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ANALYSIS OF AERONAUTIC LANGUAGE INTERACTION

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Abstract: *The departure point for the research is the statement that conversation analysis (CA) is aimed to uncover the tacit reasoning procedures as well as sociolinguistic competencies underlying the production and interpretation of talk in organized sequences of interaction [1]. It makes CA popular method in the effective discourse study. Considering aeronautical language interaction (ALI) at a macro level, it is obvious that the linguistic investigation of Aviation English should be done in the connective discourse developed by pilot and controller in the ‘ground-to-air’ talk. Therefore, CA might provide initial knowledge of the radiotelephony exchanges between pilot and controller in that specific context. The aim of this article is to look at CA as a method to describe conventional interactions in radiotelephony through prism of conversation features of general language conventions. To know more about conversation features of RLC can contribute to flight safety associated with language related human factor.*

Keywords: aeronautical communication; aeronautical discourse; aviation phraseology; conversation analysis; human factor; plain English

1. Targets of Conversation Analysis

Regarding general language use, CA looks at ordinary everyday spoken discourse with a purpose to understanding what way people made their interactions and how social relations are developed via spoken discourse.

CA aims to study recorded and naturally occurring interaction. The analysis specifically focuses on revealing how sequences of language action are generated and how the participants understand and respond to one another in their turns at talk.

It is interesting, that CA has been widely used for analyzing the organization and outcomes of naturally occurring talk and social interaction in contexts of professional work and learning, particularly how participants collaboratively produce and understand their interactions, whatever it is they are doing together [2].

The researchers point out that in the case of conversation, participants take turns-at-talk. These turns are themselves composed of one or more so called turn-constructive units (TCUs), which are the smallest units that may constitute a turn. Turns can be made up of a single word, a phrase, a clause, or a full sentence. They are not syntactic or semantic

units, but genuinely pragmatic ones^{Ошибка! Залкада не определена.}. S. Levinson points to the importance of the TCUs due to its signaling the recipient when the ongoing turn may be complete. Thus, the TCUs help syntactically in anticipating the point of completeness [3].

Prosody is the other way of knowing this point a speaker can stretch or reduce the vocalization of the intended last syllable of the turn, or mark it with a noticeable tone movement such as the falling pitch movement in the last word [4]. The recognizable potential end of a turn is a ‘transition relevance place’ (TRP). According to S. Levinson, TRP can be identified by a change in the pitch or volume of the voice, the end of a syntactic unit of language, a momentary silence, or some sort of body motion [3]. Therefore, transition between speakers usually occurs at such a point, and it is at TRP that speakers employ the conversational techniques.

So, speech events are mainly concerned what people say in different everyday environments, e.g., debates, interviews, discussions and others, are various speech events.

Regarding the organization of a conversation, it can be described at two levels – at the levels of turn-taking and sequence organization [2].

To keep turn-taking the participants know where and how to change the roles of speaker and listener. Regarding sequence organization, there is a coherent series of exchange interrelated communicative actions, e.g., the interaction begins with a question and ends with the answer to the question. These are so called adjacency pairs. It is important to notice, that when a recipient of a turn at talk hears the speaker's utterance as the first part of a particular type of adjacency pair, the appropriate thing to do next is to deliver an utterance that may count as the second part of the same pair.

It is known that CA focuses on modelling how the interacting procedures and expectations actually employed by participants in producing and understanding conversation. One key source of verification here is what happens when some hitch occurs. In other words, when the hypothesized organization does not operate in the predicted/expected way – since then participants should address themselves to the problem thus produced. Ошибка! Закладка не определена.

Knowing when it is acceptable or obligatory to take a turn in conversation is essential to the cooperative development of the discourse. This knowledge involves such factors as knowing how to recognize appropriate turn-exchange points and knowing how long the pauses between turns should be. If the pause is longer than acceptable, it might seem as a gap in conversation.

