LANGUAGE ASSESSMENT OF AVIATION SAFETY THREATS AND RISKS

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The article focuses on language assessment of aviation safety threats and risks. The basic characteristics and specific features of radio exchange interaction have been accentuated. The gist of "a communication failure" has been examined. It has been emphasized various factors that cause a communication failure. The importance of researching professional competence of prospective aviation operators (pilots and air traffic controllers) has been justified. The typology of exercises for making the educational process of prospective aviation operators more effective is described. It also summarizes the findings on the students' language difficulties in the course of aviation English language training (language errors while using radio exchange phraseology; linguistic errors while using spoken language; audio errors; subject errors).

The article also discusses the introduction of the International Aviation Language Proficiency Requirements. It highlights ICAO standards and recommended practices concerning language proficiency requirements.

Key words: Aviation English, Aviation safety, Language assessment, Language difficulties, Radio exchange.

Aviation safety has become one of the most important issues of aeronautical system. Safety experts are constantly seeking means to improve safety in order to reduce the already low accident rates. Thus, in recent years more attention has been focused on human factors that contribute to accidents. Communication is one of them and the emphasis is placed on it, meanwhile the role of language proficiency and language use in aviation incidents and accidents are being covered.

Research has shown that studies in the field of aviation English language training covers a wide range of issues, though, not many have been done on the language assessment of aviation safety threats and risks; and not many have received a proper reflection in special literature. The studies considered the issue of specialists' training of radio exchange interaction only from the perspective of foreign language communicative competence of an aviation specialist. In our opinion, the analysis of radio exchange interaction peculiarities along with the process of formation the professional communicative competence of prospective aviation operators (pilots and air traffic controllers) will clarify the question of language assessment of safety threats and risks in aviation and open the prospects for students' self-realization in their future professional environment as well as in communication with foreign colleagues.

It is worth to mention that these days the training of students is provided under drastic global and national changes. Firstly, the outbreak of the COVID-19 pandemic which has created a new paradigm of 'life in social distancing'. In the sector of higher education most universities were forced to shift from conventional, face-to-face instruction to distance teaching and learning [1; 2]. Secondly, in light of the Russian Invasion of Ukraine and the threat the war poses on civilians, including academics and students who continue their work.

The objective of the current study is to consider the issue of language assessment of safety threats and risks in aviation, describing and analyzing the basic characteristics and specific peculiarities of radio exchange and the factors which cause a communication failure; highlighting the ICAO standards and recommended practices concerning language proficiency requirements; outlining the professional communicative competence of a prospective aviation operator and summarizing the students' language difficulties (language errors while using radio exchange phraseology; linguistic

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errors while using spoken language; audio errors; subject errors) in the course of aviation English language training.

To achieve the aim of our study, at the various stages of the research, the following methods were used: theoretical methods (analysis and synthesis, comparison and generalization, analogy), methods of structural-functional and systematic and activity approaches.

We assume that taking into consideration the specific features of radio exchange interaction, communication failures which can arise in the process of conducting radio exchange, the impact of various factors on communication failures; and understanding the typical students' errors while learning a professionally oriented language will minimize the probability and limit the language failures in their future professional field.

Radio exchange interaction, its characteristics, features, communication failures and the factors which cause them. The development of modern science and technology leads to the emergence of specialized spheres of human activity, which predetermines the emergence of specialized communication areas. The life of the communication participants depends on the level of proficiency in a professional sub-language. The language of professional communication of aviation specialists covers specific radio voice communication in the mode "air traffic controllers – aircrew" while operating a flight (flight communication); communication of aircrew with ground personnel (maintenance specialists, ground support crews, etc.) to ensure the organization of the flight and its safety (ground communication); communication with passengers usually done indirectly as aircrew announcements or directly in certain flights, if there arise situations in the cabin that require cockpit crew intervention to ensure flight safety. Thus, the aviation sub-speech provides the process of professional communication of aviators in preparation for the flight and in the process of its implementation.

