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# Analiza frazeologii Organizacji Międzynarodowego Lotnictwa Cywilnego (ICAO) używanej przez pilotów podczas komunikacji z kontrolerami ruchu lotniczego w rutynowych sytuacjach

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# Analysis of ICAO Phraseology Used by Pilots in Routine Communication with Air-Traffic Controllers

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**Oświadczenie kierującego pracą**

Oświadczam, że niniejsza praca została przygotowana pod moim kierunkiem i stwierdzam, że spełnia ona warunki do przedstawienia jej w postępowaniu o nadanie tytułu zawodowego.

Data Podpis kierującego pracą

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Oświadczam ponadto, że niniejsza wersja pracy jest identyczna z załączoną wersją elektroniczną.

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**Streszczenie**

Lotnictwo cywilne ma stosunkowo krótką historię, lecz od samego swojego istnienia problemem była komunikacja między pilotami a osobami na ziemi. Dzięki powstaniu Organizacji Międzynarodowego Lotnictwa Cywilnego (International Civil Aviation Organisation, ICAO), która opracowała i wdrożyła wiele przepisów dotyczących bezpieczeństwa, w tym obowiązku używania języka angielskiego w międzynarodowej komunikacji lotniczej, kwestia łączności uległa znacznej poprawie. Mimo to błędy w komunikacji między pilotami a kontrolerami ruchu lotniczego nadal stanowiły problem i doprowadziły do wielu katastrof. Problematyka stosowania języka angielskiego lotniczego zwróciła uwagę ICAO i w konsekwencji doprowadziła do ustanowienia standardowej frazeologii lotniczej, która składa się ze starannie dobranych zwrotów stosowanych konkretnych sytuacjach. Personel lotniczy, a w szczególności piloci oraz kontrolerzy ruchu lotniczego powinni stosować się do zaleceń ICAO i używać standardowej frazeologii podczas komunikacji głosowej. Celem niniejszej pracy jest ustalanie, czy piloci używają standardowej frazeologii w poprawny sposób oraz w jakiej formie występują odstępstwa od jej stosowania. Podstawą do napisania niniejszej pracy była analiza 33 transkrypcji rozmów między pilotami a kontrolerami ruchu lotniczego w sektorze „Warszawa Zbliżanie”.

**Słowa kluczowe**

frazeologia lotnicza, język lotniczy, komunikacja, kontroler ruchu lotniczego, lotnictwo cywilne, łączność radiowa, pilot

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Analysis of ICAO Phraseology Used by Pilots in Routine Communication with Air-Traffic Controllers

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# 1. Introduction

Civil aviation has a relatively short history, but it definitely revolutionised the way we travel nowadays. At present passenger planes are one of the safest means of transport owing to worldwide standardised regulations and recommendations. (Washington Post Online) One of the key parts of this domain is undoubtedly communication. This aspect has also undergone a standardisation and therefore English is used as a common language for communication between pilots and air-traffic controllers worldwide.

In order to minimise the risk of errors and to render communication between pilots and controllers clear, effective and unambiguous, the International Civil Aviation Organisation (ICAO) issued a list of standard words and phrases, the so-called standard phraseology, to be used by aviation personnel. Because of the fact that flight crews communicate with air-traffic controllers using voice-based radio technology, which is prone to interference, interlocutors ought to use standard phraseology in all applicable situations so that the risk of misunderstanding is reduced. Departure from standard phraseology and use of non-standard words and phrases is often the main factor of aircraft incidents and accidents.

In this essay I analyse whether pilots comply with ICAO recommendation and use standard phraseology. I am fully aware that in everyday routine working life pilots use standard phraseology, but sometimes depart from its usage and implement plain English i.e. non-standard phraseology. My research questions are:

1. Do pilots use standard phraseology in all applicable situations? If yes, do they use it in the proper context with correct meanings?
2. If not, what types of deviations from standard phraseology occur?

My thesis consists of six chapters: (1) Introduction, (2) Background, (3) Towards linguistic aspects of aviation communication, (4) Data & Method, (5) Results, (6) Conclusion.

In Chapter 2, I describe the history of radio communication in aviation industry from the very beginning till technology used nowadays. Additionally, I present principles of pilot-controller communication and stages of a flight. We will also look into the aspect of safety in aviation and fatal consequences of pilot-controller miscommunication.

Chapter 3 presents the International Civil Aviation Organisation (ICAO) as well as

linguistic aspects of aviation communication. We will define Aviation English and look into its grammar and phonetics. Further we will also learn what exactly standard and non-standard phraseologies are and present possible sources of misunderstandings in pilot-controller communication.

Chapter 4 is devoted to data and method used for the analysis of transcripts. It describes the collected transcripts and presents quantitative and qualitative approaches to data analysis.

In Chapter 5, I reveal results of the conducted analysis divided into findings from quantitative and qualitative analysis. Interesting examples from the collected transcripts are presented and discussed in more detail.

Chapter 6 summarises the whole thesis and draws conclusions from the results. The essay finishes with a list of references used in the text.

# 2. Background

This chapter consists of two sections and two subsections. The purpose of Section 2.1 is to familiarize the reader with the brief history of wireless communication in the aviation industry. Section 2.2 is an overall view of organisational aspects of modern aviation communication, i.e. it presents what pilot-controller communication looks like nowadays, as well as how the plane is supervised at all stages of its flight. There are also two subsections to Section 2.2, namely Section 2.2.1 discusses the importance of safety in aviation, while Section 2.2.2 looks into fatal results of pilot-controller miscommunication.

## 2.1 History of wireless communication in aviation

Let us start with the presentation of the evolution of air-to-ground communication and its function in the civil aviation industry.

Flying was a dream for many people from the very beginning of our civilization. Many attempted to build flying machines, but to no avail including Leonardo da Vinci - the famous Italian Renaissance scholar, who was fascinated by the phenomenon of flight. He designed a large number of mechanical devices such as parachutes, studied the way birds fly and drew a detailed project for a human-powered wing-flapping machine that was supposed to fly. (J. D. Anderson, 1997, p. 20)

The first ones to actually build and fly the plane were the Wright brothers. They made the first controlled, manned flight on December 17, 1903. The flight covered only 120 feet (37 m) in a little over 12 seconds from take-off. (J. R. Hansen, 2003, p. 27) Nevertheless, from this event on there has always been a question of how to communicate with pilots in the air.

From the very beginning of the aviation history, the air-to-ground communication was difficult. Ground crews used hand signs, coloured paddles and other visual aids. Admittedly, these were effective ways of communication for ground crews, but they gave pilots a very limited chance to communicate back. "Airmen used to lower one wing to signal that they were coming into land on the next sweep past." (D. Stacey, 2008, p. 105) This technique could certainly lead to numerous misinterpretations and the number of messages was confined to one. (D. Stacey, 2008, p. 105)

With the development of technology at the beginning of the twentieth century, planes were outfitted with telegraph systems to send messages in Morse code. (K. Beauchamp, 2001, p. 257) The wireless telegraphy was first put into experimental use by the Royal Flying Corps and the Royal Naval Air Service. (C. H. Sterling, 2008, p. 11) This technology, however, was highly unreliable, the equipment was heavy and the signal could be easily intercepted by the enemy. Therefore, the fighter aircraft of World War I were not regularly equipped with wireless systems. (Britannica online) Large panel cut outs were used to identify friendly forces and navigate back to friendly airfields instead. (C. H. Sterling, 2008, p. 10)

In 1917, the first recorded, successful air-to-ground and ground-to-air radio transmissions were performed following the invention of the first American air-to-ground radio transmitter by AT&T (AT&T online), enabling ground personnel direct voice communication with pilots instead of using Morse code.

