utterance doing questioning, another research objective was to survey the data for use of specific discourse features suggesting that the pilots and controllers were using other forms of politeness than modal constructions. Because the aviation phraseology is based on imperative constructions, it does not normally support features such as “please” and “thank you” or other lexical phrases that would be associated with politeness in speaking.

“Please”

While politeness features were found in both Syntactic-Interrogatives and Intonation-Questions, the speakers employed politeness forms more often in Syntactic-Interrogative constructions. Table 6.25 shows the distribution across the four main categories, Syntactic-Interrogative “please” and “other,” and Intonation-Question “please” and “other.” A total of 37 items contained ‘please’, with the Intonation-Question forms containing 23 uses while the Syntactic-Interrogative forms had only 14 uses (examples shown in Figure 6.30).

The use of politeness words or phrases by the Pilots in Syntactic-Interrogatives is close to the number of phrases in Intonation-Questions (11-8). Pilots used ‘please’ in only two Syntactic-Interrogative forms, but used the lexical item eight more times in Intonation-Question forms (Table 6.26). In contrast, the controllers used “Please” or other forms in Syntactic-Interrogatives more than twice as often as the forms were used in Intonation-Questions.

Table 6.25
Politeness Features

Politeness features	Pilots		ATCs		Total Use	
	Count	Percent	Count	Percent	Count	Percent
Syntactic-Interrogatives						
'Please '	2	5%	12	14%	14	12%
Other Markers (not 'Please')	9	24%	20	24%	29	24%
Courtesy: 'just' / 'want'	10	26%	23	28%	33	27%
Subtotal	*21*	*58%*	*55*	*68%*	*76*	*63%*
Intonation-Questions						
'Please'	8	21%	15	18%	23	19%
Other Markers (not 'Please')	0	0%	0	0%	0	0%
Courtesy: 'just' / 'want'	9	24%	13	16%	22	18%
Subtotal	*17*	*45%*	*28*	*34%*	*45*	*37%*
Total	38	100%	83	100%	121	100%

The controllers employed "please" almost equally between the Syntactic-Interrogative and Intonation-Question forms, but used "Other Markers" only in Syntactic-Interrogative forms.

Figure 6.30. Politeness: Explicit "Please."

Syntactic-Interrogative

a. DH02 C What's your speed again, <u>please</u>?

b. TG07 C You're on a zero eight zero heading, are you?
P That's affirmative
C OK. Could you make it zero niner zero, <u>please</u>?

Figure 6.31. Politeness: Intonation-Questions

c. DB01 P We're looking for direct [to] Main City, **<u>please</u>**?

d. TC01 P Give me a good rate through six [thousand feet] **<u>please</u>**?

e. TM13 C **<u>Please</u>** repeat the squawk?

In Figure 6.30.a., the controller uses an interrogative form, "what," to convey his request to have the pilot's speed repeated, then the controller adds "please" at the end of the message. In Figure 6.30.b., the controller combines use of a modal with "please" to reinforce the controller's request to have the pilot slightly alter the flight path from 080 degrees to 090 degrees.

In Intonation-Question forms, there were several ways in which "please" was incorporated into a request. In Figures 6.30.c. and d., each pilot used declarative and imperative syntax for his request, and then ended his message with rising intonation on "please" to convey the questioning function. In Figure 6.30.e, the controller prefaced his request with "please" to modify the standard phraseology, "repeat the squawk."

The higher number of uses of all forms of "Please" and other forms by the controllers may also be tied to the larger number of controller questions throughout the data.

Other Politeness Features

Other politeness features were also used generally more often by controllers than by pilots, but only in Syntactic-Interrogative forms since there were none in Intonation-Question forms. The most significant difference in the use of politeness features showed when politeness was identified by use of modal constructions. Controllers used this structure three times more frequently than did the pilots.

When combining the categories ("do you mind," with modals, and miscellaneous vocabulary), the controllers used these "other markers" twice as often as did the pilots. It should be noted that the modal verbs counted in this subdivision were also counted in the modal verb category described in a previous section. The two categories provide separate views of the language used in aviation discourse, the verb use (in the earlier section) describes modal use in creating questions, while the modal verbs in this section are examined for constructions that provide a less direct way of stating a question function.

Additional politeness forms that did not employ 'please' (with or without modal verb forms) ranged from single lexical items, such as "sir." The examples shown in Figure 6.33 indicate the diversity of the politeness features found in the corpus.

Figure 6.33. Other Politeness Features.

Syntactic-Interrogative

TG10	C	OK, and who'd you file [a flight plan] with, sir?
TL01	C	Would you prefer to follow the shore to Main City?

Intonation-Question

DD18	P	We'd like to get just a little lower?
TH01	P	Any chance for direct to City for Lima Charlie?
TQ16	C	yes, sir **?**

Rather than use the formal phraseology of "are you able," one controller used conversational English to let the pilot know that the plane needed to move to a higher altitude (see previous section on Auxiliary Verbs). While this is expressed as a polite request, the pilot's response is also couched in polite terms but indicating that he is ready to comply with the controller's message (Figure 6.34).

Figure 6.34. Politeness: Non-Standard Phraseology: "Can."

TG24	C	<u>Can I get you up</u> to seven thousand [feet] Alpha Bravo?
	P	Yeah, sure, <u>we can go</u> up to seven, Alpha Bravo.

In another example, the controller has provided all the required information for landing to the pilot (Figure 6.35). There is construction equipment at the end of the runway, temporarily causing the runway to be several hundred feet shorter than published in aviation charts. The controller needs to confirm that the pilot is aware of the situation. Rather than reading out the information (a standard procedure), the controller inquires whether the commercial pilot, who is probably familiar with the airport and probably current changes in runway length (information published on a daily basis), is aware of the problem for this particular landing procedure. Through use of the statement, "you're familiar with," the controller introduces the change, but allows the pilot to acknowledge that he is aware of the altered length of the runway.

Figure 6.35. Politeness: Non-Standard Phrasing.

TG18	C	…surface wind two eight zero fifteen gusting to twenty And you're familiar with the displaced threshold?
	P	Yeah, we'll find it, Scorpion Air eighty three forty eight.

In another location, a controller abbreviates the communication with a pilot in order to confirm whether the pilot needs the entire runway for the landing (Figure 6.36).

Figure 6.36. Politeness: Anticipation of Response.

DE35	C	<u>Presume</u> that to land you need the full length today?
	P	Roger

Controllers generally work to move the pilots through their flight route as efficiently as possible. In the following example, the controller offers the pilot the option to make a personal decision as to how far to deviate from the standard flight path (see Figure 6.37). Because this deviation causes no other problems in the controller's sector, he approves the change.

Figure 6.37. Non-Standard Phraseology: Informal Language.

TF05	C	Bravo Echo Papa, turn left heading zero eight zero Climb to flight level two three zero
	P	Ok, uhh, two three zero We'd like to go straight ahead
	C	OK, how far do you need to go?
	P	Uh, I'd say five to ten miles would do it.
	C	OK, that's fine

This example demonstrates evidence of cooperation by professionals trained in aviation phraseology who choose to use more general English to accomplish their task (Wyss-Bühlmann, 2004).

An example of the professional courtesy used between the controllers and pilots is also suggested by the following examples. In each of the situations, the controller was cut off from responding to a pilot due to the interference of the microphone key being pressed by someone else (Figure 6.38.b.). As a result, the controller does not hear the call sign of the pilot trying to reach the controller.