Aviation English (also known as Radiotelephony, Airspeak, or Skytalk) is one of the varieties of language for professional or specific purposes (LSP – Language for Specific Purposes), invented for a field of aviation professional activity, which has specific features and is fundamentally different from General English (GE). In Aviation language special terminology is used to provide effective, clear, concise exchange of information. Besides, Aviation English has its own alphabet, and it consists not of letters, but of words. It has been invented in order to avoid misunderstanding due to noise or other situations. Pilots and air traffic controllers use these words to spell the letters and numbers in the message. The key in ensuring flight safety is air-ground communication, that is, radio exchange between the air traffic controller and the pilot. To ensure the safety of participants, it is necessary to comply with the rules of professional communication, which is considered a component of the professional reliability of air traffic controllers and pilots. The professional discourse of civil aviation radiotelephony interaction plays a significant part in providing safety both aircraft operation and traffic control as discussed by Petrashchuk [3].

Civil Aviation Radiotelephony Interaction (RTF), or Radio Exchange is realized in bilateral exchange of information by means of radio communication equipment between the aircraft crew and ground control services and/or other aircraft, as well as internal radio communication between crew members. The main communicative aim of RTF is successful interaction which includes informing (message), request, and control of the aircraft by ground services. To achieve the aim, aviation operators should be ready to use plain language in their professional environment – a more natural language and non-coded, used in emergency conditions during the flight, for example, such as flight into deteriorating weather or a medical problem of a passenger. It means that phrases of an aviation specialist under the circumstances of danger should be concise and understandable to take necessary actions. Moreover, his or her speech should not contain slang idioms and colloquial expressions.

Since interaction takes place over the radio, contextual conditions for aviation linguistic safety include some evident factors, such as "good working radio equipment, effective language competence assessments – particularly for international aviation" as discussed by De-Matteis [4].

The basic characteristics of radiotelephony interaction are the following as discussed by Kyrychenko [5]: 1) conciseness, which provides a concise expression of certain content with a minimum number of language tools; 2) clarity, or a clear demarcation of similar language means, which prevents their confusion; 3) unambiguity, for instance the use of language with a value that does not allow misinterpretation of the statement.

As a process of distant communication, radio exchange interaction has a number of its own specific characteristics: 1) perception of information about objects of control and the system itself (the process of looking for information, its

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decoding, extraction of significant information etc.); 2) processing of information (decision-making, highlighting problem situations, comparing them); 3) making a decision based on the data obtained in the process of analyzing the information; 4) conveying the information about the decision, the implementation of actions; 5) control of the conveyed information/command performed by the crew; 6) action coordination of the crew.

There are many features of radio exchange communications that make it more difficult for users of English as a foreign language. Firstly, communication in another language is stressful. Secondly, there is no visual contact using radio exchange, making it even more difficult than face-to-face communication, where we also receive information through non-verbal channels, including body language and facial expressions. Consequently, flight and airplane control in radio exchange communications with linguistic barriers and no visual cues leads to many stressful factors.

In the process of conducting radio exchange a communication failure can appear due to various factors: complexity of information, which leads to misunderstanding; psycholinguistic factors: inadequate anticipation of a situation; language factors: lack of knowledge of phraseology, incorrect pronunciation of English words or the co-speaker has a strong accent; psycho-physiological factors: distraction due to fatigue and switching from one problem to another, stress; technical factors: technical problems with connection that causes obstacles and bad audibility in the air. In such conditions "the crew may lose their communication reliability and adequacy, revealing the traditional elements of frustration: confusion, lack of emotional stability, loss of courage and determination, volitional qualities, resistance to long-term monotonous work, reduced attention functions when reacting to information, switching to native language in extreme situations and emergencies" as discussed by Moskalenko [6]. One of the difficulties for both pilots and air traffic controllers that lead to a communication failure is to distinguish voices sounding at the same time. So, the content of English language training of aviation operators, includes necessary working procedures, basic speech intentions and typical ways of their implementation, lexical and grammatical units used in these communicative situations.