The first radio transmission system used for civil aviation purposes was installed in Croydon, England in 1927. It had only one channel and the principal uses of this facility were weather information, estimated times of arrival and position reports. (R. J. DeMik, 2008, p. 17)

In the 1930s, radios became reliable enough and had enough power to be installed on the planes as standard equipment. At the same time, the International Commission for Aerial Navigation required that all aircraft with a capacity of more than 10 passengers should carry a wireless equipment. (M. Carol, 2012, p. XX) Up to then only military planes assigned for scout missions required radios.

By 1935, about twenty radio control towers were operating across the globe. The first transmitters enabled voice communication with flight crews over a distance of about fifteen miles. Pilots were able to maintain communication with controllers at night and during bad weather conditions. There were, however, many limitations in the system, including finite area of transmission, high unreliability of the equipment, high cost and, most of all, lack of standardized rules and phrases to be used for voice communication. (R. J. DeMik, 2008, p. 17-18)

In the 1940s, the need for a reliable equipment for communication between ground and aircraft was growing. At the same time the reliability was increasing. With the invention of the jet engine at the end of World War II, a new aviation era of long distance travel arrived. Then with the formation of International Civil Aviation Organisation (ICAO) in 1947 (see Section 3.1) it was noted that a more structured perspective to

communication in aviation was necessary. (D. Stacey, 2008, p. 106)

In parallel to the formation of ICAO and following its influence, the Aeronautical Mobile (Route) Service was established. The new AM(R)S system was operated in an open way, i.e. when the air traffic control (ATC) (see Section 2.2) or mobile transmitted, the 'broadcast' was received by all radios in a range. It was a great operational advantage because everyone listening to the transmission could be aware of what was going around. The same principle is used nowadays (see Section 2.2). An air-traffic controller 'broadcasts' the message to each and every plane on the frequency, but it is usually intended for one only. (D. Stacey, 2008, p. 106)

At the time, the system had one disadvantage. Only 70 channels could be accommodated in it and only one transmitter could be operated on the channel on one occasion. As the growth in civil aviation continued, the market demand grew and in some parts of the world the 70 channels were not enough. With the development of technology, the increase of the number of channels was possible with 140 channels available in the 1950s, 360 in the 1960s, till theoretical 760 channels achievable in 1979. Due to the further channel split in 1996, 2280 channels are now available. The total of 2280 is 'theoretical' because this number cannot be reached for a lot of reasons, such as keeping some of the channels adjacent to protected or high-priority services sterile e.g. airfield or sector ATC frequencies. (D. Stacey, 2008, p. 106-108) Let us dwell more on modern aviation communication in Section 2.2.

## 2.2 Pilot-controller communication and ATC role nowadays

The purpose of this section is to outline basic air-traffic control functions and describe how the plane is supervised at all stages of its flight.

At present, communication between flight crews and air-traffic controllers is still dependent on voice-based radio technology. Simplex communications are used in the vast majority of ATC (air-traffic control) systems i.e. when one person is transmitting, the frequency is unavailable for others to use. (R. J. DeMik, 2008, p. 18) Because of this fact, messages have to be as short as possible.

Also a radar is used to track planes in the air and determine distance, direction, speed, altitude and even type of aircraft. All the planes in the air are under precise supervision of air-traffic control towers across the globe, except for uncontrolled airspace

which is classified and designated in accordance with ICAO rules and needs of the given country. (ICAO, 2001, Section 2.6)

Every single commercial plane must be equipped with a transponder – a device, which helps to identify the machine by sending a signal to the tower. An air-traffic controller can see the speed, altitude, direction, type of aircraft and the call sign. Transponders are used to avoid collisions with other machines as well as with the ground.

Each plane supervised by the ATC must hold a call sign – a code that distinguishes the aircraft from others in the air space. It consists of the characters corresponding to the registration marking of the aircraft; or the telephony designator of the aircraft operating agency, followed by the last four characters of the registration marking of the aircraft; or the telephony designator of the aircraft operating agency, followed by the flight identification. (ICAO, 2007b, Section 2.7.2)

The main aim of Air-Traffic Control (ATC) nowadays is to prevent collisions between aircraft and in the manoeuvring area between aircraft and obstructions, organize, expedite and maintain an orderly flow of air traffic and provide information and other support for pilots. ATC service is provided worldwide by controllers from the ground in controlled airspace and in airport manoeuvring areas. An advisory service can be provided to aircraft in uncontrolled airspace as well. (ICAO, 1996, pp. 1-3)

To ensure safety to plane operations and prevent collisions, Air-Traffic Control requires separation rules between the aircraft to ensure a minimum amount of empty space around the machine is maintained at all times. Many aircraft are also equipped with the anti-collision system e.g. TCAS, which warns the flight crew if the plane gets too close to other aircraft. (FAA, 2011, p. 5)

Contingent upon the airspace class as well as type of flight, ATC may deliver either instructions that pilots have to obey or advisories that the flight crew may disregard. The pilot in command (PIC) may not obey the ATC instruction in an emergency as she or he is the only authority for the safe operation of the plane. (ICAO, 2007a, Section 4.5.1)

There are boundaries of controlled airspace with clearly designated areas. These include local control provided at the airport. It is usually divided into ground-taxi, tower and departure at larger airports, but may be combined at smaller airports. Local control is in charge of the 'movement' and restricted areas of the airport, which consist of aprons, taxiways, runways, holding areas etc. and giving clearances for take-offs and landings providing required runway separation at any time. Should the local controller identify any unsafe condition, a plane may be instructed to abort the take-off roll or go-around

(discontinue landing). After take-off, the tower/departure controller transfers responsibility for the flight to an en-route controller, who is responsible for providing the service to planes in flight between airports ensuring that separation procedures between aircraft are complied with. As soon as the aircraft reaches the borderline of a centre's controlled area it is 'handed over' to another control centre. After the hand-over, the flight crew changes the radio frequency and starts talking to the next controller. As soon as the plane is ready to descend to its destination, the en-route controller transfers the plane to the appropriate approach controller, who directs the machine down to the final approach and the touch down on the runway. Then the flight crew is informed about the appropriate tower/ground frequency and given further instructions to turn to a particular taxiway and move towards the assigned parking location. (S. W. Hinrich, 2008, pp. 75-76) Each part of the flight is the responsibility of a different controller. For example, a flight crew of a flight from Toronto to Montreal with the distance between these cities being about 500 km, will communicate with 15 various controllers on the route. (D. Morris, 2007, p. 96)

### 2.2.1 Safety

In this section, we discuss the safety issue in the aviation industry with the emphasis on communication problems.

As a result of globalisation, the air travel became one of the most common means of transport. In the last past-half century the yearly number of international air travellers grew from 25 million in 1950 via 664 million in 1999 (A. Tajima, 2004, p. 451) to almost 3.3 billion in 2014. Furthermore, it is predicted that the number will reach 7 billion by 2034. (IATA, 2015, press release No. 55, online) Air transportation is extremely significant for the massive movement of people. In this particular area safety is essential. Huge efforts have been made to improve the whole air transport system in order to achieve a high level of safety including navigation aids, aircraft, aerodromes and maintenance facilities. In spite of all the steps taken, tragic air accidents still occur. Miscommunication is one of the major factors that contribute to accidents. Errors in communication, in particular between air-traffic controllers and pilots pose a very serious danger. (A. Tajima, 2004, p. 451)

Voice communication is of great flexibility allowing both the flight crew and the air traffic controller a vast amount of information exchange quickly in busy airspace. This advantage can, however, cause many problems including ambiguity and misunderstanding,

which lead to fatal results. (A. Tajima, 2004, p. 451, see Section 2.2.2) This common problem stimulated the development of many new strategies and technologies to eliminate communication issues and keep the crowded skies safe. The civil aviation of nowadays is full of complicated rules and regulations that are introduced early in training of pilots and air traffic controllers. (D. Morris, 2007, p. 94)

In 1951 the International Civil Aviation Organization (ICAO) recommended in "ICAO Annex 10 ICAO (Vol I, 5.2.1.1.2) to the International Chicago Convention" that the English language be used always for "international aeronautical radiotelephony communications." In order to eliminate the language barrier, this crucial recommendation was broadly approved.