It is also important to know how (and if) one may talk while someone else is talking – that is, if conversational overlap is allowed. Levinson points out that the interactants may be expected either to try to repair the hitch, or alternatively, to draw strong inferences of a quite specific kind from the absence of the expected behaviour, and to act accordingly [3].

It seems that for a conversation to run smoothly and effectively, the organization of turns should be managed to keep the conversation on track. The response to an utterance often provides some kind of a hearer's interpretation of the prior utterance, and so indicates the alignment.

It is interesting, that alignment can be displayed and adjusted not only in responses to an utterance, but also in advance. Alignment is especially important at the openings and closings of conversation [3].

One of the focuses of CA concerns the systematically organized set of practices of 'repair' that participants use to address troubles of speaking, hearing, and understanding. That problem, the

particular segment of talk to which the repair is addressed, is termed the 'trouble source' or 'repairable.' There are circumstances under which the troubles are repaired in the third position from the turn of the trouble-source [5].

The simplified example presented shows the use of third position repair in aeronautical interaction:

A: And will you give me the checklist from there (T1)

B: The checklist (brings the normal checklist into view) (T2)

*A: **No. I mean the emergency checklist.***

It should be mentioned, that the studies on repairs have initially been concerned with the problems in speaking, hearing and understanding talk. However, participants in interaction also encounter other kinds of trouble. According to Arminen et al., the corrective practices may also subject participants' physical actions, interactive multimodal semiotic facilities and the interactive actions of parties with their environment [5].

According to Schegloff, repairs are the things done to fix a conversational breakdown and restore alignment. Breakdowns can be misunderstandings as well as disagreements, rejections and other difficulties. A repair initiation marks a *possible disjunction with the immediately preceding talk*, while a repair outcome results either in a *solution or abandonment of the problem* [6]. Therefore, revisions may occur when the speaker can anticipate that trouble is likely and reformulates talk accordingly. In third position, speaker A tackles to address the trouble by making involved in a repair operation relative to the talk in T1. In the sequential context of repair after next turn, the third position repair supplies and is dedicated to *the last structurally provided defence of intersubjectivity in conversation* [6].

From the aforementioned review of conversation features described by CA it is suggested that ALI is different in the process of ground-to-air talk conventions and the way pilot and controller understand and respond to one another in their turns in various contexts of flight operation. The CA can have a cue on how TCUs are formed and at what TRPs conversational techniques are employed, how turn-taking strategies are characterized in the radiotelephony non-visual coded language exchanges.

2. Aeronautical language communication

This communication is non-visual, coded language interaction/talk between flight crew and air traffic controller via radiotelephony equipment using English phraseology mainly, and, additionally, plain English in situations when phraseology is not sufficient to realize all possible communicative intentions [7].

The ALI is aimed to provide safety of flights identified by a contributory role of language related human factor [8]. According to the requirements of International Civil Aviation Organization (ICAO) the language used in ALI by communicators – a pilot and a controller – should be precise, laconic and unambiguous in their communicative intentions in various job related contexts including radiotelephony conventions in English during the flight [7].

It is important to take into account that ALI is a strong regulated area by ICAO – its rules and recommendations are to be followed by all pilots and controllers during their aeronautical exchanges.

However, the regulated character of communication may lead to high predictability of turn-taking, and, on the other hand, increase the impact of expectancies. In other words, in routine contexts of flight operation the ALI participants do not use conversation strategies spontaneously, but apply what has been built in by the rules.

Due to strong safety issue and regulated character of aeronautical language exchanges pilot and controller cooperate in specific way. Firstly, the standard exchange between pilot and controller is characterized as a *loop* (Figure 1).