ICAO policy on language proficiency. Flight safety is ensured both by the performance of high professionalism and mobilization readiness of pilots and air traffic controllers to act either in standard or in emergency situations. Accident investigators found a common contributing element: insufficient English language proficiency on the part of the flight crew or a controller had played a contributing role in the chain of events leading to the accident. Any failure or mistake in perception or transmission the information in English contains a serious risk of regular operation system disruption "Dispatcher – Crew – Aircraft – Environment" and, thus, poses a threat to flight safety.

The analysis of aviation events related to the "human factor" in the operation of the "Dispatcher – Crew – Aircraft – Environment" system using the English language has become a serious argument for ICAO to consider aviation English as one of the risk factors along with errors in piloting, aircraft failures, difficult meteorological conditions, etc. Prior to the introduction of the Common English Language requirements by ICAO, it was also possible to fly and navigate air traffic without English. "There were times when one flight crew member could speak English and air traffic controllers worked with the help of an interpreter" as discussed by Grynyuk [7]. The initial reason for ICAO's decision to develop standard rules for the use of the English language was the resonant catastrophes.

In March 1977 at Tenerife Airport, when 583 people died in a collision at the runway when two B-747s of KLM and PanAm took off. This catastrophe is still the largest casualty rate in world civil aviation. In investigating the crash, it was found that the participants had different levels of aviation English, and there was a misuse of common English phrases in those cases where only standard phraseology was to be used. In 1978 another "language" catastrophe followed already in the air, when the British Trojan 38 and the Yugoslavian DS-9 collided in the zone of responsibility of Zagreb ATC. At the most critical moment, in the conditions of intensive air traffic, the air traffic controller turned to Croatian instead of English. At that time, it was the biggest airplane collision in the civil aviation. There were also cases when pilots in the Spanish and French skies moved from English to Spanish or French. At the same time, English-speaking pilots became "lazy" and did not use the correct phraseology while communicating with air traffic controllers [7; 9].

ICAO had to pay very serious attention not only to details, but also to the depth of aviation English proficiency of pilots and air traffic controllers. In 2000, the Proficiency Requirements in Common English Study Group (PRICESG) convened for the first time. PRICESG was established by

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the Air Navigation Commission to assist ICAO in advancing the language competency task, which included, among other elements, the following aspects: 1) to carry out a comprehensive review of existing provisions concerning all aspects of air-ground and ground-ground voice communications in international civil aviation, aimed at the identification of deficiencies and/or shortcomings; 2) to develop ICAO provisions concerning standardized English language testing requirements and procedures; 3) to develop minimum skill level requirements in the common usage of the English language [8].

Concern over the role of language in accidents led to the adoption of ICAO Assembly Resolution A32-16, in which the ICAO Council was urged to direct the Air Navigation Commission to consider this matter with a high degree of priority and complete the task of strengthening relevant ICAO provisions concerning language requirements, with a view to obligating Contracting States to take steps to ensure that air traffic control personnel and flight crews involved in flight operations in airspace where the use of the English language is required are proficient in conducting radiotelephony communications in the English language. Thus, in March 2003, the ICAO Council adopted a set of Standards and Recommended Practices (SARPS), which increased the English language proficiency requirements for pilots and ATC air traffic controllers involved in international flights. According to these English proficiency requirements, the ICAO standard phraseology should be used whenever possible, and when the phraseology is not applicable, ATC pilots and air traffic controllers should demonstrate a minimum level of spoken language proficiency. From 5 March 2008, ATC pilots, ATC air traffic controllers and aircraft station operators were to demonstrate an ability to speak and understand the language used for radio exchange communications, due to the ICAO Scale 4 holistic criteria and language proficiency scale. The purpose of the ICAO language proficiency requirements is to ensure that the language proficiency of pilots and air traffic controllers is sufficient to reduce miscommunication, allow pilots and air traffic controllers to recognize and solve potential miscommunication. The language should be a tool to identify and solve a potential problem before it becomes a disaster. Rather than language playing a contributing role, the object of ICAO language proficiency requirements is for language to play a problem-avoiding role.