### 2.2.2 Fatal miscommunication

This section is devoted to an example of miscommunication between pilots of two planes and an air-traffic controller that led to the tragedy.

In order to showcase the importance of pilot-controller communication let us now present an example of a tragic accident that resulted from communication issues i.e. a fatal runway collision between two Boeing 747s on the 27$^{th}$ March 1977 that took place on the Spanish Island of Tenerife (Los Rodeos Airport). A disastrous chain of numerous mistakes with a great influence of miscommunication led to the tragedy. When a Pan Am Boeing 747 was taxing down the runway in a thick fog, a KLM 747 had already lined up at the end of the same runway. KLM first officer radioed the tower that they were "ready for take-off". Shortly after this transmission, the KLM crew received after-take-off instructions concerning the route, but not including the take-off clearance. The first officer read the flight clearance back adding that they were "at take-off now". The controller replied "OK", which only made the KLM crew more certain that they received the take-off clearance. The Dutch Boeing began its roll down the runway. The controller then immediately added "stand by for take-off, I will call you" signalling that he had not given the KLM crew clearance for commencing the take-off roll. At the same time the Pan Am crew radioed that they were "still taxiing down the runway!". Both transmissions were unfortunately blocked by the interference on the frequency and KLM crew could not hear the most crucial information. Eventually, the Dutch Boeing collided with the Pan Am machine at a high speed killing 583 people. It is the deadliest accident in aviation history.

Among many consequences after the crash there was the implementation of the rule not to use the phrase 'take-off' until actual take-off clearance is given or cancelled. Up until that point, aircrews and controllers should use the phrase 'departure' in its place. Additionally, a readback of the key parts of the instruction is required instead of colloquial 'roger' or 'ok'. (ALPA, n.d., pp. 26-28; Aviation Safety Network online)

In Chapter 3 we will take a closer look at the most important aviation regulatory agency, its recommendations in terms of pilot-controller communication and language requirements. We will also define and describe the language used by aviation professionals and show factors that can contribute to pilot-controller communication problems.

# 3. Towards linguistic aspects of aviation communication

This chapter deals with linguistic aspects of aviation communication and is divided into five sections. Section 3.1 describes the International Civil Aviation Organisation (ICAO), its role and competences in the aviation industry. Section 3.2 deals with Language Proficiency Standards introduced by ICAO, while Section 3.3 presents the principle of pilot-controller communication, namely the 'communication loop'. Section 3.4 focuses on linguistic aspect of communication between pilots and controllers. It includes a description of the language used by aviation professionals, its grammar and phonetics. Moreover, we present a list of words and phrases that are supposed to be used by both pilots and controllers, i.e. the so-called 'standard phraseology' and briefly describe its contradiction, namely 'non-standard phraseology'. Additionally, we present how words and phrases are used during selected stages of a flight. Finally, Section 3.5 shows possible sources of misunderstandings in pilot-controller communication.

## 3.1 ICAO and its role in aviation

This section describes the most important and influential aviation regulatory agency and its aims for the civil aviation industry.

International Civil Aviation Organisation is a specialized institution of the United Nations and was founded on the 4th April 1947. It systematizes rules and procedures of international air navigation, develops policies and standards as well as supports the development of international air transport to provide safety of operations. ICAO approves recommended practices regarding infrastructure, flight inspection and prevention of unlawful interference. The organisation also clarifies certain function for operation in the air travel industry including air traffic management, navigation, aeronautical message handling and undoubtedly communication. It specifies the protocols for air accident investigation as well. ICAO gathers 191 member states, which signed the Chicago Convention (Convention on International Civil Aviation) and industry groups whose common goal is to provide safe, efficient, secure, profit-making and environmentally friendly civil aviation industry. (ICAO online)

ICAO is also the most important authority for establishing and regulating official

aviation phraseology for civil and commercial aviation. One of its major tasks was to create and publish official phraseology to be used by pilots and controllers as a universal language for international flights. [A broader description of ICAO phraseology and glossary can be found in Section 3.4.4]. In many countries there are other agencies that contribute to regulating the language used by pilots and controllers e.g. the Federal Aviation Administration (FAA) in the United States or the Civil Aviation Authority (CAA) in the United Kingdom. All American flight crews, however, are supposed to comply with ICAO standards if they differ from FAA rules. (S. W. Hinrich, 2008, p. 72)

## 3.2 ICAO Proficiency Standards

This section focuses on language competence requirements imposed by ICAO.

ICAO noted that "communications, or the lack thereof, has been shown by many accident investigations to play a significant role". (ICAO, 2003, pp. 1-2) In April 2003, worldwide minimum English language standard for use in civil aviation was established. It requires "aviation professionals involved in international operations to demonstrate a certain level of English language proficiency." (ICAO, 2003, pp. 1-2)

In the standard introduced in 2003, English proficiency levels (1 – 6) are clearly described. Aviation personnel must reach at least level 4 with a great attention paid to listening comprehension, spoken interaction and production (see Table 1). They must be able to communicate accurately and clearly on work-related and common topics, use correct communication strategies, identify and deal with misunderstandings in a general or work-related framework. Flight crews and air traffic controllers must be acquainted with radiotelephony communication and know basic standard phraseology. The ICAO language proficiency requirements clearly define standards of radiotelephony communication in the international controlled airspace, face-to-face information delivery between flight crew in the cockpit as well as between flight crew and airport staff. Training of listening comprehension is necessary in order to understand clearances, instructions, advisories and information delivered by the ATC. (A. Kukovec, 2008, pp. 128-129)

**ICAO language proficiency rating scale – Level 4 (operational)**

| PRONUNCIATION | STRUCTURE | VOCABULARY | FLUENCY | COMPREHENSION | INTERACTIONS |
|---|---|---|---|---|---|
| Pronunciation, stress, rhythm, and intonation are influenced by the first language or regional variation but only sometimes interfere with understanding | Basic grammatical structures and sentence patterns are used creatively and are usually well controlled. Errors may occur, particularly in unusual or unexpected circumstances, but rarely interfere with meaning. | Vocabulary range and accuracy are usually sufficient to communicate effectively on common, concrete, and work related topics. Can often paraphrase successfully when lacking vocabulary in unusual or unexpected circumstances. | Produces stretches of language at an appropriate tempo. There may be occasional loss of fluency on transition from rehearsed or formulaic speech to spontaneous interaction, but this does not prevent effective communication. Can make limited use of discourse markers or connectors. Fillers are not distracting. | Comprehension is mostly accurate on common, concrete, and work related topics when the accent or variety used is sufficiently intelligible for an international community of users. When the speaker is confronted with a linguistic or situational complication or an unexpected turn of events, comprehension may be slower or require clarification strategies. | Responses are usually immediate, appropriate, and informative. Initiates and maintains exchanges even when dealing with an unexpected turn of events. Deals adequately with apparent misunderstandings by checking, confirming, or clarifying. |

Table 1. Selected language skill descriptors from the ICAO Rating Scale at level 4

Source: Manual on the Implementation of ICAO Language Proficiency Requirements, International Civil Aviation Organization (2004)

## 3.3 Communication loop

Radio communication between pilots and controllers is based on the 'communication loop' rule (see Figure 1). In more detail: First, the aircraft's call sign has to be given in order to inform the pilot that the following message is meant for him. Then, instructions are transmitted by using ICAO standard phraseology (see Section 3.4.4) and, finally, pilot reads the instruction back to the controller including the call sign so that the controller can identify the sender of the message. (S. Koble/P. Roh, 2013, p. 46)