Figure 6.38. Courtesy Comments.

a. TA15	C	And who was the other call, please?
b. TJ11	C	…// thank you. I missed the other call?
c. TP13	C	And somebody else got covered*? (Note: *See Glossary, Appendix A)

The controller's use of rising intonation also alerts other pilots in the area that the controller could not reply to whoever had just called. The controller's language is courteous, although it does not use any standard phraseology. The controller's language invites the pilot who was cut off to identify again, but the controller's choice of words also alerts the other pilots to temporarily avoid initiating a message until the pilot makes a reply.

Courtesy Markers

In the corpus, frequent use of both "want" and "just were identified. In order to separate the two lexical items from politeness markers, they were both assigned to a separate category as "Courtesy" markers.

"Want"/"Want + to"

The verb "want" was identified by Linde (1988) as a specific marker for politeness in aviation (see Chapter IV, Aviation Discourse). In various combinations, the verb "want" occurred in 33 messages in the corpus. The use of "want" is included in the Courtesy classification, shown separately in Table 6.27 for description.

Table 6.26
Courtesy: "WANT" + "WANT TO"

Politeness: WANT	Pilots		ATCs		Total Use	
	Count	Percent	Count	Percent	Count	Percent
Syntactic-Interrogatives						
Do/Did you want…	8	67%	20	91%	28	85%
Want, other forms	0	0%	1	5%	1	3%
Intonation-Questions						
Do/Did you want…	0	0%	0	0%	0	0
Want, other forms	4	33%	1	5%	5	4
Total	12	100%	22	100%	33	12

In the imperative-based phraseology of aviation, offering choices are not in the approved terminology lists. However, the research data shows both speaker groups used the verb "want" to clarify information or to offer choices.

The most frequent use of "want" occurred in the construction "do you want…?" as a Syntactic-Interrogative structure that was used by the controllers almost exclusively. Pilots only used this construction 12 times in both Syntactic-Interrogative and Intonation-Question forms. The dominance by the controllers is not completely unexpected since it is the controllers who more frequently are in a position to offer a choice. However, as shown in the previous examples, "want" also occurred as a resource used by pilots to check their understanding of information in the previous message.

As shown in Table 6.26, the pilots used "want" as frequently as all other Syntactic-Interrogative politeness features combined (8/8 items) used by pilots. The controllers' use of "want" was just under 50% of the use of all Syntactic-Interrogative politeness features spoken by controllers. In addition, the controllers used "want" in only one item that did not use the form, “Do/Did you want,” shown in Figure 6.39. The uses of “want” occurred to either mitigate requests or to intensify choices offered to the listener. In all cases, the controllers used this form and extended their question by using two full Syntactic-Interrogative clauses to present the options to the pilots, as shown in Figure 6.39.

Figure 6.39. “Want” to Offer Choices.

Syntactic-Interrogative

a. TI35	C	Did you <u>want</u> to go direct to that point *or* do you mind a vector around it to the west a little bit?
b. TO04	C	Scorpion eight zero four, umm... do you <u>want</u> to go [now] *or* do you <u>want</u> to wait?
	P	…uh…[two second pause] Uhh eight zero four, sure we are full ok to go [sic]

In a longer message, the following example shows the controller offering the pilot two choices although the first choice is briefly aborted when the controller stops to repair his initial choice of tense for the verb, “do” (shown in Figure 6.40).

Figure 6.40. “Want:” Multiple Uses by Speaker

TM14	C	Do you <u>want</u> uhh *or* did you <u>want</u> us uhh to cancel that *or* were you going to call on the ground at Next City…?

In the following example (see Figure 6.41), the Pilot is clarifying what he thinks the Controller intended in the preceding turn.

Figure 6.41 a. Syntactic-Interrogative: “Want” Clarification.

a. DI03	P	Do you want us to go to (the radio frequency for the) Tower now?
	C	Just uhh be uhh there…we’ll be handing you over very shortly

Figure 6.41.a. is an example of a question framed by the pilot asking for instructions rather than stating explicitly that the pilot is still waiting for further instructions from the controller or that the pilot is admitting he didn’t understand the controller’s previous instruction.

Figure 6.41.b. Syntactic-Interrogative: Use of “Want” for Clarification.

b. TI01	P	Do you still want us on a two forty [degrees] heading?

In Figure 6.41.b., the pilot uses “still want” to clarify whether he should remain on the current heading. His uncertainty or confusion is mitigated by use of the direct question.

Figure 6.41.c. Syntactic-Interrogative: Use of “Want” for Clarification.

c. TH04	C	OK, you can actually… You can [go] direct to Next City course Do you want to do that?

In Figure 6.41.c., the controller is offering the pilot a new possible route. Through use of “want” the controller is offering a choice to the pilot, but also asking the pilot to explicitly clarify (“that”) the pilot’s intentions at this time.

Rather than use standard phraseology, such as “say again,” “confirm,” or “verify” to ask for repetition, some of the speakers used “want” in a full Syntactic-Interrogative structure to confirm current information or possibly to confirm implied information (see Figure 6.42).

Figure 6.42. Syntactic-Interrogative: Use of "Want" for Confirmation.

Syntactic-Interrogative

a. TI05	P	Roger to one five thousand (altitude) And do you <u>want</u> us to remain on the heading?
b. TC13	C	Do you <u>want</u> to … to work between then ten uh between ten and fourteen thousand?

The use of "want" also occurred in Intonation-Question forms generally to seek clarification or confirmation of a specific instruction.

Figure 6.43. Intonation-Question: Use of "Want" for Clarification/Confirmation.

a. DJ04	P	You <u>want</u>ed us facing east?
b. TL05	P	We <u>want</u> to verify the altitude with [sic] eight thousand?

The use of "want" for either clarification/confirmation shows that speakers are seeking more precise information, but using non-standard phraseology to make their requests. In addition, the use of "want" to indicate choices indicates that controllers make offers to pilots rather than rely on standard phraseology through use of "say again" or use "confirm" or "verify" when communicating with the pilots.

"Just"

Another form of politeness that occurred in the data was found when speakers sought to mitigate their request through use of the lexical item, "just" used to specify particular information as shown in Table 6.27.

The data showed a total of 21 uses of "just" with both controllers and pilots using "just" as a mitigating device but more often to specify information provided in a previous message. Although both controllers and pilots used "just" to mitigate a request, less than 20% of all uses occurred in this form. More than 80% of the messages used "just" to specify one item of factual information mentioned in the previous turn(s). Of the 21 items with "just," the verb accompanying the adverb was "confirm" in 11 of the messages.

Table 6.27
Courtesy: "JUST"

Politeness "Just"	Pilots		ATCs		Total Use	
	Count	Percent	Count	Percent	Count	Percent
Syntactic-Interrogatives						
Mitigation of Request	2	29%	2	14%	4	19%
Specifying Information	0	0%	0	0%	0	0%
Intonation-Questions						
Mitigation of Request	0	0%	0	0%	0	0%
Specifying Information	5	71%	12	86%	17	81%
Total	7	100%	14	100%	21	100%

Mitigating a request included several examples of an open-ended comment without specifying a particular piece of information to be provided (Figure 6.44).

Figure 6.44. "Just:" Mitigation of Request.

a. TE05 P (Would you) just repeat that?

DD18 P Could you just confirm there's no air activity?

b. DE07 C (Would you) just confirm this information?