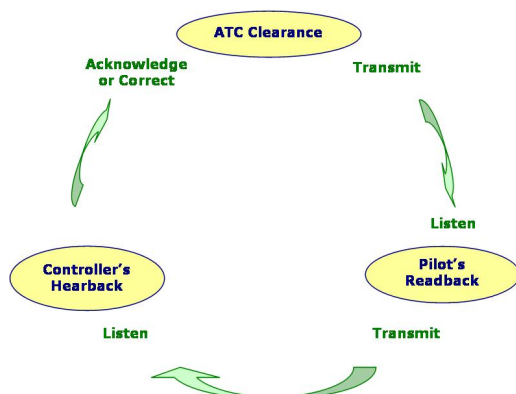


Fig. 1. Aeronautical communication loop (adapted from Ragan, 1997)

The loop consists of a clearance transmission by a controller – listening and reading back by a pilot – listening and hearing back by a controller. The loop can be viewed as preceded by specific openings depending on the ALI step (beginning and ending of a bit of communication defined by strict order of operations at a particular stage of flight (e.g., start-up, taxiing, taking off, climbing, descending, etc.). Before the controller pronounces clearance (permission to follow instructions), the pilot says the air traffic control station name, then the aircraft call-sign and the pilot's request or intentions. After checking (by hear back) the message appropriateness to what has been sent, the controller confirms (or denies) the correct understanding.

According to ICAO, such communication loop presents a proof and correction process that guarantee the completeness of exchanges and minimize misunderstanding [7].

Secondly, effective verbal ALI relies on a shared understanding of flight operation procedures and phraseology, which is a shared language of radiotelephony exchanges. Namely, the lexical units with specific meaning within the context of aircraft, aerodrome and air traffic operations are comprehensible for both participants of aeronautical conversation.

It is important to note that RLC is a particular case of using two languages in radiotelephony routine exchanges between pilot and controller during the flight operation – English phraseology (invented language) and plain English (natural language). The radiotelephony phraseology has been invented to ensure the meaning that is conveyed by the aeronautical participants without need for explanations.

Thirdly, the communicative functions are defined for each of the aeronautical participants. Below there is a list of common communicative functions directed towards triggering actions, since ALI is a specific kind of communication, regarding performing of particular actions by pilot and controller. Some examples of the communicative functions are as follows [7]:

Orders

Giving an order, cancellation of an order by a controller - Announce compliance or non-compliance by a pilot.

Permission/approval

Request permission/approval by a pilot - Give, deny, approve permission, or forbid by a controller.

Advice (markers for politeness, directness)

Request advice by a pilot - Give advice, suggest a solution to a problem by a controller.

Requests and offers to act

Request action by another, offer to act – Agree or refuse to act; State reluctance/unwillingness to act

Undertakings

Undertake to give a service; announce a spontaneous decision to act - Agree to undertaking/decision, etc.

As mentioned before, CA is involved with the organization of turn-takings in conversation, particularly, the formative sense of various turn forms, turn contents and turn lengths in accordance to different parameters. In case of ALI, conversation is not that one of ordinary loose format because of regulated nature of the exchanges with its fixed turns with formalized lengths and standardized contents. What the participants want to say, the way they say it and how long the turn is – all these are regulated by ICAO interactional rules and operational procedures [9].

The contact between pilot and controller is in-voice only, unlike face-to-face communication, where understanding can be facilitated visually by eye contact, face expression and gestures, enhancing understanding the speaker better and facilitating response from the hearer.

When face-to-face communication, non-verbal signals, such as body language, can carry a subjective message that can controvert the objective message, for example: nodding the head saying ‘yes’ or ‘no’ [10]. So, non-visual contact is what makes ALI unusual and difficult due to lack of a back-channel visual signal.

The manner of speech during verbal communication influences straightly the meaning given to the message by the hearer. This applies to the objective and subjective messages. During aeronautical interaction, there is often no possibility of expressing the message fully because of strictly prescribed phraseology and time pressure, and it is necessary to verify yourself using call signs, because, for example, the frequency may change unexpectedly and there is possibility of mistake. No mistakes can occur during the flight, since the responsibility for people’s lives is crucial [11].

Pilot and controller professionals are normally trained in using the radios for verbal communication, and their character of speech straightly depends on the instructor’s pieces of advice and their job experience. Everyone who uses

the High Frequency radios to transmit the reports or gather the reports recognizes their own way of ‘frequency’ voice and the pattern of speech. To minimize possible miscommunication professional pilots and controllers learn to speak slower, pronounce messages more clearly, neutralize the accent, modulate the tone and volume of voice, and to stress certain words [7].

