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Message from the Sky: Radiotelephony in Air-Ground Communication

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ABSTRACT

Air-ground communication is a unique conversational discourse via specific technological equipment engaged by pilots and air traffic controllers. To conduct efficient air-ground communication, a special language or radiotelephony, is deliberately created and designed for aviation personnel to successfully conduct flight operations and to communicate through wireless technology. Therefore, radiotelephony may be seen as a universal or 'international language' used by pilots and air traffic controllers around the world, but it is also a distinctive language used within a restricted environment by a specific profession. A study was conducted to look at the general organisation and communication strategies in radiotelephony at discourse level and to describe its linguistic properties. This paper presents preliminary findings of the analysis done at discourse level and identifies categories of word formations used to construct the lexicon of radiotelephony.The analysis shows that turns are achieved in formulaic patterns embedded with confined units of moves. At the lexical level, compounding and shortening play a substantial role in contributingterms specific to the genre. The findings indicate that radiotelephony possesses distinctive linguistic characteristics influenced by the wireless medium of communication, certain flight operation activities and the unique institutional goal of interaction.

Keywords: Air-ground communication, aviation language, discourse, lexicon, radiotelephony

INTRODUCTION

In the aviation context, effective communication is an essential component of flight operations. Pilots, cabin crew, air traffic controllers, maintenance personnel and ground staff need to establish a mutual understanding of the nature of events relevant to the operational procedures.

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Air-ground communication is one among several communications conducted in the aviation context which requires a specific language as the active converse between pilots and air traffic controllers around the world.

The need to perform non face-to-face communication through wireless technology between aircraft in the air and traffic controllers on the ground in a task-oriented, high-workload and high-technology context has made the language distinctive. In addition, accurate interpretation relies tremendously on the context of the situation as well as the quality of a particular medium, namely, radio transmission. All these restraints have resulted in a language that is constructed and shaped into a distinctive discourse.

Generally, linguistic elements of radiotelephony is described as very close to robot-like or telegraphic language carried through a limited set of syntactical units within rigid discourse strategies, which only few people involved in the same field of expertise would understand. Linguistic reduction or expansion from its corresponding natural language properties is intentionally regulated to efficiently serve the institutional practice, nature of technological medium, specific characteristics of communication and task objective but there is no strong evidence from any research to support any of these.

A study was conducted to explicate the unique linguistic properties of radiotelephony as a reference grammar in the language training curriculum for pilot trainees and experienced pilots, especially the non-native speakers of English. The ongoing study aims to look at the language in four domains: discourse, lexicon, syntax and morphology. This paper presents findings from analysis on the first two levels: discourse and lexical.

RADIOTELEPHONY AS SUBLANGUAGE IN AIR-GROUND COMMUNICATION

In a speech community, the essential function of language in general is to create mutual understanding among members. However, it is widely accepted that even in the same community with monolingual speakers, language variation is a frequently occurring natural phenomenon. A language which is somehow different from the language ordinarily used to convey messages in particular groups of institutional members is known as *sublanguage*, a subset of standard natural language.

The term *sublanguage* was introduced by Zellig Harris (Harris, 1968, p. 152), who used the term for a portion of natural language differing from other portions of the same language syntactically and/or lexically. In extending the concept, Read and Bárcena (2000, p. 355) explain the circumstances in which sublanguages generally emerge: scientists, technicians, mechanics and people in general establishing communication about a specific subject matter in a professional or erudite way gradually begin to manipulate and adapt the rules of the language they use in accordance with their communicative needs.

Sublanguage is often categorized by a restricted set of linguistic properties which may be described as a subsystem of natural language or an independent system. Nonetheless, it is often believed that sublanguage patterns would be cited from natural language simply by deleting a number of rules and syntactical units that are not relevant.

One among various sublanguages denoted in the specialised communication setting is radiotelephony, a language particularly used in conversation conducted between pilot and air traffic controller. It is purely created to meet the needs of communication through wireless technology between aircraft in the air and traffic controllers on the ground.

Radiotelephony is slightly different from the usual description of other sublanguages in that it is not developed naturally from its corresponding language. Instead, it is a planned, constructed, or invented language deliberately designed by one person or a small group of people and intended for communication for a specific purpose. The language seems to be based on a set of prescribed rules in order to reduce complexity and flexibility of natural language which usually leads to confusion and misunderstanding.