In Figure 6.44.b., this is a broad request ("just confirm") for information rather than identifying a specific data item. The pilot responded by repeating the list of weather and flight factors that had been provided by the controller in the controller's previous turn. The interaction was completed when the controller acknowledged the pilot's correct reply.

In other examples, “just” was used to politely specify that only a certain piece of information that was needed by the speaker to continue the current task (see Figure 6.45).

Figure 6.45. “Just:” Requesting Specific Information.

a. TI03 P Scorpion Air four zero seven seven
Just confirm that heading was zero nine at eight thousand?

b. DG02 C Just report the heading, please?

c. DG04 C Runway’s one zero
and just give me your heading please?

d. TM15 C Just confirm when you’re at ten thousand?

e. TM15 C Just inform me the..the route you have currently
at the moment?

Typically the speaker used an imperative form of the verb, but in one example each by a controller and a pilot, use of a progressive form was employed.

Figure 6.46. “Just” + Progressive Verb Form

a. DA19 P uhh…just confirming…it’s Alitalia we’re waiting for?

b. DJ46 C Just confirming your request for being in flight position
for runway six?

In one extended exchange, the controller issued instructions which were then read back by the pilot (Figure 6.47, below). However, the pilot responded in rather informal language, so the controller overtly targeted the information he wanted to know by specifying the phrase he expected to hear from the pilot, “hold short of [the] runway,” which suggests other possibilities than the response, “go to,” as spoken by the Pilot. In the Figure 6.47, “hold short” is identified in italics but does not represent any specific emphasis or stress used by either speaker.

Figure 6.47. "Just:" Highlighting a Correction.

TC24	C	Scorpion Air four six six when you exit right *hold short* of two four right and remain on my frequency please
	P	*Go to* two four right and stay with you Scorpion Air four six six
	C	uh…all right...just confirm *hold short* of runway two four?
	P	*Holding short* turning right Scorpion Air four six six

"Holding short" (standard phraseology) *requires* that the pilot stop the plane and wait for further instructions at the entrance to a runway, whereas "go to" (non-standard phraseology) only *implies* that the pilot will stop once he arrives at the entrance to the runway. In addition, the controller phrased his request using rising intonation as if reminding the Pilot to use the exact phraseology to confirm the controller's request. The pilot repeated the standard phrase which states what he intends to do when he gets to the entrance to the runway, giving it priority (first position in the message) over his other response, "turning right," which is the maneuver he is doing at the moment.

The use of "just" to target specific information is not part of the approved phraseology; however, the examples found in the data suggest that the lexical item has been successfully used as a resource to more precisely request information.

Compound and Complex questions

There were over 30 instances where the pilots and controllers framed their inquiries in an extended clausal form on the same topic, identified in the classification system as "compound and complex questions" (see Table 6.28). These items were classified into three subcategories, "compound," "complex," and "compound-complex" questions.

Table 6.28
Compound and Complex Questions

Compound/Complex Forms	Pilots		ATCs		Total Use	
	Count	Percent	Count	Percent	Count	Percent
Syntactic-Interrogatives						
Compound QUs	0	0%	7	28%	7	23%
Complex QUs	2	40%	12	43%	14	47%
Compound/Complex QUs	1	20%	4	14%	5	17%
Subtotal	*3*	*60%*	*23*	*92%*	*26*	*87%*
Intonation-Questions						
Compound QUs	2	40%	2	8%	4	13%
Complex QUs	0	0%	0	0%	0	0%
Compound/Complex QUs	0	0%	0	0%	0	0%
Total	5	17%	25	83%	30	100%

The first subclass represented "compound questions:" two verbs with a single subject or two noun phrases with a single predicate. A total of 7 of these structures were identified, 7 by pilots and none by controllers. The double verbs or nouns were joined with a conjunction, most frequently with "and" or "or" (see Figure 6.48).

Figure 6.48. Compound Question Forms.

Syntactic-Interrogative
a. TN01 C What do you prefer 23 or 24 Right?

Intonation-Question
b. DD14 P We'd like to work south of City Center uhh….towards this area *and* check in before returning to the east?

In Figure 6.48.b., there is no subject for the second clause beginning with "check in" leaving a single subject for this extended utterance.

The second subclass included "complex questions:" structures with two full clauses joined by a conjunction, again almost always using "or" (Figure 6.49). Although these structures appeared twice as often as the "compound questions" (n=14), the "complex questions" were used much more frequently by controllers than by the Pilots (12/2). Controllers, used the "complex" structures nearly twice as often than they used the "compound" structures (12/7).

Figure 6.49. Complex Question Forms.

a. TC05A C	Are you above the runway 24 approach
	or
TC05B	Would you like vectors cleared into NDB 6 circle for 24?
b. TO04A C	Scorpion eight zero four, umm
	Do you want to go [now]
	or
TO04B	Do you want to wait?

Several of these complex questions appeared in the same recording of Toronto data, suggesting that the extended question clauses might be the personal speaking style of an individual controller. However, these forms were used by both pilots and controller as well as at both locations which indicates that the forms may be more representative of spoken English rather than a particular regional style.

A third small group of complex question forms were used only in Syntactic-Interrogative structures by both speakers, representing only 17% of all these constructions (see Figure 6.50). These structures were a combination of compound and complex forms which also represented an extended questioning turn by the speaker. These structures were used more frequently by the Controllers, possibly as a means to more efficiently phrase a request for information.

Figure 6.50. Complex-Compound Forms.

TK19.	C	And would you like higher than five thousand? [*no* conjunction] Would you like six thousand?

These compound and complex interrogatives are also included in the count of question forms identified in other categories. However, because of the extended nature of the clause structure as well as the clear use of question structure and intonation, these items were separated into a classification in order to analyze their frequency and form. All three of these messages indicate that pilots and controllers do use questions, in diverse forms and in various lengths to acquire the necessary information during communicative sequences.

CHAPTER VII

DISCUSSION

The previous chapters have reported the results of analysis of the more than 24 hours of international aviation communication. The analysis showed that pilots and controllers do use a variety of syntactic, lexical and prosodic forms to convey questioning functions. In the following paragraphs, the results will be summarized in terms of the research questions.

Summary of Research Questions

1. Do questions occur frequently enough to be important as a discourse resource used by pilots or controllers?

There are definitely questions in air traffic control: the data yielded 677 questions used in more than 24 hours. The corpus indicates that both interrogative and non-interrogative forms provide an important discourse resource for both pilots and controllers.

Throughout the corpus, more than 27 questions per hour were used by the aviation professionals. This frequency, in spite of aviation regulations, indicates that the native-speaker pilots and controllers rely on questions in addition to formal phraseology. The claim that there are no questions in air traffic control may be due to the fact that there are no questions in the official phraseology handbooks.

2. Do questions occur more often in pilot or controller messages?

With 677 questions in the data, questions occurred at a rate of nearly 28 questions per hour.

The pilots used a total of 219 questions, or 9 questions per hour, while the controllers used 458 questions, or 18 questions per hour. The pilots may depend more on questions to facilitate their flight tasks, while the controllers use questions to more precisely direct pilots and planes at busy airports and while enroute.

3. Do pilots and controllers use questions more often to seek information, to clarify and/or repair information, or to confirm misunderstood or incomplete messages?

Overall, the pilots and controllers used the Information Seeking function for just over 60% of their messages functioning as questions. Information Checking was used in only 22% of the questions, while the information clarifying function was used least of all, for only 17% of all questioning. When analyzed by form, the three functions occurred nearly twice as often in Syntactic-Interrogative forms as in Intonation-Question forms (61-39%).