The language proficiency requirements and Rating Scale were developed to assess speaking and listening proficiency for aeronautical radiotelephony communications. The requirements were also developed for use in assessing proficiency in all languages used for radiotelephony communications. The scope and focus of the ICAO Language Proficiency Rating Scale are specific [8]: the ICAO Rating Scale addresses only spoken language; it does not address reading and writing skills;

– the ICAO Rating Scale has a distinct aeronautical radiotelephony focus; it addresses the use of language in a work-related aviation context, voice-only communications, using strategic competences for safe communications in case of complications or unexpected turn of events, and emphasizing intelligibility in an international community of users;

– ICAO Operational Level 4 does not target high degrees of grammatical correctness or native-like pronunciation. Grammar, syntax, vocabulary and pronunciation are judged primarily to the extent that they do not interfere with effective oral communication;

– the final rating is not the average or aggregate of the ratings in each of the six ICAO language proficiency skills but the lowest of these six ratings.

The enhanced language proficiency requirements had been adopted precisely to improve the reliability of radio communications in situations where the standard phraseology was not sufficient. ICAO Member States should ensure that their use of phraseology is as close to the standard ICAO phraseology as possible. Standard phraseology is the minimum required level of professional communicative foreign language competence. Native speakers and other experienced users of English should be aware of the dangers, learn strategies to improve intercultural communication, refrain from using idioms, colloquialisms and other jargon in radio exchange communication, and adjust the rate of speech. The minimum level of English proficiency for an aviation specialist is level 4 on the ICAO scale – Operational. An aviation specialist who masters level 4 should have a clear and good pronunciation, correct stress, rhythm of speech and intonation. Speech tempo isn't slow; the speaker should be ready for spontaneous conversation. "Answers are usually immediate, accurate and informative" as discussed in ICAO Manual [8]. Since ICAO requires the mandatory use of English "at the request of any aircraft station and at all ground stations serving their assigned airports and routes that are used to provide international air communications", and most flights operated by Ukrainian airlines are operated ATC

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bodies in the airspace of our state are international, then the language of radio exchange for Ukrainian pilots and air traffic controllers is English, that is, a foreign language that is specially studied by these specialists in order to become an instrument of their reliable and effective professional activity. Thus, the main goal of prospective air operators' training is the formation of professional communicative competence.

Formation of professional communicative competence of a prospective aviation specialist. Today special requirements have been put forward on a modern aviation specialist – a professional who is able to solve problems of theoretical and practical significance, make decisions in different situations, and have emotional resistance to extreme conditions in the field of aviation professional activity. It implies that prospective aviation pilots and air traffic controllers should have sufficient knowledge of English to perform their professional activities [9; 10; 11; 13].

A communicative approach is focused on learning through communication and forming a professional, who can speak fluently, discuss topics referring his professional activity without difficulties, etc. A competence-based approach presupposes the orientation of professional education. The main requirement in the implementation of competence-based approach is to create conditions for students to solve problems, give them the opportunity to see their achievements. The recommendations of the Inter-Aviation Committee indicate the need to develop "targeted comprehensive programs on all aspects of the influence of the human factor on flight safety" as discussed elsewhere [9; 12; 13].

Communicative and competence-based approaches play a significant role in the formation of prospective aviation specialists' communicative competence which defines the degree of their readiness to future professional activity. Communicative competence of prospective pilots and air traffic controllers consists of professional knowledge, skills and abilities: ability to solve problems which occurs in professional and socio-cultural language environment as discussed elsewhere [9; 10; 11; 13].

The analysis of radio exchange interaction peculiarities and the requirements for professional communicative competence allow us to model the typology of exercises for pilots and air traffic controllers' professional training. While elaborating the complex of exercises we took into account the following aspects: psycholinguistic features, information overload, high pace of work, work in stressful conditions, the pilot's dependence on extra-linguistic factors influencing the quality of radiotelephony interaction etc.