In order to provide the fundamental background of air-ground communication, the situational parameters (developed from Biber, as cited in Johnstone, 2004, pp. 150-151) are enlarged here in order to describe the context in which the interaction occurs, as the context is overtly associated with linguistic properties and the overall discourse which radiotelephony is conducted.

Characteristics of Working Environment and Responsibilities of Participants

The prime duty of a commercial pilot is to control and direct the aircraft with its load of passengers to the destination. On each flight, at least two pilots work together and take turns to perform as the pilot-flying, that is, the pilot in control of the aircraft, and generally responsible for making most routine decisions, and pilot-not-flying who assists pilot-flying and is responsible for most air-ground communications. Along the flight path, pilots need to be vigilant to monitor all the core instruments and the in-sight traffic.

An air traffic controller, on the other hand, is a person who works on the ground and is responsible for directing and instructing each aircraft to perform each phase of flight systematically and effectively, and maintaining a safe flow of air traffic, as well as preventing collisions among aircrafts. The scenario in the control centre with a group of controllers working together during the same shift is full of voice communication. They not only need to concentrate on the communication but also to work with computer software and radar systems in order to maintain visual awareness of the entire airfield and a smooth flow of traffic both on the ground and in the air.

Communicative Characteristics of Participants

Air-ground communication is strictly dyadic which means that any conversation is reserved for only two persons: a pilot from one particular airline, and an air traffic controller who is accountable for that particular aircraft. The fundamental agreement between participants is to state the turn one at a time, therefore during the one-on-one interaction, no interruption from other aircraft should be developed.

It is possible that there is a pilot audience who listens to the interaction because they all share the same radio frequency while operating over a particular airspace. As a result, they have to pay maximum attention to the exchanges and wait until each is completed before they begin their own conversation with an air traffic controller.

Air-ground communication is more like talk-in-action referring to the interaction which occurs moment-to-moment in talking, understanding, seeing and acting. On top of that, a great amount of information needs to be rapidly exchanged within a short period of time as the interactions from and to one controller are performed continuously at each stage of flight path.

Relations between Addresser and Addressee

Both a pilot and an air traffic controller are theoretically on an equal status since they are more or less similar to two groups of the same company's employees working for different departments who coordinate on the same task in order to accomplish it. Even so, since the role of an air traffic controller is pretty much alike a traffic policeman managing and controlling the traffic on the ground and over the airspace, s/he somehow has a little higher level of authority over pilots.

In accordance with a controller's main duty mentioned earlier, s/he has to provide the pilots with proper information, instructions and flight parameters to either smoothen the flight operations or to avoid mid-air collisions, as well as pave the way for them to reach their destination airports safely.

In contrast, pilots mostly need to follow the instructions and report their presence directly to the air traffic controller when reaching a particular point along the airway. Nonetheless, it does not mean that pilots cannot negotiate for an alternative arrangement to operate the aircraft because the basic assumption of this social interaction is that they have to respect each other as they are depending on the exchange of information to accomplish the same goal.

All in all, at each stated phase of the flight and in the case of distress and urgency situations, the communication will be conducted within the dependency relationship between the participants.

Characteristics of the Place of Communication

Air-ground communication is performed similarly to non face-to-face communication on the ground. The participants engage in the interaction from different workplaces. A pilot is in an active aircraft while an air

traffic controller works in a control centre building. The communication is possibly conducted either on the ground at pre-flight, takeoff and landing phases of flight or in the airspace at departure, en route, descent and approach phases of flight for the pilots, but for the controllers, the conversation is always initiated from the ground stations. Communication is reserved only in the workplace based on the same amount of tasks and goals to accomplish, and the entire conversation is always recorded at work stations, the aircraft and the control centre building, in case of any possible air accident.

Thus, a high technology workplace with explicit operational procedures is the most suitable term to describe the places where air-ground communication is conducted to literally complete reutilized activities.