The pilots used more Information Clarifying questions slightly more than Information Checking (20-19%), but still depended heavily on the Information Seeking category (61%). The controllers used the three functions in nearly the same proportion as the overall rate: Information Seeking, 62%; Information Checking, 23%; Information Clarifying, 15%. The controllers used more checking on already provided information and seeking new information functions.

4. How frequently do controllers or pilots use syntactic or lexical forms of interrogatives when asking questions?

The results showed that both speakers depended on Syntactic-Interrogative forms most often to express questions (64%). The most often used Syntactic-Interrogative form was use of WH-word questions, followed by inverted subject-verb and tag-question forms. Wyss-Bühlmann suggests that questions may be a focus on content, separate from function (formal phraseology). Mell also suggests that questions may serve social functions between speakers within the same speech community.

In addition to simple interrogative clauses, use of extended clauses showed that speakers did not adhere to the professional requirement for conciseness. The most specific example is the number of compound and complex questions, used by both speaker roles, which used longer clauses to express the speaker's intent. Nevile suggests that interactions have been adapted to meet demands of the tasks.

Pilots used more only slightly more Syntactic-Interrogative forms than Intonation-Question forms (57-43%). Pilots employed inverted more subject-verb syntax and modals than they did WH-words, but only by a small margin. The controllers employed Syntactic-Interrogatives in over two-thirds of their messages compared to the Intonation-Question forms (67-33%).

The controllers expressed interrogative forms most often using WH-words for almost one-third of their messages, while inverted subject-verbs and tags as well as modals occurred in only 20% of the items. Controllers' higher rate of Syntactic-Interrogative forms may be due to the Controllers' need to obtain specific information from the pilots.

The high rate of Repairs in Syntactic-Interrogatives may be due to the novelty of the question since it does not come from standard phraseology

5. To what extent do controllers and pilots use intonation as a cue in imperative or declarative syntax in order to convey questioning functions?

The speakers used Intonation-Question forms just less than half as often as they used the Syntactic-Interrogatives. Intonation-Question forms occurred most often when the speakers used requesting forms that included “request,” “confirm,” and “verify” as the principle verb in the declarative or imperative clause with rising intonation (43%). The use of the requesting verbs was the most common feature in pilot messages, followed by auxiliary verb and tag forms. Like the pilots, controllers depended heavily on the requesting verbs, followed by the auxiliary verbs and tag forms in Intonation-Question forms.

The use of prosodic features in many of these Intonation-Question forms may be a result of the speaker attempting to make the message clearer to the listener, using more typical communicative strategies (Wyss-Bühlmann).or follow variations as in more general discourse.

6. Do controllers or pilots incorporate any politeness features of indicating indirect or politeness forms?

In both groups, use of a variety of politeness features (lexical and syntactic forms) occurred in 17% of all messages. More politeness markers were found in Syntactic-Interrogative forms, including use of modal verbs and other lexical items. In addition, the uses of “just” and “want” were found as key lexical items used to modify or mitigate interrogative syntax.

The corpus indicates that there are questions used in regular aviation communications to resolve gaps in information due miscommunication or misunderstanding, but more importantly, questions are used to find or clarify information. In addition, few requests were made for speakers to repeat information using standard phraseology. The total number of questions found in the data suggests that both pilots and controllers depend on questions as a resource when carrying out their daily tasks.

CHAPTER VIII

LIMITATIONS, IMPLICATIONS and CONCLUSION

Limitations

In any research project, there are limitations to the scope and depth of the study. There are several limitations inherent in this study. The first limitation concerns access to live aviation data. While the 24 hours of recording used in this study are international in scope, the results provide only a glimpse into the daily communication activity at each airport. In addition, the extended length of many of the transmissions involving questioning functions may disproportionally attract the radio scanner's attention (see discussion of scanner operations in Chapter V), causing the scanner to more easily detect other ongoing transmissions when the original frequency becomes momentarily silent. Thus, the number of questions found in the Results may not accurately represent the total amount of questions at either airport during the recording times. However, the high frequency of many of the target forms for each of the questioning functions provides evidence of patterns of discourse at each location.

A second limitation comes from the operation of a radio scanner at a specific airport location. Although the scanners picked up transmissions at the two airports named in the study, there is no way for the listener to deliberately select the frequency of the controllers or flights. As the scanner roams a specific band-width for an active frequency and eliminates transmissions occurring on other frequencies, a signal may be picked up from Approach/Departure, Ground/Taxi, Pre-departure Clearance, or other controller functional positions depending on the signal being broadcast. The listener-researcher has only access to the active signal.

Transmission quality is another potential limitation for this study. The scanners used to transmit the air-to-ground communications may experience signal interference caused by weather conditions, other signals being transmitted from sources near the scanner or airport, or by poor quality radio transmission from either the control tower or the airplane cockpit. Any and all of these problems occurred at some point in all the recordings used in this study. As a result, some potentially useful data were unrecoverable.

However, according to a working air traffic controller, poor quality transmissions go with the nature of the job and are not uncommon problems for the controllers or pilots (A. Garcia, personal communication). Radio volume, static, or other problems are an integral part of the challenge of aviation communication. The varying quality of the transmissions is, in itself, one of the reasons pilots and controllers recorded in this study may have used questioning functions to clarify or confirm information already provided in the longer message context.

Transmission quality also occasionally prevented accurate identification of a speaker role for either the pilot or the controller during some interactions. In some situations, the message picked up on the scanner was not complete enough to determine if the controller was issuing new instructions or requesting information from the same pilot as in the an immediately preceding message(s). Although aviation communication regulations require a call sign from the pilot, controllers are not required to make any further self-identification beyond an initial acknowledgement to the pilot's first transmission or when the controller initiates a transmission. If the text of the recorded message clearly signals the speaker role, it was counted in the data; however, if the message was ambiguous as to role, it was not included in the count. Thus, the frequency count for some categories may have been affected by discarded messages.

In addition to the more technical limitations outlined above, the data reported in this study is limited to nearly all native speakers of English, (as determined by their lack of accent). In Toronto, pilots with non-native accents represented less than 10 messages (out of more than 660 turns). In Dublin, less than 20 pilots (out of more than 630 turns) had noticeable accents suggesting they were non-native speakers of English. In Dublin, two controllers had noticeable Irish accents, but represented less than 25 turns in the data. As a result, the data contains only a limited sample of non-native speakers in the two locations.

A final limitation was the research design which precluded a complete count of all aviation discourse functions since this study only looked at forms using interrogative syntax or intonation to convey the speaker's questions during the recordings. As a result, information clarification and information checking functions may be equal to or significantly more common than information seeking in *non*-questioning discourse since the aviation phraseology is designed to use intonation-question interrogative structures and to minimize intonation cues in transmissions. More research into the comparative frequency with non-questioning forms is needed to accurately portray the daily use of questions in aviation communications.

Implications

The high count of questioning forms suggests several implications that can be drawn from this study. Below, the implications are organized into several broad topics: aviation and aviation-related training issues, professional discourse, general discourse, and World Englishes. The chapter concludes with English language training implications.