In our opinion, the described below exercises can facilitate the air operators' training process and help coping with real difficulties of professional communication: 1) exercises to develop pronunciation skills: fluency, pace, emphasis of words, clarity of pronunciation; 2) exercises to develop the ability to perceive messages under adverse conditions: due to various obstacles and specifically created difficulties (the numbers in reverse order, simultaneous listening of two different texts, etc.; 3) exercises to develop listening skills (listening to and understanding a fragment of radiotelephony interaction, using knowledge of the basic phraseology of RTF, code words, forecasting, etc.

It is necessary to take into account such a feature of their professional communication as complete dependence on third-party factors that affect the quality of radio traffic: a factor of time; insufficient operational information, poor quality of communication intelligibility surprise. The way to overcome their impact on communication is to form the psycho-physiological and communicative readiness of the dispatcher for radio exchange based on exercises that simulate the specific features of real communication. The development of exercises implies the possibility of training on the basis of a training dispatch simulator, which allows visualizing all controlled objects, setting them the necessary characteristics (speed, direction, etc.) and practicing the required communication skills [9; 11]. However, within the framework of a professionally oriented language course, this opportunity is far from being accomplished due to a number of technical and organizational reasons. Teachers often have to simulate working conditions directly at their classes using classical teaching aids (textbook, audio player, etc.). To overcome the teaching and learning difficulties in this case, we can recommend the following types of exercises for: 1) the development of listening skills (phonetic dictation – an audio cut from call signs, reported by pilots of different nationalities; listening to the "pilot-controller" conversations to identify the correct confirmation by the pilot commands issued to him; listening to the "pilot-dispatcher" conversations to compare the incoming audio information with the proposed visual support (map, flight path diagram, telegram, scenario) and identify inconsistencies; 2) the spatial representation of the air situation in a specific area

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of responsibility (students are invited to listen to the pilot's report and the "pilot-dispatcher" to record navigation information of aircraft, speed, altitude, courses, manoeuvres, time; construct the trajectory of the aircraft in a longitudinal or vertical profile; analyze the potential for controlling the aircraft based on the proposed scheme of the responsibility area, issued meteorological conditions); 3) memory (oral counting in the mind, snowball game; listening to multi-component reports of pilots, "pilot-dispatcher" negotiations aiming at confirming the received information or retelling without written recording); 4) communication skills (drawing a situation; listening to an excerpt from the "pilot-controller" conversations without the initial and final replicas of the pilot and the controller to restore the situation; playing the situation by roles).

Language difficulties the Ukrainian students encounter while learning the Aviation English. Language errors, in both understanding and speaking, are failures to comply with a norm of the language system or subsystem being used. Errors may be isolated to one language item or negatively affect the meaning of a whole message. However, inevitable language errors should always be considered and judged in the wider context of miscommunication or failure to communicate successfully [7; 14; 15; 16; 17; 18]. Knowing and understanding the language difficulties will apparently enable students to prevent from making mistakes, and can be avoided in their professional activity. Thus, regardless of the radio exchange language registry being studied, prospective pilots and air traffic controllers encounter two types of errors – language and subject.

Language errors while using radio exchange phraseology [19; 20; 21; 22; 23] occur in incorrect reading of numbers: flight level one hundred (instead of one-zero-zero), heading one-eighty (instead of one-eight-zero).

1. Lexical errors are as follows: mixing of words and expressions close in meaning but different in use: cleared/approved, confirm/affirm/acknowledge, maintain/continue, and replacing radio phraseology units with spoken language: pick up heading 130, wait for start-up, report in what weather conditions you are flying now (Report flight conditions), etc.

2. Grammatical errors include violation of word order and omission of significant parts of the grammatical structure: Air France 1053, foreign object on the runway – stop immediately (instead of Stop immediately, Air France 1053, stop immediately, foreign object on the runway), and extension of the stable phraseology units by means

of a commonly used language: Expect departure at 05 minutes (instead of Expect departure at 05).

Linguistic errors while using spoken language [25; 26; 27; 28] include lexical errors: mixing of words, terms and expressions similar in meaning but different in the situation of using them: height/flight level/altitude, over/above.

1. The use of "pseudo-international" words (so-called "false friends of the translator"): shassee (instead of gear), trap (instead of steps/stairs), telescopic trap (instead of jetway), cabin (instead of cockpit).