Mode of Communication

The interaction is restricted to radio transmission which is occasionally interrupted by high frequency noise. Most aircraft are equipped with at least one high-quality radio for a communication which operates in the very high frequency (VHF) radio band. The VHF band is between 108 to 137 MHz, which covers its use for commercial and general aviation, radio navigational aids, air traffic control and others. The aircrafts fly high enough so that their transmitters can be received hundreds of miles away.

The transmission is controlled by a push-to-talk system: the speaker needs to push the button every time in order to relay the message; otherwise, the message cannot be dispatched to the co-participant. As the system contributes to instant information exchange because of the space and time constraints, the management of air traffic within this system largely depends on the timely exchange of information between pilots and air traffic controllers.

Relation of Participants to the Content of Communication

The relation is almost similar to the one in ordinary conversation in which the participants have to comprehend the communication in real time but within certain duration in order to appropriately and accurately exchange information, provide instructions, and follow directions which are highly associated with various flight activities.

The major difference is that the participants need to be alert almost all the time to thoroughly receive details of essential information without any emotion involved. The basic assumption of the interaction is based on evidential facts, thus, the participants do not need to evaluate the content whether it is accurate or not. However, they have to be fully aware of the information conveyed by deliberately reviewing it before transmitting.

Even though the production of the interaction is not scripted beforehand, it is somehow governed by the particular stages of flight profile which apparently indicate and direct what the content of the communication is supposed to be, and what kinds of text the participants should deliver.

Purposes, Intents, and Goals of Communication

The participants in air-ground communication share the same ultimate institutional goal which is manoeuvering the flight to the destination airport safely and efficiently. An air traffic controller provides essential information and instructions to assist the fight operations whereas a pilot acknowledges and follows the instructions as well as informs, inquires and negotiates for the best flight solution.

The fundamental ground which a pilot and an air traffic controller always have is the objective to commute solely on the social activities or tasks of flight operation. Therefore, they have to interchangeably initiate the contact throughout the flight to accomplish those tasks. It can be concluded that air-ground communication is interaction with a distinguishable task and goal orientation in which the participants engage to achieve a similar institutional purpose, intent and goal.

Topic of Communication

The only topic in air-ground communication concerns aviation-related matters, which are flight instructions, flight parameters, weather information, and specific aerodrome information. It is unlike any regular conversation in which the speakers always introduce, develop and change topics as it is an important dimension of conversation structure (Thornbury & Slade, 2006, p. 127).

The information and instructions transmitted through radio transition between a pilot and an air traffic controller centre on the safe and expeditious operation of the aircraft. Air traffic controllers instruct and direct the movement of the aircraft on and in vicinity of an airport and over the airspace whereas pilots perform standard callouts, state intentions, ask questions, and convey information. Therefore, any other matters which are not relevant to flight operations are not allowed in the interaction.

Sharing of Specialised Knowledge among Participants in the Communication

The pilot and air traffic controller must share specialised knowledge concerning the nature of responsibility, working environment, advanced technologies and intricate procedures of flight operations.

The essential medium in air-ground communication is a language which can be used as a lingua franca among several nationalities of pilots and controllers in the commercial aviation industry who are equally responsible for providing air service around the world in order to perform a specific task towards a specific purpose. The language is strictly conformed to only in the aviation industry during the working period of flight operation. The participants need to have mutual specialised knowledge and comprehend the special patterns of language. They all must be trained in the flight training school to acquire the distinct linguistic constructions and practices before the actual flight.

These parameters provide the context for identifying and understanding the distinctive characteristics of air-ground communication, the production and

interpretation of the interaction and the occurrence of procedural format in the language.

METHOD AND ANALYSIS

The study analysed messages using the prescribed language of radiotelephony obtained from the *Manual of Radiotelephony* (2006) issued by the International Civil Aviation Organization (ICAO), the organization of the United Nations that designates rules and regulations of international air navigation. This specific manual is open for the public to get access and download. In total, 556 messages or 278 exchanges were analysed.

In order to identify the discourse organisation of air-ground communication, data were classified and interpreted in accord with the concept of *move* and *act* in the Model of Conversational Analysis developed by Sinclair and Coulthard (1975) following the conventional theoretical framework of conversational analysis.

First, each exchange was sorted and put into a table as presented in Table 1 to demonstrate the detailed elements of each exchange under designated labels as used by Sinclair and Coulthard (1975).