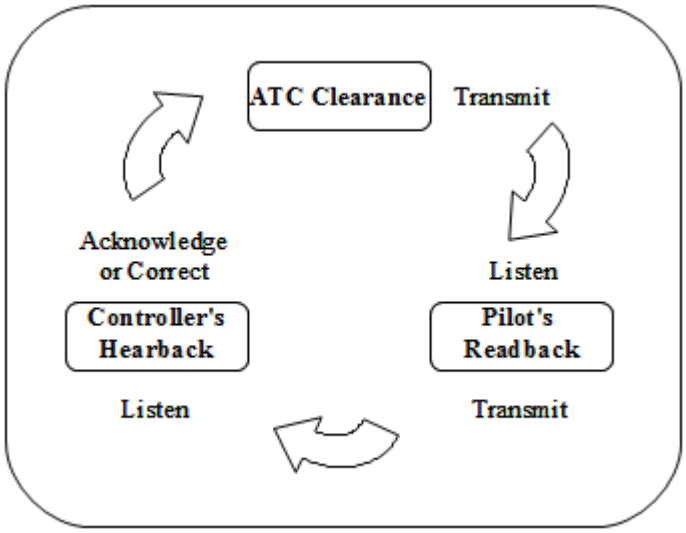



Figure 1. The pilot / controller communication loop

Source: European Action Plan for Air Ground Communications Safety, Eurocontrol (2006)

The controller transmits his message (instruction or clearance) via radio to the pilot, who listens precisely and repeats the obtained message or a crucial part of it back to the controller to confirm the correct reception. This procedure is called the 'readback'. (S. Koble, P. Roh, 2013, p. 44)

The flight crew must read parts related to the safety of the flight back to the controller. These include: ATC route clearances, clearances and instructions to enter, land on, take off from, hold short of, cross or backtrack on any runway; and runway-in-use, altimeter settings, SSR codes, level instructions, heading and speed instructions and, whether issued by the controller or contained in ATIS broadcasts, transition levels. (ICAO, 2001, Section 3.7.3)

Then, the controller listens to pilot's readback and confirms or corrects it. This procedure is called the 'hearback'. (S. Koble/P. Roh, 2013, p. 44)

Table 2 presents an example of ATC instruction followed by pilot's readback.

| ATC instruction | Pilot's readback |
|---|---|
| FASTAIR 345 RUNWAY 09<br>CLEARED FOR TAKE-OFF | CLEARED FOR TAKE-OFF<br>RUNWAY 09 FASTAIR 345 |

Table 2. Example of ATC instruction followed by pilot's readback

Source: ICAO Doc. 9432, Section 4.5.8

## 3.4 Aviation English

As mentioned in Section 2.2.1, the English language is always used for international radio communication between pilots and controllers. This official language used by aviation professionals has undergone many changes and became a semi-artificial sublanguage, and therefore is now called 'Aviation English'. (C. Breul, 2013, p. 71) Let us characterise it in more detail.

Aviation English is a controlled type of highly specialised language with the grammar and vocabulary restrictions in order to avoid ambiguity. The language of aviation is usually referred to as 'airspeak' or 'aviation phraseology'. It is officially used by pilots and air-traffic controllers in daily transmissions and emergency situations. All the Aviation English phraseology has been standardised by ICAO to avoid ambiguity. Because of the fact that air-to-ground communication does not involve any face-to-face contact eliminating important non-verbal cues or gestures and takes place in a rapidly changing environment, the 'airspeak' is composed of reduced syntactic forms such as phrases and jargon-based units. Following ICAO instructions, many general English lexical units have acquired specialised meanings that only exist in the world of aviation. The routine phrases and words used in communication between pilots and air-traffic controllers are not supposed to be a potential source of ambiguity. The idea 'one word – one meaning' has been achieved by a very careful assignment of words and phrases. All the words used on the radio have specific meanings, functions and restrictions. Together, they build fixed phrases and patterns (called phraseological units) in which none of the words or their order can be changed. The correct interpretation of this speech depends on the training and experience of the users, therefore each aviation professional is obliged to know and understand the appropriate use of specific phrases and words in order to convey necessary data in meaningful blocks of information avoiding common linguistic misunderstandings. (S. W. Hinrich, 2008, pp. 78-80; A. Leśniczek, 2011, pp. 179-180)

In the next subsections we will focus on the linguistics aspects of Aviation English, i.e. grammar and phonetics. We will also look at the method of transmitting numbers and we will define standard phraseology and non-standard phraseology.

### 3.4.1 Grammar

Sentences should be short and simply structured thus include only main clauses. Embedded subordinate clauses such as relative or that-complement clauses should not be present. The majority of transmissions are in the imperative, either instructions or requests e.g. instead of a complicated interrogative form like 'could you please say again?', the imperative 'say again!' is used. Because of this, the utterances do not contain a subject pronoun. For the reason that a lot of pilots' transmission constitute readbacks of ATC instructions, they do not contain a subject pronoun either. The use of subjects is thus minimized, as subject of any verb is understood to be the pilot.

Additionally, the use of prepositions in Aviation English is very limited. They must be used carefully and avoided directly before and after numbers, because of the homonymy between 'to' and 'two', 'for' and 'four' or 'on' and 'one' e.g. 'climb to eight zero' may be understood as 'climb two eight zero'. Therefore, instructions concerning flight levels should always be transmitted without prepositions, but with the addition 'flight level' e.g. 'climb to flight level five zero'.

Furthermore, negative constructions occur rarely, as they signal 'unusual' situations, in which either ATC or the pilot are not able to comply with a request or further information has to provided. In such cases where negation is needed, the English words 'no' and 'not' have to be avoided, as they are too short and phonologically weak and could consequently be missed in the transmission. Negation must be expressed by the term 'negative', followed by a corrective statement, e.g. 'AirlineXYZ, negative, turn right heading two three five'. (S. Koble, P. Roh, 2013, p. 45; D. Estival, C. Farris, B. Molesworth, 2016, pp. 22-35)

### 3.4.2 Phonetics

Both pilots and controllers have to speak clearly and maintain a constant volume. Short pauses before and after transmitting numbers help to convey numerical information. Fillers like 'ah', 'uh' and 'er' should be avoided. The ICAO alphabet was developed for clarity of communication over the radio. This spelling alphabet is used to transmit combinations of letters and numbers e.g. waypoints, taxiways and call signs. (S. Koble, P. Roh, 2013, p. 45)

| *Letter* | *Word* | *Pronunciation* |
|---|---|---|
| **A** | **Alfa** | AL FAH |
| **B** | **Bravo** | BRAH VOH |
| **C** | **Charlie** | CHAR LEE *or*<br>SHAR LEE |
| **D** | **Delta** | DELL TAH |
| **E** | **Echo** | ECK OH |
| **F** | **Foxtrot** | FOKS TROT |
| **G** | **Golf** | GOLF |
| **H** | **Hotel** | HO TELL |
| **I** | **India** | IN DEE AH |
| **J** | **Juliett** | JEW LEE ETT |
| **K** | **Kilo** | KEY LOH |
| **L** | **Lima** | LEE MAH |
| **M** | **Mike** | MIKE |
| **N** | **November** | NO VEM BER |
| **O** | **Oscar** | OSS CAH |
| **P** | **Papa** | PAH PAH |
| **Q** | **Quebec** | KEH BECK |
| **R** | **Romeo** | ROW ME OH |
| **S** | **Sierra** | SEE AIR RAH |
| **T** | **Tango** | TANG GO |
| **U** | **Uniform** | YOU NEE FORM *or*<br>OO NEE FORM |
| **V** | **Victor** | VIK TAH |
| **W** | **Whiskey** | WISS KEY |
| **X** | **X-ray** | ECKS RAY |
| **Y** | **Yankee** | YANG KEY |
| **Z** | **Zulu** | ZOO LOO |

Table 3. ICAO Alphabet

Source: ICAO Doc. 9432, Section 2.3

Note.— Syllables to be emphasized are underlined.