Aviation Discourse

Aviation phraseology when combined with Aviation English represents a working, viable language code. As the technology of both aircraft and communication improves, there is still the need for interpersonal communication during daily flights. Morrow, Rodvold & Lee (1994) noted that increasing “[the] stock of standard phrases for indicating and repairing problems would provide the flexibility that is now gained by switching into a ‘natural’ conversational mode, without sacrificing precision” (p. 254). This approach implies that formal phraseology needs additional formulaic language constructions of the same style as the control-command structures currently in place. Wyss-Bühlmann (2004) cites the need for more “natural language” to be added to routine or standard phraseology (p. 192). This method would focus more on the language that is actually used, similar to the language found in questions in this study. One implication drawn from the results of this study suggests that ICAO and national agencies (such as the FAA or the UK Civil Aviation Authority) consider the addition of some basic questioning items to international phraseology in order to provide approved direct questioning forms in aviation transmissions.

Similarity in general patterns of questioning at both locations also suggest that the variety of questioning functions are not specific to one location or a specific regional use of aviation English. As a result, the elements investigated in this study also need to be measured within several other aviation contexts. These include language-based environments, such as other native-speaking English locations (Australia, United States, etc.) as well as non-native English locations, or where English is a foreign language, such as in Africa, Asia, Europe, or Latin America. The findings should also be examined for patterns in more extreme situations, such as high-traffic travel periods on Friday afternoons or Monday mornings at various locations or during rapidly changing weather conditions. There may also be benefits to close examination of particular flights, based on distance (long and short flight distance) or terrain (crossing high mountains or over long, flat areas such as oceans or plains) which might alter the type of language used in these specific contexts. When combined, these studies would build a more complete picture of the discourse used in aviation communication.

Because the rules which prescribe the form and the application of the form are a critical component of aviation phraseology, the rules of the phraseology guide the development of constructions and the use of aviation language in a similar manner to the rules of formal grammar for a given language. Sinclair (1991) suggests "grammar is thus part of the management of text rather than the focus of the meaning-creation" (p. 8). Using this analogy, the form of phraseology, as the management of the text of the specific aviation task, may be subordinate to the need for a question to clarify the previous speaker's meaning. This implies that more research should be done examining the variations in phraseology for how a speaker selects a particular syntactic form (declarative, interrogative, etc.) at a given point in an interaction.

Aviation Training Issues

The findings discussed in the previous chapter can also be applied to the regular use of more general conversation skills that include both the variety of grammatical forms for interrogatives and the importance of intonation in aviation communication. This implies that all aviation personnel, but especially non-native speakers in aviation professions, would benefit from specific aviation language training that covers language skills that include the ability to create and answer questioning functions (not just interrogative syntax), to understand the function and use of modal constructions, and to develop proficiency in seeking information, clarification and confirmations (Mitsutomi & O'Brien, 2003; Robertson, 2004).

One of the significant findings discussed in Chapter VI was the frequency of various politeness features. Linde (1988) noted that cultural assumptions may need to be considered (both institutional and national) when training for politeness and mitigation of instructions, commands and requests. Linde notes "It would also be necessary to train [aviation personnel] in forms of communication that can challenge a superior's assessment of a situation while [still] indicating respect for the superior's position" (p. 396). In a cross-cultural environment, understanding the cultural and social values of crew members or controller-peers from other countries becomes essential as many aviation-related businesses continue to hire employees from outside local environments.

The variations of language described in this study clearly point to a need for greater appreciation and identification of local uses of aviation terminology and subsequent variations in specific areas. Each region develops its own style and vocabulary "even in such a restricted and globally monitored language as Airspeak, even though the [sic] ICAO specifies the rules for Airspeak and monitors the language, there are [still] variations in local use" (Sullivan & Girginer, 2002, p. 403).

General Discourse

Because language changes reflect the needs of its speakers, the extensive use of the questioning forms may represent a shift in the needs of aviation professionals. Broader implications of this study suggest that speakers may access task-related speech patterns more easily than specific vocabulary. The few fillers or repairs used suggest that the speakers in the study do not seem to be searching for word to fit the phraseology 'slot' for task; rather they continue to communicate and incorporate in more general language. Orasanu, Fischer and Davison (1997) have argued that use of clarification strategies allow speakers to resolve communication problems and "thus restore mutual understanding" (Orasanu, Fischer et al., 1997). If questioning serves to address clarification issues and can re-establish understanding, the implication is that questioning serves as a worthwhile resource in aviation discourse, not one to be discarded.

Givón (1993) argues that markedness exists in tense-aspect-modality systems, defined as a "binary contrast" of the presence or absence of certain categories of complexity. In each category, the marked case is more complex structurally, harder to process cognitively and occurs less frequently in general discourse which represents "the presence of the category" (p. 178). This dichotomy may be applicable to the highly restricted aviation phraseology where the approved forms are the unmarked forms, in that these structures are expected and anticipated in the established formulaic constructions. The high frequency of interrogatives and intonation patterns (as used in declaratives), which become an unexpected form in aviation discourse, may also suggest that non-standard forms may represent a means to 'mark' or reinforce the non-routine language to more accurately convey the speaker's meaning by drawing the listener's attention to the unexpected questioning format.

A key issue for the aviation industry is safety. Safety has been the impetus for many of the research projects outlined in the aviation literature review in Chapter IV. As a result, analysis of questioning and non-standard language also becomes important in aviation safety training. Through analysis of which phases of flight are more likely to produce questioning, researchers may also find data that indicates whether current flight and control practices may need to be modified to minimize the need for questioning related to procedures.

Professional Discourse

Even in a restricted linguistic context such as standard aviation phraseology, fixed or formulaic phrases are not always enough to adequately exchange information in dynamic environments. Formal phraseologies required in both local and international environments (such as fire, police or emergency services) may need to be reviewed on a periodic basis to reflect expanded contexts that develop through frequent use of the formulaic language in the variety of language environments. Wyss-Bühlmann (2004) suggests that as the variations become more widely used, they also become more routine and thus carry less strategic impact. As a result, there is a place for more conventional language in addition to the routine or standard phraseology.

The variations found throughout the data in Chapter V suggest that aviation professionals accept and continue to use these forms for daily interaction. Therefore, more research needs to be done to focus on how the aviation community, within itself, "agrees to use language for work-related purposes" (Tarone, 2005, p. 157). The variations, while acceptable within the discourse community, are distinguished as non-acceptable when discussing phraseology with outsiders (Drew & Heritage, 1992), hence the frequent comment, "there are no questions in air traffic control" provided to outside inquiries regarding the structure of aviation language.

Another area of research should include how these discourse variations build a collaborative workplace even though pilots and controllers are never in face-to-face situations. The discourse via radiotelephony relies solely on verbal signals as the means of constructing the interaction (Drew & Sorjonen, 1997; Nevile, 2004). The research focus should examine how the speakers cooperatively build the communicative sequence through use of verbal cues. Additional research should also investigate how gender may or may not alter the language of aviation by collecting and analyzing discourse data that includes female controllers or pilots who are still a minority within the profession (Mumby & Clair, 1997).

In addition, students, as well as working professionals, should become aware that expert use of only a formal language code such as a phraseology does not represent true expertise in aviation communication. The use of authentic examples permits teachers to demonstrate the performance and perception of experts who are native and nonnative speakers. Research into authentic use of (aviation) discourse "allows us to analyze instead the actual performance and interpretation of expert members of real discourse communities" (Tarone, 2005, p. 162). The focus of language use shifts to the expertise within the discourse community and not just on the native speaker's ability to memorize a set of specific formulaic phrases.