Repair is interpreted as a communication strategy to deal with problems in speaking, hearing and understanding talk in conversation practices which form an orderly organization of repair immediately in talk [5].

3. Specific features of aeronautical conversations

The nature of turn-takings in ALI as well as other parameters of CA like TCU adjacency pairs and TRPs can be identified through communicative functions standard for radiotelephony exchanges on each phase of flight operation. For instance, adjacency pairs can be found under each communicative function based on pilot and controller parts of conversation, e.g., ‘(C) give an order – (P) announce compliance with an order’, etc.

In ALI, similarly to common conversations between two parties, the turns between pilot and controller are changing alternately. Our everyday speech patterns consist of units, and the communicators themselves manage the conversation flow and rhythm. In contrast, ALI is specific by strong regulations of turns in standard radiotelephony interaction.

In everyday conversations, the most popular technique is the one by which a current speaker selects a next speaker. A basic technique in this respect involves combining an address term with a sequence-initiating action such as question, request, complaint, etc. In the example below, Mark addresses his talk to Rita by using her name and produces a question that is also a request in the line (1). In this way, he selects her to speak next, what she actually does in line (2).

(1) *Mark*: Rita, can you help me with my homework?

(2) *Rita*: Do it yourself.

In case of ALI, the utterances are produced according to stages of flight in a peculiar context. In the example below, a controller gives an instruction to a pilot to climb to the flight level 210 and the pilot

must read back the main bits of the controller's message.

ATC: SPEED BIRD 543, climb Flight Level 210.

Pilot: Climbing flight level 210, SPEED BIRD 543.

Both phrases are produced by using standard phraseology and standard rules for aeronautical interaction in this entire moment of flight operation. These phrases are always produced in all flights and by all pilots and controllers.

The readbacks are obligatory in ALI. They are repetitive messages to avoid misunderstanding and provide flight safety. If the repeated message is wrong, the hearer must notice it, provide correction and the second repetition will follow. So, readback is vital for ensuring mutual understanding between the pilot and the controller of the intended plan of the message. The language actions are performed according to strong radiotelephony rules, not by decisions of speakers as communication technique. It can be viewed as 'prescribed turn-taking' and two utterances 'instruction-readback' – as 'prescribed TCU adjacency pair'. Readback is vital for ensuring mutual understanding between pilot and controller.

ALI includes other linguistic compensatory devices to avoid or minimize misunderstandings. They are in the list of phraseology Standard Words [9]. Some examples from the list are as follows:

'*Say again*' – repeat all, or the following part of your last transmission; '*Words twice*' – (as a request) communication is difficult, please send every word or group of words twice, (as information) since communication is difficult every word or group of words in this message will be sent twice;

'*Confirm*' – I request verification of: clearance, instruction, action, information, etc.

Openings and endings in radiotelephony exchanges are under strict rules to use name of the air traffic station and the aircraft call sign. The call sign is a unique naming for transmission purpose.

According to the rules, there is a scheme of the establishment and continuation of communication between pilot and station [5]:

Pilot: [Station Name] [Station Type] [Aircraft Call Sign].

Station: [Aircraft Call Sign] [Station Name] [Station Type].

For example:

Pilot: GRENOBLE TOWER F-GBCD.

Station: F-GBCD GRENOBLE TOWER.

Where 'GRENOBLE TOWER' is air traffic station name and 'F-GBCD' is aircraft call sign.

The use of call signs is important for recognizing the speaker. It is not possible to omit the call signs, in order to avoid misunderstandings. According to radiotelephony rules, call signs must be used when establishing communication. The calling procedure of an aircraft establishing communication follows the specific format: Call sign of station called, followed by call sign of station calling. In order to reply they repeat the call sign of the station calling followed by call sign of the answering station [9].

For example:

Pilot: Kiev Radar, SKY DUBAI seven two nine, [*reporting*] descending to four thousand feet, QNH one zero one three.