In terms of transmitting the numbers users have to bear in mind that the pronunciation of some digits differs from standard English. The number 'three' /θri:/ becomes 'tree' /tri:/, 'nine' /naɪn/ is pronounced 'niner' /naɪnəʳ/ in order to avoid confusion with the number 'five'. For the same reasons the number 'four' /fɔːʳ / is pronounced 'fower' /foʊəʳ/. (S. Koble/ P. Roh, 2013, p. 46)

### 3.4.3 Transmission of numbers

All numbers shall be transmitted by pronouncing each digit separately e.g. CCA 238 (call sign) pronounced as 'Air China two three eight', FL180 (flight level) as 'flight level one eight zero' or 4 203 (transponder code) as 'squawk four two zero three'. Decimal numbers are also given digit by digit and are separated by the term 'decimal', e.g. 'one two decimal eight' for '12.8'. (ICAO, 2007b, Section 2.4) However,

> Numbers used in the transmission of altitude, cloud height, visibility and runway visual range (RVR) information, which contain whole hundreds and whole thousands, shall be transmitted by pronouncing each digit in the number of hundreds or thousands followed by the word HUNDRED or THOUSAND as appropriate. (ICAO, 2007b, Section 2.4)

For example, altitude 800 is transmitted as 'altitude eight hundred'.

> Combinations of thousands and whole hundreds shall be transmitted by pronouncing each digit in the number of thousands followed by the word THOUSAND followed by the number of hundreds followed by the word HUNDRED. (ICAO, 2007b, Section 2.4)

For example 1 700 (runway visual range) is transmitted as 'RVR one thousand seven hundred'. (ICAO, 2007b, Section 2.4)

### 3.4.4 Standard phraseology

The fatal runway collision between two Boeing 747s in Tenerfie, which was caused mainly by ambiguous radio communication (see Section 2.2.2) triggered the development of ICAO standard phraseology. It is a list of terms and phrases that must be used by aviation professionals to provide unambiguous, clear, efficient and intelligible flight communication. Standard phrases have been carefully determined by ICAO in order to avoid homonyms and possible misunderstandings. For example the phrase 'take-off' can only be used when the actual clearance for take-off is issued. In other cases the term 'departure' is used.

Examples of standard ICAO phraseology are listed below:

| *Phrase* | *Meaning* |
|---|---|
| ACKNOWLEDGE | "Let me know that you have received and understood this message." |
| AFFIRM | "Yes." |
| APPROVED | "Permission for proposed action granted." |
| BREAK | "I hereby indicate the separation between portions of the message."*(To be used where there is no clear distinction between the text and other portions of the message.)* |
| BREAK BREAK | "I hereby indicate the separation between messages transmitted to different aircraft in a very busy environment." |
| CANCEL | "Annul the previously transmitted clearance." |
| CHECK | "Examine a system or procedure."<br>*(Not to be used in any other context. No answer is normally expected.)* |
| CLEARED | "Authorized to proceed under the conditions specified." |
| CONFIRM | "I request verification of: (*clearance, instruction, action, information*)." |
| CONTACT | "Establish communications with..." |
| CORRECT | "True" or "Accurate". |
| CORRECTION | "An error has been made in this transmission (*or* message indicated). The correct version is..." |
| DISREGARD | "Ignore." |
| GO AHEAD | "Proceed with your message."<br>*Note:- Not used whenever the possibility exists of misconstruing "GO AHEAD" as an authorization for an aircraft to proceed. The phrase "GO AHEAD" may be omitted and, in its place, a response made by using the calling aeronautical station's call sign followed by the answering aeronautical station's call sign.* |
| HOW DO YOU READ | "What is the readability of my transmission?" |
| I SAY AGAIN | "I repeat for clarity or emphasis." |
| MAINTAIN | "Continue in accordance with the condition(s) specified" or in its literal sense, e.g. "Maintain VFR". |
| MONITOR | "Listen out on (frequency)." |
| NEGATIVE | "No" *or* "Permission not granted" *or* "That is not correct" *or* "Not capable".. |
| OVER | "My transmission is ended, and I expect a response from you."<br>*Note.— Not normally used in VHF communications.* |
| OUT | "This exchange of transmissions is ended and no response is expected."<br>*Note.— Not normally used in VHF communications.* |
| READ BACK | "Repeat all, or the specified part, of this message back to me exactly as received." |
| RECLEARED | "A change has been made to your last clearance and this new clearance supersedes your previous clearance or part thereof." |
| REPORT | "Pass me the following information..." |
| REQUEST | "I should like to know..." *or* "I wish to obtain..." |
| ROGER | "I have received all of your last transmission."<br>*Note.— Under no circumstances to be used in reply to a question requiring "READ BACK" or a direct answer in the affirmative (AFFIRM) or negative (NEGATIVE).* |
| SAY AGAIN | "Repeat all, or the following part, of your last transmission." |
| SPEAK SLOWER | "Reduce your rate of speech." |

| | |
|---|---|
| STANDBY | "Wait and I will call you."<br><br>*Note.— The caller would normally re-establish contact if the delay is lengthy. STANDBY is not an approval or denial.* |
| UNABLE | "I cannot comply with your request, instruction, or clearance."<br><br>Note- UNABLE is normally followed by a reason. |
| WILCO | *(Abbreviation for "will comply".)* "I understand your message and will comply with it." |
| WORDS TWICE | a) *As a request:* "Communication is difficult. Please send every word, or group of words, twice."<br><br>b) *As information:* "Since communication is difficult, every word, or group of words, in this message will be sent twice." |

Table 4. ICAO Standard Phraseology phrases and expressions

Source: ICAO Doc. 9432, Section 2.6

### 3.4.5 Non-standard phraseology

The use of standard phraseology is obligatory for all ICAO member states, nevertheless, it is impossible to predict all situations that may arise and consequently provide all necessary expressions. Therefore, flight crews and controllers may add 'plain' language phrases, but they have to be equally clear, concise and unambiguous as ICAO phraseologies. Users have to bear in mind that the English language is often not the mother tongue of the interlocutors of a transmission. An extra caution regarding difficulties faced by second-language speakers should be exercised to provide safe communication. "Transmissions should be slow and clear". (ICAO, 2007b, p. III) Users should avoid idiomatic expressions, colloquialisms, indirect statements and slang.

There are also situations in which pilots and controllers deviate from standard phraseology even if it is completely sufficient to maintain communication i.e. they use words and phrases that are not listed in the standard phraseology list, but should have used the prescribed words and phrases. (S. W. Hinrich, 2008, p. 87) To help interpersonal communication that is more difficult in the context of the radio, pilots and controllers often add politeness markers e.g. greetings or thanks. These, however, are also considered to be deviations from standard phraseology and should be avoided. (D. Estival/C. Farris/B. Molesworth, 2016, p. 29)

Examples of standard and non-standard phraseology are shown in Table 5.

| Standard phraseology (approved) | Non-standard phraseology (unapproved) |
|---|---|
| **ATC**: Say again call sign?<br>**Pilot**: Scorpion one two three four. | **ATC**: So, what's your call sign?<br>**Pilot**: You're talking to Scorpion twelve thirty- four. |

Table 5. Examples of standard and non-standard phraseology.