World Englishes

Aviation is a global industry with employees and partners in nearly every country in the world. The use of English in this international environment is an important issue not only for daily communication as well as training future members of the aviation community. As a result, training for aviation jobs is conducted in many of the world's languages, including pilots and controllers who come in contact with speakers of many other languages. For most of these speakers, their English language training began with non-native teachers who learned their English from other non-native speakers, creating regional variations of vocabulary and syntax. The new ICAO proficiency requirements recognize these varieties of English as equal, not subordinate, to any native speaker standards. But the ICAO requirements also stress that English language training needs to focus on mutual intelligibility so that all speakers of English in an aviation context are able to communicate at a functional level. One implication of this study is speakers become aware of the practicality in using questions to check and clarify message information that was unintelligible, confusing or interrupted.

The recognition by the United Nations of the role of the many emerging forms of English also suggests an immediate need for more research in international contexts to determine the forms and language of non-standard phraseology used on a regular basis at locations where English is not the first or official language of a nation-state. In addition, the training implications for findings from this study suggest that aviation language training should include specific training not only in aviation phraseology, but in the use of direct questioning and intonation variations.

Native speakers

The new ICAO proficiency standards focus on the responsibility of native speakers to monitor and maintain their own accent and intelligibility to meet the needs of an international environment. The findings of this study are based on primarily native speakers (pilots and controllers) since few non-native accents were heard in the recordings. These findings suggest native speakers should monitor their speech for lengthy non-standard interactions, such as extended multiple-part clauses and phrases. The implication is that all speakers need to develop awareness of the value of short, direct questions to obtain necessary information or clarification, thereby reducing the transmission time for a specific interaction. One means of examining native speaker competence would be setting up a study to train and then monitor the speakers for use of the suggested modifications in their daily aviation communication.

Non-Native Speakers

For non-native speakers, the findings confirm that there should be training and extensive practice in asking and answering both direct and indirect questions, not just relying on memorized phrases (International Civil Aviation Organization, 2004; Mitsutomi & O'Brien, 2003). Non-native speakers also need more practice in understanding the ‘added value’ of using intonation to convey meaning. They need to become aware that they can improve their communicative skills without learning additional vocabulary; rather, they can successfully employ intonation in their discourse to expand their overall intelligibility. Second or foreign language teachers need to incorporate authentic language samples of the target language or language to be used for specific purposes into curricula so that students will better understand the importance of learning more than just a standard vocabulary (Sullivan & Girginer, 2002).

Conclusion

The purpose of this study was to investigate the use of questions in aviation communication: the Syntactic-Interrogative and Intonation-Question structures found in daily interactions between pilots and controllers. The research focused on recordings of authentic samples to examine the discourse as it occurred without judging whether or not the discourse correctly followed standard ICAO phraseology.

Review of discourse literature shows that context, syntax and intonation combine with pragmatic features to contribute to the participants' complete understanding of the interaction. In global aviation discourse, the restricted language of ICAO phraseology is designed to minimize syntax and intonation in order to more accurately pass information between pilots and controllers through the use of specific formula-based phrases. However, the high attention to safety has led to targeting any variation in use of those phrases as error or deviation from standard performance that may contribute to unsafe conditions, possibly resulting in serious or fatal consequences.

The results of this study provide evidence that daily aviation communication does regularly "deviate" from standard phraseology. Although not approved for standard communications, the high number of questioning items indicates that questioning is done on a frequent basis with speakers regularly using interrogative as well as intonation-based interrogative features to accomplish these functions. Thus, these questioning variations show that aviation language is regularly modified and used as a practical discourse option for transmitting information between the pilots and controllers.

By investigating the messages without classifying them into error-based categories, this study was able to examine patterns of question use by native speakers of English in two locations and examine what functions those questions served. In addition, the syntactic forms of the questions and the intonation patterns of questioning functions were documented. The findings suggest that aviation professionals do not consider questioning as either unusual or noteworthy, but more likely as a part of their regular discourse lexicon. More importantly, the use of direct questions suggests that interrogative structures may be a viable addition to the currently approved vocabulary of standard aviation phraseology. The high frequency of questioning using intonation features suggests that intonation itself may also be an important element for training aviation professionals to enhance the linguistic element of their messages.

In conclusion, this study provides evidence that even a restricted language, such as aviation phraseology, continues to evolve and change based on the needs and use of its speakers. Because English is a primary language of global aviation, additional studies investigating the forms of the English phraseology used in various regions need to be continued in order to provide further evidence of how pilots and controllers work together to achieve accurate and effective communication in international aviation.

Doubtless … both grammarians and philosophers have been aware that it is by no means easy to distinguish even questions, commands, and so on from statements.

J. L. Austin, Harvard Lecture, 1955

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APPENDICES

APPENDIX A

SELECTED GLOSSARY OF

AVIATION TERMS

Accident: An event that occurs when a person is aboard an aircraft with the intention of flight, or during actual flight, in which any person suffers a fatal or serious injury or in which the aircraft receives substantial damage (see also Incident). (Oster, Strong, & Zorn, 1992, p. 181).

AIM: Aeronautical Information Manual; FAA publication "provides the aviation community with basic flight information and ATC procedures in the National Airspace System (NAS) of the United States" (FAA/AIM, Introduction). The Manual also contains a Pilot/Controller Glossary of aviation terminology.

Air Route Traffic Control Center: Facility established to provide air traffic control service to aircraft operating on IFR flight plans within controlled airspace and principally during the en route phase of flight. (FAA/AIM, 2004, p. PCG A-4).

Apron: Defined area, on a land airport or aerodrome, intended to accommodate aircraft for purposes of loading or unloading passengers, mail or cargo, refueling, parking, or maintenance (FAA/AIM, 2004, PCG A-6).

ASRS: Aviation Safety Reporting System (operated by NASA), “The ASRS collects, analyzes, and responds to voluntarily submitted aviation safety incident reports in order to lessen the likelihood of aviation accidents” (Retrieved April 20, 2007 from http://asrs.arc.nasa.gov/overview_nf.htm).

ATC: (1) Air Traffic Control: “A system of directing all aircraft operating within designated airspace by radio. ATC is divided into sectors such as Tower (airport or aerodrome control for takeoffs and landings), Departures (for departing aircraft), Control or Center (for enroute aircraft), and Approach (for arriving aircraft) (Nevile, 2004, p. xii);

(2) an abbreviation for Air Traffic Controller, known in the United States as an Air Traffic Control Specialist: “A person authorized to provide air traffic control service” (FAA/AIM, 2004, p. PCG A-5).

ATSAT: Aviation Topic-Speech Act Taxonomy. (see Chapter IV: Prinzo, Britton & Hendrix, 1995).

CAA: Civil Aviation Administration, United Kingdom; the British national equivalent to the FAA in the United States.

Callsign (sometimes written as “call sign”): tail number of general aviation plane or flight number of commercial flight; used to identify plane in ATC transmission.

Clearance: (Air Traffic Clearance), a verbal permission given by an air traffic controller for an aircraft to move as directed; the pilot-in-command must follow the clearance instructions except in an emergency or unless an amended clearance has been obtained. A pilot may request clarification or amendment to a clearance, as appropriate, any time a clearance is not fully understood, or considered unacceptable because of safety of flight. Controllers should, to the extent of operational practicality and safety, honor the pilot's request (adapted from FAA/AIM, 2004, p. PCG A-4).

Cockpit: original term for area of aircraft where pilot(s) operate all control and navigation instruments; sometimes referred to as "Flightdeck" (Nevile, 2004, p. 84).