ATC: SKY DUBAI seven two nine, Kiev Radar, [*responding by confirming*] identified; [*instructing*] descend to altitude two thousand five hundred feet, cleared ILS three six left.

Pilot: SKY DUBAI seven two nine, [*readbacking*] descending two thousand five hundred feet, cleared ILS approach runway three six left.

ATC: SKY DUBAI seven two nine, [*instructing*] contact Boryspil Tower one one nine decimal six five.¹

From the above example, it is easy to find out how specific ALI is, call signs are of crucial importance, they help to check the position of an aircraft, to verify and to proof the information, they ensure accuracy during the radiotelephony interactions [12].

Here is one more example of authentic radiotelephony exchange between the pilot and the air traffic controller. The talk takes place before landing:

Pilot: Kiev-Radar, UNIFORM KILO MIKE two zero two), [*reporting*] descending four thousand feet, heading three four zero.

ATC: UNIFORM KILO MIKE two zero two, Kiev, [*confirming*] identified, [*instructing*] present heading for intercept localizer runway

¹ Authentic script of aeronautical conversation.

three six right, descend altitude two thousand five hundred feet.

Pilot: [readbacking] Descend two thousand five hundred feet, intercept localizer runway three six right UNIFORM KILO MIKE two zero two.

Pilot: [reporting] Established localizer runway three six right.

ATC: UNIFORM KILO MIKE two zero two, [instructing] cleared ILS three six right.

Pilot: [readbacking] Continue approach, cleared ILS three six right UNIFORM KILO MIKE two zero two.

ATC: UNIFORM KILO MIKE two zero two, [instructing] contact Tower one one nine decimal three.

Pilot: UNIFORM KILO MIKE two zero two, [readbacking] one nine three.

In this example, the pilot informs the controller about descending and reports the descending level. The controller, in turn, confirms the level, informs the pilot about the required level for descending, and gives other instructions. They exchange the readbacks and the controller informs the pilot about next actions to undertake, namely, to contact the Tower. All turns in the example above are standardized by form, content and length. The adjacency pairs based on communicative functions are constructed as ‘instructing-readbacking’; ‘reporting-confirming’ and ‘requesting-advising’.

Different from ordinary conversation in ALI the adjacency pair can include a distant element, which is delayed due to operational procedure. In the above example of aeronautical talk these pairs are as follows:

‘instructing – readbacking-----reporting’;

‘reporting – confirming-----instructing’;

‘reporting – instructing-----readbacking’.

Pilot, in some way, depends on the Controller, he/she has to get approval from a controller to do actions after controller’s approval, agreement, confirmation; and it is significantly important to follow the prescribed scheme. Such standardization results in high degree of expectancy, which, however, is dangerous in case of non-routine turn of events. Then the radiotelephony participants may have a problem, which requires repair of communication.

Repair during ALI is not quite easy, because of the possibility of misunderstanding occurrence.

Repair is the phenomenon, which is based on repetition of the same phrase but with the corrected information. When an error in transmission occurs, the word correction must be spoken, the last correct phrase is repeated, and only after that the correct version of the message is transmitted. For example:

Pilot: Farstair 345 Akela 47 FL 280 Bavox 07... correction Bavox 57;

ATC: Fastair 345 Roger.

According to ICAO, in case when the receiving operator is in doubt whether the message he received is understood correctly, he shall request the repetition of either full or the part of the message [9]. There is a marker for requesting the repetition, namely ‘say again’. The scheme looks as follows:

Station: STATION CALLING [Station Name] [Station Type] SAY AGAIN YOURCALL SIGN.

Pilot: [Station Name] [Station Type] [Aircraft Call Sign].

ATC: STATION CALLING GRENOBLE TOWER, SAY AGAIN YOURCALL SIGN.

Pilot: GRENOBLE TOWER F-GBCD.

So, repairs in ALI is about letting the other receiving operator know about changes, correctness that follows, to draw attention to the mistake made and to repair it in a safe way.