For lexical level analysis, the data were accumulated and processed through two different programmes, AntCon3.2.2w (2007) and Collocation Extract 3.07 to identify the lexical items of radiotelephony. Then, the data was examined based on the criteria of word-formation conventional classification system (Sager *et al*., 1980; Algeo, 1995) and new classification system (Shortis, 2001).

The data were organised and summarised to show the highly distinctive reference grammar of radiotelephony in air-ground communication in which this particular sublanguage is embedded.

TABLE 1
Example of an exchange in radiotelephony

L.O.D.	Source	Content	Act	e.s.	Move	e.s.	Exchange	ex.
3.	ATC	Station calling Georgetown ground Say again your call sign	summon inquire	pre-head head	eliciting	I	Elicit	4
4.	PT	Georgetown ground Fastair 345	reply-summon informative	pre-head head	informing	R		
5.	PT	Fastair 345 Wickin 47 flight level 003 Marlow 07 Correction Marlow 57	summon informative	pre-head head	informing	I	Inform	5
6.	ATC	Fastair 345 roger	reply-summon receive/ terminate	pre-head head	acknowledging	R		

(ATC = Air traffic Controller PT = Pilot L.O.D. = line of dialogue
e.s. = element of structure ex. = number of exchange)

FINDINGS

Discourse Structure of Air-ground Communication

The findings show three main types of exchanges in radiotelephony: *direct exchange, inform exchange* and *elicit exchange*. According to the data, the most frequent exchange found is direct exchange (155 exchanges), followed by inform exchange (68 exchanges) and elicit exchange (55 exchanges). There is also a supplementary exchange, *summon exchange*, which is an optional exchange to fully perform a identification-recognition process before proceeding to establish one among the three core exchanges.

All types of exchanges are based on the confined sequences of moves with rigid alternatives of acts embedded in each move which are closely related to the fundamental pair-part of the natural spoken discourse. However, the restricted organization is conformed with no overlapped or insertion sequence as in natural conversation in its corresponding language.

The nature of the discourse is best understood by looking at the fundamental background of air-ground discourse. In accordance with International Civil Aviation Organization (ICAO), an air-ground communication process is roughly designated as stated in Fig.1 in order to be compatible with its distinctive situational parameters.

This communication model displays a graphical representation of what the participants in the air-ground communication should perform. The process is often referred to as the readback/ hearback loop. It is a procedure developed for actively listening to and confirming messages between a pilot and an air traffic controller.

The four stages of the communication process in relation to the model are illustrated in details, as follows:

a. The first stage involves an air traffic controller compiling a message in the form of a command or an instruction and encoding it into words. These are then transmitted to the pilot verbally through a specific radio frequency.

b. The second stage involves a pilot actively listening to the message.

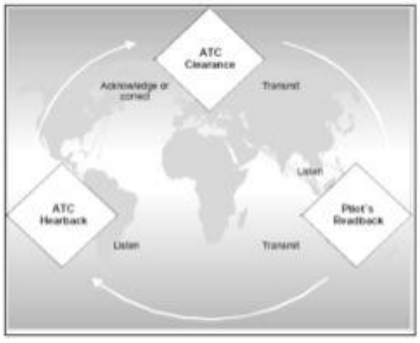

Fig.1: Air-ground communication process model (Flight Safety Foundation, 2000)

This relies on a pilot analysing the transmission and extracting the critical information.

c. The third stage involves a pilot transmitting the received information back to an air traffic controller, commonly referred to as a *readback*. Extracting and reading back the crucial parts of a message or a clearance demonstrates to an air traffic controller that a pilot has sensed the inward message and decoded it into something meaningful or it can also be done through specific response terms such as *affirm* or *roger*.

d. The final stage involves an air traffic controller actively listening for a correct readback from a pilot. This is known as a *hearback*. This allows a controller to identify any misunderstandings and make necessary corrections.

On the other hand, if a pilot initiates the turn, s/he will conduct the first stage of communication process. After that, the second and third stages belong to a controller to listen to, verify and acknowledge the received information. Eventually, a pilot will conduct the final stage which is known as *hearback*. Nonetheless, the hearback stage may be optional if there is nothing to correct.