CVR: Cockpit Voice Recorder; Records all audio transmissions from the flight deck with air traffic control, company dispatch, etc.; commonly referred to as the "Black Box" although the unit is painted bright orange for visibility in recovery; see also FDR/Flight Recorder (NTSB, 2004).

En Route: Areas between departure and destination terminal [control] areas. (FAA/AIM, 2004, p. PCG E-1).

FAA: Federal Aviation Administration; the federal-level agency supervising and regulating all non-military aviation in United States; administered by the US Department of Transportation.

FDR: Flight Data Recorder; records information about mechanical performance of aircraft during flight, such as airspeed, vertical acceleration, etc.; see also Flight Recorder (NTSB, 2004).

Flightdeck: another term for "Cockpit" (Nevile, 2004, p. 84).

Flight Recorder: Any type of recorder installed in the aircraft for the purpose of complementing accident/incident investigation (AIM, Pilot-Controller Glossary, F-4).

General Aviation ("GA," ICAO): "All civil aviation operations, other than scheduled air services and nonscheduled air transport operations for remuneration or hire" (FAA/AIM, 2004, p. PCG G-1).

Hearback: when a controller listens to the pilot's readback (Monan, 1986, p. 32).

IATA: International Air Transport Association (Orasanu et al., 1991).

ICAO: International Civil Aviation Organization, an agency of the United Nations which regulates all international non-military aviation (FAA/AIM, 2004, p. PCG I-5).

ICAO Manual of Implementation (Document 9835): Describes background of English language proficiency issues in aviation context; lists specific descriptors to be used for revised English proficiency standards adopted in 2003.

ICAO Radiotelephony Manual: Procedures for Air Navigation Services: Air Traffic Management (Document 4444); describes procedures and ICAO phraseology for air traffic control.

IFR: Instrument Flight Rules, "Rules governing navigation of aircraft by reference to cockpit instruments and radio navigation aids alone to enable flight regardless of visibility. This is the normal operating procedure for [commercial] airline flights" (FAA/AIM, 2004, p. PCG I-3).

Incidents: An occurrence, other than an accident, associated with the operation of an aircraft which affects or could affect the safety of operation (ICAO, 2001, Air Traffic Management).

NASA: National Aeronautics and Space Administration. US Agency that oversees development of flight technologies, scientific discovery, space exploration and operation of the space shuttle (Retrieved April 20, 2007 from http://www.nasa.gov/about/highlights/what_does_nasa_do.html).

Readback: when a flight crew member restates "the ATC safety-related parts of ATC clearances and instructions transmitted" [by the controller] (ICAO, 2001, p. 4.5).

Squawk, or Squawk ident: "Activate specific modes/codes/functions on the aircraft transponder; e.g., "Squawk three/Alpha, two one zero five, low" (FAA/AIM, 2004, p. PCG S-5).

Transponder, transponder signal: "A radio device fitted to aircraft which, when triggered off by certain radar wavelengths, emits a signal visible on ground radar screens. The signal usually includes additional information such as the altitude of the aircraft" (Nevile, 2004, p. xv).

VFR: Visual Flight Rules, "Stipulated flight procedures for navigating aircraft visually, clear of clouds, in Visual Meteorological Conditions" (Nevile, 2004, p. xv); "Rules that govern the procedures for conducting flight under visual conditions. The term "VFR" is also used in the United States to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition, it is used by pilots and controllers to indicate type of flight rules" (FAA/AIM, 2004, p. PCG V-3).

APPENDIX B

SAMPLE TRANSCRIPT OF AUDIO RECORDING

DUBLIN (EIDW)

Transcript File	DB05
ATC location	EIDW Dublin (Ireland)
Source	www.squawkident.com/livefeed.html
Recording Date	Tuesday May 4
Recording Time [Stillwater daylight time]	0937
Recording Duration (in hrs): 00:30:55	

NOTE: because transmissions are received by scanner, exchanges between pilots and controllers may be incomplete; only portions of some exchanges are transmitted via scanner signal.

Transcription conventions:
1. Q**uestions in bold** +?
2. All numbers are spelled out due to pronunciation variations
3. (kkk) microphone key cutting off transmission between pilot and controller
4. "ssss/" static interference with audible messages
5. "xxx" unintelligible voice/message

Recording Time	**Speaker**	**Message**
00:00:06	C	…//runway two eight Report vacating Bravo seven left approved …(2 secs) for Georgetown **Is that ok for your height?**
	P	It's fine for us Xxx one one two Bravo

00:01:02	P	*Scorpion** five eight six ***Request taxi*** *[Note: *Scorpion* has been substituted for all commercial airline names throughout this sample transcript]
	C	*Scorpion* five eight six Taxi link to Fox one Echo one Hold short two eight
	P	Link to Fox one Echo one Hold short two eight *Scorpion* five eight six
00:02:44	P	…// we're at one seven xxx *Scorpion* two Kilo Delta
00:02:47	C	Two Kilo Delta Readback correct **Confirm fully ready now**?
	P	Aay-firm ma'am Fully ready now xxx Kilo Delta
	C	Roger *Scorpion* two Kilo Delta Monitor Ground frequency one two one eight Kilo Call you Bye bye
	P	One twenty eight *Scorpion* Kilo Bye
00:03:38	P	ehhh… Ground *Scorpion* Kilo Delta **Could you confirm that QNH one zero zero six**?
	C	Aay-firm That's uhh that's what the <u>alt</u> is showing now one zero zero six
	P	Thanks *Scorpion* Kilo Delta
00:04:08	C	Aircraft three five four Delta Good'day to you Turn right ten degrees at vectors for runway two eight And descend to five thousand feet And QNH one zero zero six

00:04:20	P	Ok right ten degrees Down to five thousand feet On one zero zero six Three five four Delta
	C	Xxx three five four Delta Aay-firm **And you can maintain high speed**?
	P	I will maintain high speed Three five four Delta
00:06:50	C	…//radar identified Vector to ILS approach runway two eight umm …descend uhh flight level …if you can descend to five thousand feet QNH is one zero zero six
	P	Descend to five thousand feet One zero zero six uhh two six five *Scorpion* four six five seven
		// (*interrupted by another message*)
00:09:22	C	…// five two Tango **Report your speed**?
	P	Uhh two five zero is correct
	C	Two five zero Roger
00:09:33	C	…// Alpha You're cleared for Lima nine seven five It'll be two Alpha departure Squawk is two zero seven three Airborne frequency one two nine one seven and **what time did you say**?
	P	The time is thirteen Tango Cleared Lima nine seven five Two Alpha Two zero seven three And one two nine one seven *Scorpion* six five Alpha
	C	*Scorpion* six five Alpha Readback correct Report ready to start
	P	Ok

00:11:10	C	… bound **Can you come up on one two nine one seven please**?
		Kk//
00:15:24	P	Dublin radar *Scorpion* two forty five Descending to flight level eight zero Direct to Tulsea
	C	Two four five Good'day to you **uhh will:: you be ok for height**?
	P	Aay-firm
00:16:00	C	*Scorpion* two four five
	P	Go ahead Two forty five
00:16:06	C	**Ok** **Will you be ok for height**?
	P	Confirm there's no need for tow truck
00:16:48	P	… //seven two six Quebec **Can you confirm frequency Heathrow London**?
	C	*…//Repeat?* one two niner kk seven
	P	…// thirty seven Thank you
00:20:25	P	Dublin Papa Romeo India How do you read?
	C	Papa Rom-Romeo India Dublin QNH one zero zero six
	P	Dublin One double oh six Papa Romeo Whiskey Seven thousand Identified to land Just climbing through one thousand eight hundred to three thousand to clear high ground on the way *to Lester*