2. Errors in preposition: on what flight level did you experience moderate turbulence? (instead of what flight level...); Are you able to reach FL340 via BUKET? (instead of by BUKET); Expect departure in 55 (instead of at 55).

3. Mixing parts of speech and/or replacing with cognate words: Roger, you're too height for the approach (instead of high); What assistant do you need? (instead of assistance); Report fly conditions (instead of flight).

4. Grammatical errors consist of errors in verb forms: I hadn't your flight plan; are you expect? Have you come back?

– word order errors: This information gave our neighbor sector (Our neighbor sector gave this information);

– errors in selecting a subject: *There* is your marshaller left of you (Your marshaller is left of you);

– errors in noun number selection: Roger, passengers with heart attack (instead of passenger).

5. Audio errors include errors in numbers and letters: Alfa/Tango/Echo, Echo/X-ray, Bravo/Papa, 650/6500, and errors in the perception of phrases based on misunderstanding a word or phrase, presented in the Table 1:

Subject errors begin with the formation of spontaneous false beliefs while ;acquiring subject knowledge of the specialty [28; 29; 30; 31]. If they are not corrected, they appear systematically in unrealistic commands: (P) Request immediate return to the field. – (C) Roger, you need to return, make three-*sixty* turn. (C) *Maintain* FL 160, *descend* at your discretion to FL 120. (P) Request immediate return to Helsinki – (C) Roger, make right *turn* 190 degrees.

According to statistics, almost 80 percent of aviation accidents and incidents are somehow connected with the imperfect communication and speech interaction of aviation operators. One of the leading areas of professional activity of aviation specialists is a professional communication, which is considered a component of their professional

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Table 1 – Examples of errors in the perception of phrases based on misunderstanding a word or phrase

What was said by the pilot	What was heard
We'll have to descend slowly	We'll have to descend to ULLI
We have no emergency	We have an emergency
We'll expect a tug	We'll expect attack
There's some music on the frequency	There's some military on the frequency
Please, inspect our stand	Police expect us to stand
We have sparks on the right-hand side of the aircraft	We have a pax on the right-hand side of the aircraft
We have a quite rude man on board	We have a flight route plan on board
We'll continue holding with other circuits	We'll continue holding without circuits
The passenger's become better	The passengers come back
We do need a tug	We don't need a tug

reliability. Thus, the knowledge of professional English has been defined as one of the crucial factors for a modern aviation specialist, which affects aviation safety. The conducted research proved that the effectiveness of teaching English to aviation students depends on the following points: pedagogical conditions, modelling the situations applicable to aviation specialists' professional environment, the use of authentic materials at classes, and clear material selection which encourage the formation of aviation specialist professional communicative competence. However, we understand that they do not cover the problem fully and, more likely, there are other dimensions which need to be studied and, possibly, be the prospects for the further research of this issue.

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МОВНА ОЦІНКА ЗАГРОЗ ТА РИЗИКІВ БЕЗПЕКИ АВІАЦІЇ

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Стаття присвячена мовній оцінці загроз та ризиків безпеки авіації. Акцентовано увагу на характеристиках та особливостях радіообмінної взаємодії. Розглянуто суть «комунікаційного збою». Наголошено на різних факторах, які спричиняють збій зв'язку. Обґрунтовано важливість дослідження професійної компетентності майбутніх авіаційних експлуатантів (пілотів та диспетчерів). Описано типологію вправ для підвищення ефективності навчального процесу майбутніх авіаційних операторів. Він також узагальнює висновки щодо мовних труднощів студентів під час навчання авіаційної англійської мови (мовні помилки під час використання фразеології радіообміну; мовні помилки під час використання розмовної мови; звукові помилки; тематичні помилки). У статті також розглядається запровадження Міжнародних вимог володіння авіаційною мовою. Він висвітлює стандарти ІКАО та рекомендовану практику щодо вимог володіння мовою.

Ключові слова: авіаційна англійська мова, авіаційна безпека, мовна оцінка, мовні труднощі, радіообмін.

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