Source: S. W. Hinrich, 2008, p. 87

### 3.4.6 Use of ICAO phraseology during different stages of a flight

All words and phrases prescribed by ICAO are related to different stages of a flight. Table 6 presents samples of terminology used from the moment of taxing for take off till landing.

| Phase of flight | Controller's instructions | Pilot's readback | Purpose of communication |
|---|---|---|---|
| **Taxi / pre-departure**<br>Plane is ready to leave | FASTAIR 345 TAXI TO HOLDING POINT RUNWAY 27 GIVE WAY TO B747 PASSING LEFT TO RIGHT QNH 1019 | HOLDING POINT RUNWAY 27 QNH 1019, GIVING WAY TO B747 FASTAIR 345 | ATC directs pilot/plane to a specific point on the airfield (runway 27 holding point); instructs the pilot to give way to another plane (Boeing 747) and informs of the altimeter setting. |
| **Enroute**<br>Plane is ready to move into a new ATC sector | FASTAIR 345 CONTACT ALEXANDER CONTROL 129.1 | 129.1 FASTAIR 345 | ATC informs pilot of the next point of contact and provides the radio frequency (129.1). |
| **Tower**<br>Plane is arriving at destination, ready to land | FASTAIR 345 RUNWAY 27 CLEARED TO LAND WIND 270 DEGREES 20 KNOTS | RUNWAY 27 CLEARED TO LAND FASTAIR 345 | ATC informs pilot of runway to use and clears pilot for landing; provides wind direction (270) degrees, speed (20 knots). |

Table 6. Use of standard phraseology during selected stages of a flight

Sources: ICAO Doc. 9432, Sections 4.7.2, 4.4.3, 2.8.2.1; S. W. Hinrich, 2008, p. 81

## 3.5 Possible radio transmission misunderstanding factors

The English language must be used for international air-ground communication and both the controllers and the pilots have to meet ICAO Language Proficiency Requirements

according to ICAO recommendations. There are, however, many factors that can contribute to communication errors. Let us characterise them now.

Communication issues can have different grounds including the fact that a large number of users are non-native speakers of the English language and their strong accent can have a negative impact on transmission understanding. Additionally, a continuous switching from Aviation English in communication with ATC to general English or a different language in communication with the crew (code-switching/mixing) might also cause misinterpretation and misunderstanding. Further problems may occur as a consequence of high work load phases during the flight, in which pilots communicate with controllers with a high rate of speech in a hectic and disturbed atmosphere. Strict and impersonal ICAO phraseology, imbalance between speaker roles (controllers issue instructions and pilots are in the role of order recipients), blocked transmission on a busy frequency, fatigue, noise and stress only increase the possibility of communication issues.

All factors mentioned above can contribute to readback and hearback errors or confusing and mixing instructions, which contain a lot of numerical information (e.g. call sign, heading, altitude). The results of such communication issues can be extremely dangerous e.g. a call sign confusion can lead a pilot to carry out instructions meant for another aircraft. (D. Estival, C. Farris, B. Molesworth, 2016, p. 10; S. Hansen-Schirra, 2013, pp. 83-84; S. Koble/P. Roh, 2013, pp. 44-45)

# 4. Data and method

This chapter consists of two sections, namely 'The Data' (see Section 4.1) and 'Method' (see Section 4.2). In Section 4.1, the reader learns about the collected data and its source. Section 4.2 describes the analytical method applied in the present study.

## 4.1 The data

The data for the aim of this study was obtained in the form of audio files from LiveATC.Net (see Section 4.1.1). Two recordings of real life pilot-controller transmissions, the total length of which is 1 hour and 45 minutes were transcribed. The transcripts were given numbers and put into the spreadsheet program for the purpose of further analysis.

### 4.1.1 Source of recordings

Both recordings were accessed from LiveATC.Net, a website that enables aviation enthusiasts to listen to voice communication between pilots and air-traffic controllers in real time from selected air-traffic control sectors all over the world. Most of the recordings are archived for retrieval for up to 30 days.

I decided to download two recordings from two randomly chosen days. The first file is 1:15 h long, and the second lasts for 30 minutes. Additionally, I gained via email a written consent for the use of the obtained data in this paper from the owner of the website LiveATC.Net.

The gathered data comes from Warsaw Approach sector, which is responsible for aircraft arriving and departing from and to both Warsaw Chopin Airport (EPWA) and Warsaw Modlin Airport (EPMO). Main tasks of the air-traffic controllers working in this sector are to provide arrival routes, issue approach clearances, prepare arriving aircraft to intercept the final approach track and manage flight levels and altitudes of the traffic to ensure proper separation. They also handle departure flight in the climb phase and thus are responsible for providing departure routes, issuing climb clearances, assigning speeds and ensuring safe separation between departures and arrivals.

The reason I chose this sector is the fact that Warsaw Approach serves two airports making it one of the busiest areas in the Polish airspace. Furthermore, the approach sector requires more complex communication, i.e. there are more interactions than in enroute or tower sectors.

### 4.1.2 Transcription Technique

All the radio transmissions were transcribed manually, i.e. without the use a special software. Often they had to be played many times to write everything down correctly as the quality of the recordings was poor. Nevertheless, unclear sections, omissions and noise are still present in the transcripts. They were marked by the word 'unintelligible' in square brackets. The transmissions produced by air-traffic controllers were marked by the word 'ATC', while those produced by pilots were marked by the word 'PILOT'.

### 4.1.3 Corpus

The corpus consists of 33 transcripts obtained from 2 recordings of the total length of 1:45 h. Communication was conducted with 20 departing and 13 arriving aircraft representing 9 different airlines in 2016. Because of the fact that LOT Polish Airlines serves almost half of the traffic at Warsaw Chopin Airport, the vast majority of transmissions were conducted with flight crews of this airline (20 out of 33) Table 7 presents the list of airlines and number of transcripts included in the study.

| **Airline** | **Number of transcripts** |
|---|---|
| LOT Polish Airlines | 20 |
| Ryanair | 5 |
| Lufthansa | 2 |
| Aeroflot | 1 |
| airBaltic | 1 |
| Air Serbia | 1 |
| Austrian Airlines | 1 |
| Eurowings | 1 |
| Norwegian Air International | 1 |

Table 7: List of airlines and number of transcripts.

The total number of words used in the transcripts is 3,105, of which 1,597 were produced by pilots and 1,508 by air-traffic controllers. Each transcript reveals a different number of words. The longest transmission has 360 words, while the shortest has only 35. There are also differences in the number of turn-takings, but the analysis of this aspect is beyond the scope of this study. Table 8 shows the number of words used in each transcript.

| No. | Number of words (pilot) | Number of words (ATC) | Number of words (total) |
|---|---|---|---|
| #1_FR1062 | 212 | 148 | 360 |
| #2_OS632 | 27 | 26 | 53 |
| #3_FR6944 | 74 | 89 | 163 |
| #4_D85141 | 51 | 42 | 93 |
| #5_LO3859 | 18 | 17 | 35 |
| #6_LO3825 | 21 | 16 | 37 |
| #7_LO3921 | 18 | 18 | 36 |
| #8_LO231 | 24 | 21 | 45 |
| #9_LO321 | 24 | 20 | 44 |
| #10_LO333 | 26 | 21 | 47 |
| #11_FR4741 | 59 | 58 | 117 |
| #12_LO269 | 24 | 21 | 45 |
| #13_FR4043 | 63 | 47 | 110 |
| #14_SU2003 | 30 | 23 | 53 |
| #15_LO455 | 31 | 26 | 57 |
| #16_LH1616 | 111 | 94 | 205 |
| #17_LO394 | 56 | 70 | 126 |
| #18_LO383 | 27 | 30 | 57 |
| #19_LO375 | 23 | 20 | 43 |
| #20_LO459 | 30 | 28 | 58 |
| #21_JU635 | 46 | 35 | 81 |
| #22_FR1405 | 56 | 47 | 103 |
| #23_LO322 | 55 | 56 | 111 |
| #24_BT462 | 23 | 24 | 47 |
| #25_LO334 | 61 | 81 | 142 |
| #26_LH1346 | 75 | 78 | 153 |
| #27_LO463 | 25 | 45 | 70 |
| #28_LO3904 | 79 | 93 | 172 |
| #29_LO3958 | 32 | 46 | 78 |
| #30_LO251 | 31 | 31 | 62 |
| #31_LO232 | 49 | 36 | 85 |

| | | | |
|---|---|---|---|
| #32_LO3832 | 66 | 52 | 118 |
| #33_EW1723 | 50 | 49 | 99 |
| Total: | 1597 | 1508 | 3105 |

Table 8: Number of words used in the transcripts divided into 'pilot', 'ATC' and 'total'.