	C	Papa Romeo India Roger on navigation *You're on train* separation Maintain *through* controlled air space **Do you have a flight plan**?
	P	We do indeed Papa India out
		- - - END

APPENDIX C

SAMPLE ANALYSIS SHEET

FOR WH-QUESTIONS

A. Dublin Samples

A.0	Class	**WH-questions**	
	Parameters: WH -word is subject- or topic-noun in clause. WH-word may be singular, plural or possessive form Item may be included other classifications in clause/phrase		
	Subclass	**Source**	**Example**
A.1	WHO	DK/12	**Who's** departure are you gonna give me today? Dublin transcript E, line 12
A.2	WHERE	DB/02	and hold short **where**? Dublin transcript B; line 02
A.3	WHEN	XXX	*No 'when' questions in Dublin corpus*
A.4	WHAT	DB/18a	**What's** your souls on board? Dublin transcript B, line18a (partial transcript, divided for analysis)
A.5	WHICH	DD/33a	So **which** departure can we expect? Dublin transcript D, line 33a.
A.6	WHY	DH/37	**Why** don't you report slow aircraft up over control zone? Dublin transcript H, line 37
A.7	HOW	DH/21	So remind me, **how** many miles you require? Dublin H, line 21

B. Toronto Samples

A.0	Class	WH-questions	
	Parameters: WH-word is subject- or topic-noun in clause. WH-word may be singular, plural or possessive form May include other classifications in clause/phrase		
	Subclass	**Source**	**Example**
A.1	WHO	TA/15 TF/15	and **who** was the other call please? **Who's** the one identifying eight east north east of the field? Toronto transcript 15, line15
A.2	WHERE	TC/06	And **where** will the approach be…down at one thirty Toronto transcript O, line 06.
A.3	WHEN	XXX	*No 'when' questions in Toronto data set*
A.4	WHAT	TC/08	**What's** that mach translate 7879? Toronto transcript O, line 08
A.5	WHICH	TD/11	**Which** is correct? Toronto transcript D, line 11
A.6	WHY	TM/27	**Why** is that guy hearing them on 2527…not working anybody else? Toronto transcript M, line 27
A.7	HOW	TA/08	Kitchener one, **how** do you read? Toronto transcript A, line 08

APPENDIX D

ICAO LANGUAGE PROFICIENCY RATING SCALE

OPERATIONAL - LEVEL 4

AREA	***SPECIFICATION***	***TARGET PROFICIENCY***
Pronunciation	*Assumes a dialect and/or accent intelligible to the aeronautical community*	Pronunciation, stress, rhythm, and intonation are influenced by the first language or regional variation but only sometimes interfere with ease of understanding
Structure	*Relevant grammatical structures and sentence patterns are determined by language functions appropriate to the task.*	Basic grammatical structures and sentence patterns are used creatively and are usually well controlled. Errors may occur, particularly in unusual or unexpected circumstances, but rarely interfere with meaning.
Vocabulary	*(none provided)*	Vocabulary range and accuracy are usually sufficient to communicate effectively on common concrete, and work-related topics. Can often paraphrase successfully when lacking vocabulary in unusual or unexpected circumstances.
Fluency	*(none provided)*	Produces stretches of language at an appropriate tempo. There may be occasional loss of fluency on transition from rehearsed or formulaic speech to spontaneous interaction, but this does not prevent effective communication. Can make limited use of discourse markers or connectors. Fillers are not distracting.
Comprehension	*(none provided)*	Comprehension is mostly accurate on common, concrete, and work-related topics when the accent or variety used is sufficiently intelligible for an international community of users. When the speaker is confronted with a linguistic or situational complication or an unexpected turn of events, comprehension may be slower or require clarification strategies.
Interactions	*(none provided)*	Responses are usually immediate, appropriates and informative. Initiates and maintains exchanges even when dealing with an unexpected turn of events. deals adequately with apparent misunderstandings by checking, confirming or clarifying.

VITA

Sally Wellenbrock Hinrich

Candidate for the Degree of

Doctor of Philosophy

Dissertation: THE USE OF QUESTIONS IN INTERNATIONAL PILOT AND AIR TRAFFIC CONTROL COMMUNICATION

Major Field: TESOL and Applied Linguistics

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Personal Data:

Education: Graduated from A. A. Stagg Sr. High School in Stockton, California in June, 1964; received Bachelor of Arts degree in History from the University of Washington, Seattle, Washington in 1968; received Master of Arts in TESOL (Teaching English to Speakers of Other Languages) from Portland State University, Portland, Oregon in 1988; received Master of Public Administration from Lewis & Clark College, Portland, Oregon in 1993; completed the requirements for a Doctor of Philosophy with a major in English: TESOL and Applied Linguistics, on Oklahoma State University in May, 2008.

Experience: Taught English as a Second Language at Lewis & Clark College and Portland Community College; employed by Oklahoma State University, Department of Agriculture as an instructor for Agricultural Extension Agent Technology Transfer Program (Durango, Mexico), 2002-2003; employed by Oklahoma State University, Department of English as an instructor in the Oklahoma State University-Federal Aviation Administration joint Aviation English for International Air Traffic Controllers project, 2004-2005; and as a graduate teaching associate at Oklahoma State University, Department of English, 2002 to present.

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Title of Study: THE USE OF QUESTIONS IN INTERNATIONAL PILOT AND AIR TRAFFIC CONTROLLER COMMUNICATION

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Major Field: TESOL and Applied Linguistics

Scope and Method of Study: Discourse analysis examines features of spoken interaction between the speaker and listener. In questioning, the function of the utterance is to obtain a verbal response from the listener addressing new or additional information as requested by the speaker. Thus, questions serve as a “problem-solving tool” to efficiently supply information in interactional situations (Goody, 1978). However, in certain formulaic or restricted languages, forms of questioning may be highly constrained. Aviation phraseology uses a limited glossary of command-based instructions and responses that restricts requests for information to the phrase “say again” spoken with minimal declarative intonation (ICAO, 2001). In contrast, transcripts of daily aviation transmissions exhibit non-phraseology variations that show substantial use of interrogative clauses and declarative clauses with interrogative intonation. This research study applies discourse analysis to a corpus of aviation communication to investigate the types of syntactic, semantic and pragmatic features used to express a questioning function. For this study, over 24 hours of routine aviation messages broadcast from Toronto and Dublin were recorded, transcribed and analyzed for utterances doing questioning.

Findings and Conclusions: Analysis showed that questions occurred more than 28 times per hour in the aviation corpus. The questions employed common interrogative forms, including WH-, YES/NO-, and ALTERNATIVE-questions and items with various pragmatic markers. In addition, more than 42% of the questioning functions occurred in declarative structures that incorporated rising intonation, generally associated with questioning. These findings indicate that both pilots and controllers depend on general question forms for successful interaction despite the fact that these forms are not approved for aviation communication. The results also demonstrate that even in restricted environments, aviation speakers employ general questioning forms as a valuable resource for interaction, and pragmatic features in questioning, including intonation and politeness markers, prove to be an effective tool for aviation communication.

ADVISER’S APPROVAL: Dr. Carol Moder