The communication process model is generally designated as the brief frame of air-ground discourse. The exchange found in the data is based on this model as well.

In this study, the very first prime exchange, *direct exchange,* is frequently found, totalling to 155 of 278 exchanges. Direct exchange largely aims at prospecting particular non-verbal actions to be complied with by the co-participant whom the speaker has the right or authority over. Nevertheless, it is possible for the speaker to obtain either compliance or non-compliance as a response.

Conducting an aircraft onto accurate and appropriate flight paths through the direct exchange is mainly carried out by an air traffic controller. A pilot always either complies with or rejects the directive. Based on 155 exchanges, the pattern identified in the data is shown in Fig.2.

The internal structure of direct exchange consists of two mandatory moves, *initiation* and *response* moves, which are generally equivalent to the first and the second pair-part in natural exchange as well as a follow-up move as an additional move to evaluate correctness of the information supplied in the response.

Direct exchange consists of directing and acknowledging moves as an initiation and response respectively. To begin a directing move, the speaker starts with a *summon act*, stating the target participant's call sign, then proceeds with a *starter act* (optional), which is the particular information leading on to the head act followed. The *head act* directive comes last to provide a specific instruction, as shown in Fig.3.

There are two possibilities in performing an acknowledging move as a response to a directing move.

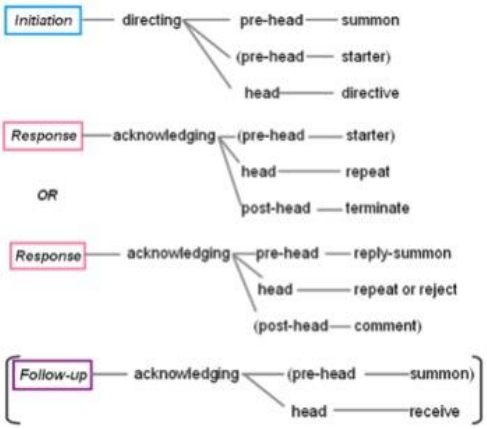

Fig.2: Structure of direct exchange

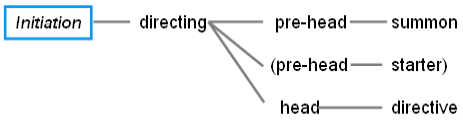

Fig.3: Structure of initiation in direct exchange

Response Pattern (1)

The regular response pattern (1) of the *acknowledging* move usually contains three acts: *starter act* (optional), *repeat act* to signify that the information is conceded as well as emphasized, mostly represented in repetition or paraphrase of the entire/ part of the message in the directive act which is realized as the *readback* stage in communication process model, and the *terminate* act to terminate an exchange and to confirm that it is the allocated participant, realised by calling his own call sign. It is noted that the starter move is optional in both initiation and response moves. This pattern is shown in Fig.4.

Example (a) illustrates this response pattern.

A controller begins with the call sign of the target aircraft (*G-AB),* followed by the starter act containing specific information *(*e.g., identification lost due to radar failure*)*, concerning the instruction (e.g., Contact Alexander control on 128.7) as the head of the directing move while a pilot begins with repeating part of the instruction as a head act and ends the exchange with his own call sign (G-AB) to point out the responder and terminate the exchange.

Response Pattern (2)

Another possible structure of acknowledging move, Response Pattern (2), is one in which the speaker begins with a reply-summon act, which is commonly his own call sign, to assure that it is the designated participant, as shown in Fig.5.

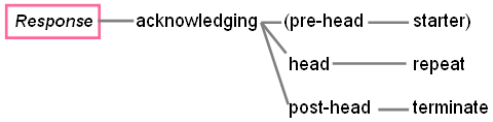

Fig.4: Structure of response pattern (1) in direct exchange

Example (a)

ATC	G-AB ***identification lost due to radar failure*** Contact Alexander control on 128.7	summon ***starter*** directive	pre-head ***pre-head*** head	directing	I	Direct
PT	128.7 G-AB	repeat terminate	head post-head	acknowledging	R	

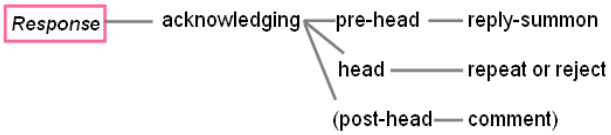

Fig.5: Structure of response pattern (2) in direct exchange

Example (b)