### 4.1.4 Data anonymization

The data was not anonymized. Real call signs and flight numbers were retained for the better understanding of the everyday airport life. Naturally occurring data provides more realistic attitude to the study. However, the exact date of the transmissions is not provided in order to protect flight crews and air-traffic controllers.

## 4.2 Method

I chose both the quantitative approach and the qualitative approach to analyse the obtained data. Only pilots' transmissions were examined with special attention paid to the influence of the preceding ATC transmissions.

### 4.2.1 Quantitative approach

First, all the transcripts were numbered and the total of words produced by pilots and air-traffic controllers in each of them was counted. This enabled me to ascertain which of the speakers can be allocated a higher density of words and whether there is a general tendency. Next, the sum of standard and non-standard words and phrases' instances was calculated in order to determine their frequency of use and their share in the total number of words. Finally, I counted the number of mistakes in readbacks and numerical data transmissions. All in all, quantitative approach to analysis allowed me to determine how often flight crews use ICAO Phraseology, as well as how widespread the deviations from standard words and phrases are.

### 4.2.2 Qualitative approach

In the qualitative analysis, I investigated in what form deviations from standard phraseology occur, i.e. I divided the non-standard phraseology into 4 categories: 'politeness markers', 'fillers', 'articles' and 'pronouns'. Some of the irregularities from standard phraseology were given equivalents with the use of approved words and phrases. The major benefit of the qualitative method is the fact that it allowed me to investigate in which situations ICAO Phraseology occur and when pilots depart from its usage. It is worth underlining that the international standards of phraseology are prescribed in two ICAO documents, namely ICAO Doc. 9432 'Manual of Radiotelephony' and Annex 10 'Aeronautical Communications' (Chapter 5). I downloaded both publications, as they were available on ICAO website, and I compared the prescribed terminology with actual radio transmissions.

### 4.2.3 Organization of the analysis

The data was analysed it terms of many aspects, therefore I decided to place the transcripts into a spreadsheet program so that the study could be conducted faster and smoother. The spreadsheet was divided into 13 columns, which allowed me to classify the phraseology that appeared in the transcripts as standard and non-standard, indicate the correctness of readbacks and transmissions of numbers, point out what types of politeness markers occurred, mark the language of transmission, indicate number of words produced by pilots and air-traffic controllers, as well as to mark if the transcript presents communication with departing or arriving aircraft. Table 9 shows the spreadsheet used for the analysis.

| No. | Transcript | Standard words and phrases/phraseology | Non-standard words and phrases/phraseology | Readback (present,correct/present,partly correct/absent) | Politeness markers (Greeting/Thanks/Request/Farewell/NO) | Language of transmission (English/Polish) | Transmission of numbers (correct/incorrect)* | Number of words (pilot) | Number of words (atc) | Number of words (total) | Other | Departure/Arrival |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **#1_FR1062** | [illegible] | Approach descending flight level 1 | Copied eh What kind of Can we W | Present, correct | Greeting, thanks, request | EN | Correct | 212 | 148 | 360 | | Arr |
| **#2_OS632** | [illegible] | Climbing | at | Present, partly correct (abbrevia | Greeting, farewell | EN | Correct | 27 | 26 | 53 | | Dep |
| **#3_FR6944** | [illegible] | descending flight level direct runwa | Eh, roger copied can you inform u | Present, partly correct (abbrevia | Greeting, thanks, farewell | EN | Correct | 74 | 89 | 163 | | Arr |
| **#4_D85141** | [illegible] | Departure squawk say again Clim | out of on eh on the We're | Present, correct | Greeting, thanks | EN | hundred' instead of 'one thou | 51 | 42 | 93 | | Dep |
| **#5_LO3859** | [illegible] | Approach passing climbing direct | NO | Present, partly correct (call sign | NO | EN | Correct | 18 | 17 | 35 | | Dep |
| **#6_LO3825** | ATC: LOT3825, proceed 9PLAM. | Approach climb flight level | NO | Present, correct | Greeting, thanks | EN | Correct | 21 | 16 | 37 | | Dep |
| **#7_LO3921** | ATC: LOT3921, proceed EVIRA. | Approach passing flight level | NO | Present, partly correct (abbrevia | Greeting, thanks | EN | Correct | 18 | 18 | 36 | | Dep |
| **#8_LO231** | ATC: LOT3418, direct OSILO, no speed restrictions. | Approach passing climb direct s | NO | Present, correct | Greeting, farewell | EN | Correct | 24 | 21 | 45 | | Dep |
| **#9_LO321** | ATC: LOT3ZM, direct EVIRA. | Approach passing climb flight le | NO | Present, partly correct (abbrevia | Greeting, thanks, farewell | EN | Correct | 24 | 20 | 44 | | Dep |
| **#10_LO333** | [illegible] | Climb flight level direct | out of | Present, correct | Greeting, thanks, farewell | EN/PL | hundred' instead of 'one thous | 26 | 21 | 47 | | Dep |
| **#11_FR4741** | [illegible] | Approach descending flight level | today and eh OK the | Present, correct | Greeting | EN | Correct | 59 | 58 | 117 | | Arr |
| **#12_LO269** | ATC: LOT3AG, direct OSILO. | Departure climbing direct | eh | Present, partly correct (abbrevia | Farewell | EN | Correct | 24 | 21 | 45 | | Dep |
| **#13_FR4043** | [illegible] | Approach Descend level runway C | we are right and for Would be allo | Present, partly correct (no call s | Greeting, thanks, farewell | EN | Correct | 63 | 47 | 110 | | Arr |
| **#14_SU2003** | ATC: Aeroflot3003, climb flight level three three zero, direct RUDKA. | Approach passing flight level clim | NO | Present, correct | Greeting, thanks, farewell | EN | Correct | 30 | 23 | 53 | | Dep |
| **#15_LO455** | [illegible] | Approach passing climb flight le | NO | Present, partly correct (abbrevia | Greeting | EN | Correct | 31 | 26 | 57 | | Dep |
| **#16_LH1616** | [illegible] | Descending flight level direct des | eighty five and for your there's a gr | Present, partly correct (call sign | Greeting, thanks, farewell | EN | Correct | 111 | 94 | 205 | | Arr |
| **#17_LO394** | [illegible] | Approach descending cleared fo | down | Present, partly correct (no call s | Greeting, thanks, farewell | EN/PL | Correct | 56 | 70 | 126 | | Arr |
| **#18_LO383** | [illegible] | Crossing direct climbing | right | Present, correct | Greeting, thanks | EN | Correct | 27 | 30 | 57 | | Dep |
| **#19_LO375** | [illegible] | Approach passing flight level clim | NO | Present, correct | Greeting, farewell | EN | Correct | 23 | 20 | 43 | | Dep |
| **#20_LO459** | ATC: LOT459, flevright, I say again flevright to OSILO. | Approach climb flight level | NO | Present, partly correct (1 readba | Greeting, farewell | EN/PL | Correct | 30 | 28 | 58 | | Dep |
| **#21_JU835** | [illegible] | Approach passing flight level app | NO | Present, correct | Greeting, thanks, farewell | EN | Correct | 46 | 35 | 81 | | Dep |
| **#22_FR1405** | [illegible] | Passing climbing altitude flight le | and eh | Present, correct | Farewell | EN | Correct | 56 | 47 | 103 | | Dep |
| **#23_LO322** | [illegible] | Approach descending flight level | eh when | Present, correct | Greeting, farewell | EN | Correct | 55 | 56 | 111 | | Arr |
| **#24_BT462** | [illegible] | Approach flight level direct speed | and | Present, correct | Greeting, thanks, farewell | EN | Correct | 23 | 24 | 47 | | Dep |
| **#25_LO334** | [illegible] | Descending confirm clear for app | copied call you when | Present, partly correct (no call s | Greeting, thanks, farewell | EN | Correct | 61 | 81 | 142 | ed call sign (not it r | Arr |
| **#26_LH1346** | [illegible] | Passing descending flight level | we have eh and | Present, partly correct (call sign | Greeting, thanks, farewell | EN | nstead of 'two eight zero', 'two t | 75 | 78 | 153 | Laughter | Arr |
| **#27_LO463** | [illegible] | Approach speed roger direct clim | OK | Present, partly correct (no call s | Greeting, thanks | EN/PL | Correct | 25 | 45 | 70 | | Dep |
| **#28_LO3904** | [illegible] | Direct descending cleared appro | when OK eh | Present, partly correct (omissior | Thanks, farewell | EN | Correct | 79 | 93 | 172 | sign used (not in re | Arr |
| **#29_LO3958** | [illegible] | Descend base leg | NO | Present, correct | Farewell | EN | Correct | 32 | 46 | 78 | | Arr |
| **#30_LO251** | [illegible] | Departure climbing speed | NO | Present, correct | Greeting, farewell | EN | Correct | 31 | 31 | 62 | | Dep |
| **#31_LO232** | [illegible] | Approach descending flight level | and | Present, correct | Greeting, thanks, farewell | EN | t ('two sixty' instead of 'two s | 49 | 36 | 85 | | Arr |
| **#32_LO3832** | [illegible] | Direct leaving flight level descen | OK | Present, correct | Thanks, farewell | EN/PL | Correct | 66 | 52 | 118 | | Arr |
| **#33_EW1723** | [illegible] | Approach airborne climbing clim | NO | Present, partly correct (call sign | Greeting, farewell | EN | Correct | 50 | 49 | 99 | | Dep |
| | | | | | | | | 1597 | 1508 | 3105 | | |