The pilot’s and the controller’s responsibilities overlap on purpose in many areas in order to provide redundancy [13]. This shared responsibility is deliberate and it is crucially important when it comes to compensation for communication failures that might affect safety. Establishing an effective radio communication involves many elements that should be considered hand in hand.

Many factors correspond to one another, and more than one element usually participating in a breakdown of the pilot-controller communication loop.

It should be noted, that even if misunderstandings do occur, they are rather easily dealt with since both parties engaged in the conversation know what replies to expect from each other [14]. It happens on base of shared knowledge of the interactants

concerning both phraseology language and rules of radiotelephony exchanges. When both parties strictly follow the rules prescribed by ICAO, the communication problems rarely occur. Standard phraseology minimizes the chances of the message being misunderstood and with the assistance of the readback/hearback processes, any error is easily detected.

4. Conclusion

The purpose of the conversation analysis is to find the meaning and significance of linguistic devices and communicative strategies applied. It has been revealed, that in aeronautic language interaction, all parameters typical for everyday ordinary conversation are different due to specific conversational form, content and context related to the aeronautical procedures and due to strict regulations aimed at providing flight safety.

It is suggested, that in terms of conversation analysis, aeronautic language interaction can be interpreted as a self-regulated language communication system. This self-regulated nature of the communication is of paramount importance to maintain smooth conversation and minimize misunderstandings between a pilot and a controller.

However, having the idea about the peculiarities of aeronautical interaction, it is possible to go further in discourse studies to be more focused on specific conversational features and, thus, to increase overall quality of the aeronautical discourse analysis.

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Аналіз мовної взаємодії під час авіаційного радіообміну

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Точкою відправлення для дослідження є твердження, що метод аналізу діалогічної взаємодії мовців під час розмови має на меті розкривати внутрішні механізми аргументації, а також соціолінгвістичні компетенції, що лежать в основі утворення та інтерпретації повідомлень тих, хто спілкується, в їхній послідовності під час взаємодії. Цей метод аналізу набув популярності у дослідженнях усного дискурсу. Розглядаючи мовну взаємодію спілкування на макрорівні, стає очевидним, що лінгвістичне

дослідження спілкування авіаційною англійською при веденні радіообміну має розглядатись у цілісному дискурсі, що утворюється пілотом і диспетчером під час радіообміну «земля-повітря». Метою даної статті є вивчення діалогічної взаємодії учасників радіообміну англійською мовою шляхом співставлення з типовими рисами діалогічної взаємодії у звичайних повсякденних ситуаціях. Більше знань про утворення дискурсу під час радіообміну сприятиме кращому розумінню впливу англійського людського фактору на безпеку польотів.

Ключові слова: авіаційне спілкування; авіаційна фразеологія; аналіз діалогічної взаємодії; дискурс радіообміну; людський фактор; розмовна англійська

Е.П. Петрашук

Анализ языкового взаимодействия в авиационном радиообмене

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Точкой отправления для исследования является утверждение, что метод анализа диалогического взаимодействия участников разговора имеет целью раскрывать внутренние механизмы аргументации, а также социолингвистические компетенции, лежащие в основе образования и интерпретации сообщений участниками в их последовательности во время общения. Этот метод анализа приобрел популярность в исследованиях устного дискурса. Рассматривая языковое взаимодействие на макроуровне, становится очевидным, что лингвистическое исследование общения на английском языке при ведении радиообмена должно рассматриваться в целостном дискурсе, который образуется пилотом и диспетчером во время радиообмена «земля-воздух». Целью данной статьи является изучение диалогического взаимодействия участников радиообмена на английском языке путем сопоставления с типичными чертами разговора в обычных повседневных ситуациях. Больше знаний об образовании дискурса во время радиообмена будет способствовать лучшему пониманию влияния англоязычного человеческого фактора на безопасность полетов.

Ключевые слова: авиационное общение; авиационная фразеологія; анализ диалогического взаимодействия; дискурс радиообмена; разговорный английский; человеческий фактор

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