ATC	Fastair 345 Georgetown departure cleared to Colinton flight level 290 cross Wicken flight level 150 or above maintain flight level 130	summon directive	pre-head head	directing	I	Direct
PT	Georgetown departure Fastair 345 ***unable to cross Wicken flight level 150 due weight*** maintaining flight level 130	reply-summon ***reject*** comment	pre-head ***head*** post-head	informing	R	

In Example (b) , a pilot adds the controller's call sign (e.g. Georgetown departure) before own call sign (e.g., Fast air 345), which is a traditional way of reply-summoning in air-ground communication.

After that, two possible acts are selected whether to *reject* (Example (b) - unable to cross Wicken flight level 150 due weight) or to *repeat*, as shown in Example (c) (*stopping*). In the post-head of the informing move such as in Example (b), a *comment act* is used to provide additional information to support the preceding message when rejecting the directive.

Comparing the two patterns of responses, both include a directing move and acknowledging, but they are slightly different in frequency and in terms of the sequence of acts conducted in each move.

In addition, direct exchange also contains the optional follow-up which is the final turn of the exchange to perform *hearback*, one of the four stages of communication process model in order to confirm that the

information repeated in preceding utterance is accurate. The speaker who determines the directing move at the initial stage, is responsible for *hearback* by beginning with the summon act, the co-participant's call sign, and then with the receive act with a designated response item, *roger*, to ensure that the message recited is perfectly correct and to indicate the end of the move.

The complete organisation, as shown is as Example (d), is strongly associated with absolute stages of the communication process model. However, this stage can be omitted if the responder is certain that the message is correctly received.

In summary, the structure of the direct exchange is rigidly reserved in two parts: the first pair-part, an utterance made by a speaker, is a directing move; the second pair-part, an expected response from a responder, is an acknowledging move. However, the internal formation of each move is varied, depending on the act selected to conform as a head act.

In regular conversation, direct exchange definitely consists of two basic moves, a command (e.g., *Don't pick it up*), and response to the command which is either compliance (e.g., *Okay*) or refusal (e.g., *I don't care*) (adapted from Thornbury & Slade, 2006, p. 120). Nonetheless, the number and details of prime acts are the same. The follow-up move is truly optional in regular spoken direct exchange but sometimes found only in a particular discourse such as in classroom discourse (Burton, 1981) with *Mhm, mhm*, and *Yeah* to indicate that the information has been received, understood and accepted in terms of correctness.

Similarly, the follow-up is not essential element in the direct exchange in air-ground communication, but the initiation move and response move are mandatory. Moreover, the linguistic form to express act in the follow-up is limited to specific terminology, compared to regular spoken discourse in which the choices are rather broad.

Example (c)

ATC	Fastair 345 stop immediately	summon directive	pre-head head	Directing	I	Direct
PT	Fastair 345 ***stopping***	reply-summon ***repeat***	pre-head ***head***	acknowledging	R	

Example (d)

ATC	G-AB descend to 3500 feet QNH 1015 transition level 50	summon directive	pre-head head	directing	I	Direct
PT	Leaving flight level 70 for 3500 feet QNH 1015 transition level G-AB	repeat terminate	head post-head	acknowledging	R	
ATC	*G-AB* *roger*	*summon* *receive*	*pre-head* *head*	*acknowledging*	*F*	

One thing to recognise is that the sequence of acts in air-ground discourse is very limited with the minimum elements, whereas in general spoken discourse, it can be much more diverse with overlapping and insertion sequences.

In conclusion, the discourse structure of air-ground communication is represented in almost rigid, predictable patterns with prescribed moves and acts in each turn. This structure results from the communication being generally influenced by several constraints, differing from any regular spoken discourse, such as rapid information change in a short period of time since it is one-to-many discourse, an artificial medium (radio transmission) which does not allow a long comfortable conversation as it is based on push-to-talk system with noise interference and restricted to the oral mode. It is non face-to-face communication which requires explicit formulaic exchanges to avoid ambiguity, and is task- and goal-centred, with messages mainly associated with flight operations.

Nevertheless, the principal moves in each exchange are technically based on the prevalent structure of common interaction in general spoken discourse. The differences lie in the types and the sequences of acts performed in each move which are more ritualised and expressed in almost formulaic linguistic patterns.

Formation of Lexical Items

The list of technical terms in radiotelephony was analysed to identify the most frequent word formation techniques used to create them. The lexical terms collected from the reference data were processed through two data analysis programs, AntCon3.2.2w (2007) and Collocation Extract 3.07, to distinguish between single-unit terms and multi-unit terms.

These items are categorised by prototypical semantic properties into 11 conceptual groups, regardless of aviation activities and flight profiles: *facility, weather, operational path, system, area, parameter, unit of service, status, process, flight performance,* and *communication expression.* These categories facilitate the teaching and learning of the terms.

The items were classified according to *word formation* techniques. The findings show that four main types of word formation were used, namely, *compounding, affixation, shift* and *shortening*. The discussion in the paper focuses only on two word-formation techniques frequently found in the data, which are *compounding* and *shortening*.

Compounding is the process of constructing words by combining words or word elements. Compounding elements in radiotelephony can go up to three units, which seldom occurs in English. Findings on the more common combination of 2 elements are presented here.

(a) *2-element compounds* are quite varied. Most of them are obviously compounded with words that indicate the meaning of the prototypical noun class, naming a person, place, thing, quality, or action, in canonical English language, for instance, *movement area, flight level, transition level, approach speed, flight plan,*

radar approach, gateway, etc. The nucleus of the compounds is the second element. Some of the elements have gone through the process of affixation before being attached to another element such as radar *vectoring* and runway *vacated*.

The affixation {–ing} is the mechanism to convert a verb to a noun whereas {–ed} is used to convert a verb to an adjective or as a past participle of passive construction in canonical English language. Both affixations are meant to form so-called prototypical noun class according to their defined semantic properties.

Besides the compounding between so-called prototypical noun-class words, there is a small number of 2-element compound members that are composed of the particle indicating a relation between things, or what is defined as *adposition* in canonical English language. The positions of the particles in compounds are either in front of the nucleus, *in sight* (area or things which a person can visualize within the certain distance) and *in progress* (something happening or being done at the time of talk or at this time) or at the back of the nucleus; *push-back, take off, go ahead, touchdown*, *straight-in*, etc.

Another compounding to be discussed here is double compound which is the compound created by combining the same words; *Pan Pan* (the urgency signal when the aircraft is in danger or there is an important message to pass on/report mostly concerning the safety in flight operation) and *break break* (i.e., I hereby indicate the separation between messages transmitted to different aircraft in a very busy environment). This particular compound is hardly found in corresponding natural language.

2-element compounding formation in radiotelephony generally reflects the compounding technique used in word formation in canonical English, but there are some distinctive characters of compounding such as *fronting-particle compound* and *double compound*.

(b) *3-element compounds* exist in fewer numbers than 2-element compounds. The distinctiveness of these compounds is that some of them are not just specialised terms denoting a particular object or a part of operation but they can also refer to the entire instruction or process of an operation. They can also refer to systems or equipment. Some examples are *precision radar approach* (a standard instrument approach procedure) and *aerodrome traffic circuit* (a specific path to be flown by an aircraft operating in the vicinity of an aerodrome). Some specialised terms are quite extraordinary since they are compounded to sound almost like a common phrase in canonical English language, yet they are all designated as multi-word terms. They are always collocated and officially issued to be used by either a pilot or an air traffic controller. Examples are *out of service* (not working or functioning properly), *rate of descent* (a measurement of speed used in lowering an aircraft mostly at the approach phase) and *radar control terminated* (any of the services that could be received while in radar contact provided used by an air traffic controller is no longer available).

One term, *TCAS resolution advisory*, is formed both through *compounding* and

shortening. The component *TCAS* stands for *Traffic Collision Avoidance System* which is itself a 4-element compound. This lexical term is then compounded with other items to form another new specialised term. The complexity of the process is rather rare in everyday usage of English.

Shortening is the process in which the elements of lexical items are reduced or left out for economic reasons to compress information both syntactically and lexically. This compression can be done by one of these two sub-formations: *acronym* or *initialism*, and *clipping*.

Acronym or *Initialism* is to shorten the item to such an extent that only initials or first few letters of each remain in order to compress the words in to one short form. The difference between acronym and initialism is how the end product is pronounced. An acronym is pronounced as if it is a single lexeme, whereas an initialism is sounded as the letters in sequence.

In the data, the terms first go through the process of compounding before they are clipped into a series of letters, ranging from 3 to 5 letters; they commonly designate equipment, system and process. Examples are ILS (Instrument Landing System), ATC (air traffic control), VFR (Visual Flight Rules), ACC (Area Control Center), PAPI (Precision Approach Path Indicator), FAF (Final Approach Fix), NOTAM (Notice To Airmen), etc. Out of 36 tokens in the data, only 8 items are acronyms which are VA-SIS, T-CAS, PA-PI, SID, A-TIS, NO-TAM, LO-RAN and STAR while the rest are cases of initialism. The shortening does not only occur at lexical level but also at sentence level such as CAVOK, initialised from *cloud and visibility is OK*.

Clipping is the process of cutting down a multi-syllabic lexeme, an initial, middle or final element. The terms mainly refer to call signs of aeronautical stations used during radio transmission of air-ground communication. These stations offer assistance and systematically manage the activities of each operative aircraft.

The terms are shortened by removing at least one element, for instance, ident (identification), in which either initial or final elements are cropped with restricted single definition. There is also a group of clipping items in which the rear part of each element and final elements are trimmed, and what remains is compounded as one lexical term. For example, SIGMET (significant meteorology), SELCAL (selective-calling radio system), VOLMET (volume meteorological information), and RNAV (area navigation). In some cases, only particular parts of the elements are crossed out such as wilco (will comply), SNOWTAM (snow to airmen), H24 (24-hour service) and NAVAID (navigation aid).

Two tokens in the sample are the product of more than one word-formation process or *double shortening*: TACAN (tactical air navigation), created by using the format of clipping with tactical and of initialism with 'air navigation', and VORTAC (VHF omni-directional radio range (VOR) and UHF tactical air navigation). Both initialism and clipping are involved.

As the air-ground communication context requires a rapid exchange of information, this particular word-formation technique is rather common as it helps in conducting short and precise conversation. In natural English language, the process is generally reserved for the casual mode of expression (Sager *et al.*, 1990).

CONCLUSION

Generally, linguistic elements of radiotelephony is mostly delineated as very close to robot-like or telegraphic language carried through a limited set of lexical units within the rigid discourse structures which only people involved in the same field of expertise would understand. Confined turn organisation and structural organisation in the discourse of air-ground communication and the formation of distinctive lexical items, are influenced by specific means of communication technology, certain flight operation activities and the unique institutional goal of interaction.

REFERENCES

Algeo, J. (1995). Having a look at the expanded predicate. In B. Aarts & C. Meyer (Eds.), *The verb in contemporary English: Theory and description* (pp. 230-217). Cambridge: Cambridge University Press.

Burton, D. (1981). Analysing spoken discourse. In M. Coulthard & M. Montgomery (Eds). *Studies in Discourse Analysis* (pp. 61-81). London: Routledge and Kegan Paul.

Harris, Z. (1968). *Mathematical structures of language.* New York: Wiley- Interscience.

International Civil Aviation Organization (2006). *Aeronautical telecommunications, Volume II Annex 10*. Montreal: ICAO.

Johnstone, B. (2004). *Discourse analysis and narrative*. Malden: Blackwell.

Read, T., & Bárcena, E. (2000). Principles of sublanguage theory and their relevance to machine translation. *Epos: Revista de filología, 16*, 351-360.

Sinclair, J.R. & Coulthard, R.M. (1975). *Towards an analysis of discourse: the English used by teachers and pupils.* London: Oxford University Press.

Sager, J. C., Dungworth, D., & McDonald, P.F. (1980). *English special languages: Principles and practice in Science and Technology.* Wiesbaden: Brandstetter.

Shortis, T. (2001). *The language of ICT: Information and Communication Technology.* London: Routledge.

Thornbury, S., & Slade, D. (2006). *Conversation: from description to pedagogy*. Cambridge: Cambridge University Press.