Table 9: Organisation of the analysis in a spreadsheet program

# 5. Results

The purpose of this chapter is to present results of the conducted analysis regarding the use of ICAO standard phraseology, non-standard phraseology and other examples of non-adherence to ICAO recommendations in the pilot-controller communication during two phases of a flight, namely approach and climb. In Section 5.1, the results of the quantitative analysis are presented. Section 5.2 shows and discusses the results of the qualitative analysis providing examples from the collected transcripts.

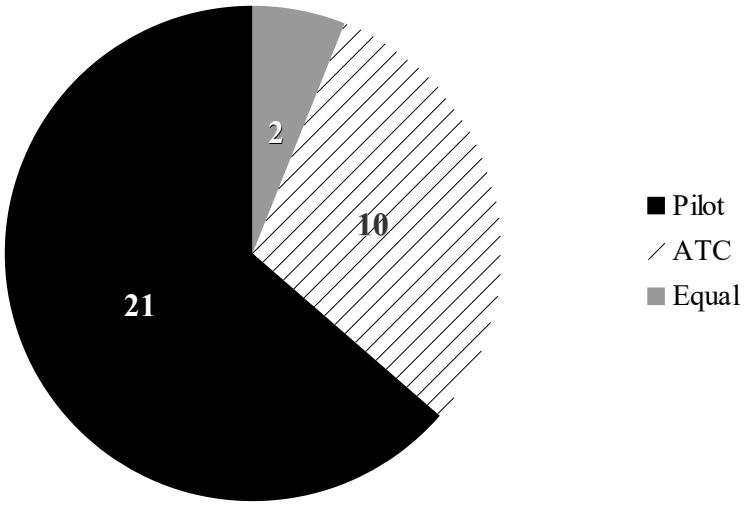
Neither quantitative or qualitative analyses of phrases like: 'localizer', 'descend', 'maintain', 'climb', 'flight level', 'altitude', 'approach', 'director', 'speed restriction', 'base leg', 'squawk', 'altimeter', 'proceed', 'fly', 'turn left heading', 'information', 'radar'; abbreviations such as: ILS, VOR, RNAV, QNH or names of navigational aids e.g. KUKXEN were conducted. This is due to the fact that these phrases are not listed in the ICAO Standard Words and Phrases list, though they are present in the ICAO manuals.

## 5.1 Results of the quantitative analysis

The aim of this section is to provide the quantitative results of the study with the use of tables and graphs for their better comprehension.

### 5.1.1 Dominance in the number of produced words

Normally, we assume that the air-traffic controllers can be allocated a higher number of words produced in transmissions, owing to the fact that they are responsible for issuing instructions, clearances and providing pilots with information, in particular in the final phase of a given flight. This study, however, revealed that in 21 out of 33 cases, pilots' transmissions contain more words than those produced by ATC. Only in 10 transmissions, controllers can be allocated a higher number of words, and in two cases both quantities are equal. Graph 1 illustrates the dominance in the number of words produced.




Graph 1: Dominance in the number of words produced divided into pilot, ATC and equal

### 5.1.2 Standard phraseology

The conducted analysis revealed that a number of ICAO standard words and phrases (see Table 4) were used by pilots in the collected transmissions. Because of the fact that the data presents only one ATC sector, which imposes certain actions on pilots and thus limits the variety of words, not all of them could be applied in pilots' utterances. Yet, the instances of standard words and phrases that appeared in the transcripts were counted and are presented in Table 10.

| Phrase | Number of instances |
|---|---|
| AFFIRM | 3 |
| CLEARED | 10 |
| CONFIRM | 2 |
| CONTACT | 2 |
| I SAY AGAIN | 1 |
| MAINTAIN | 3 |
| REPORT | 4 |
| REQUEST | 2 |
| ROGER | 3 |
| SAY AGAIN | 2 |

Table 10: ICAO standard phrases and the number of their instances in the transcripts

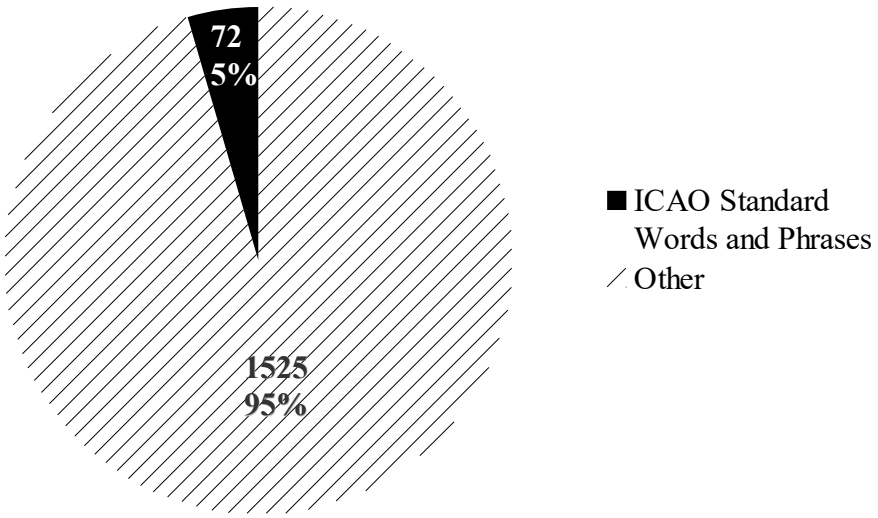
There are also other prescribed words and expressions, which were not listed in the

aforementioned ICAO table. These, which appeared in the analysed transcripts were: ‘established’, ‘direct’, ‘airborne’ and ‘going around’. Table 11 shows the number of their instances.

| Phrase | Number of instances |
|---|---|
| AIRBORNE | 1 |
| DIRECT | 22 |
| ESTABLISHED | 12 |
| GOING AROUND | 2 |

Table 11: Other standard phrases and the number of their instances in the transcripts

Now let us look at the share of standard words and phrases in the total of words used by pilots in the transcripts:




Graph 2: Share of ICAO standard words and phrases in the total of words used by pilots (In phrases containing more than one word all words were counted)

According to Graph 2, it may appear to be alarming that ICAO Phraseology accounts for only 5% in the total number of the words used by pilots. We have to, however, bear in mind that the counting did not consider call signs, names of navigational aids and numerical data such as radio frequencies, flight levels, altitudes, speeds etc. which constitute the majority of words produced by pilots.

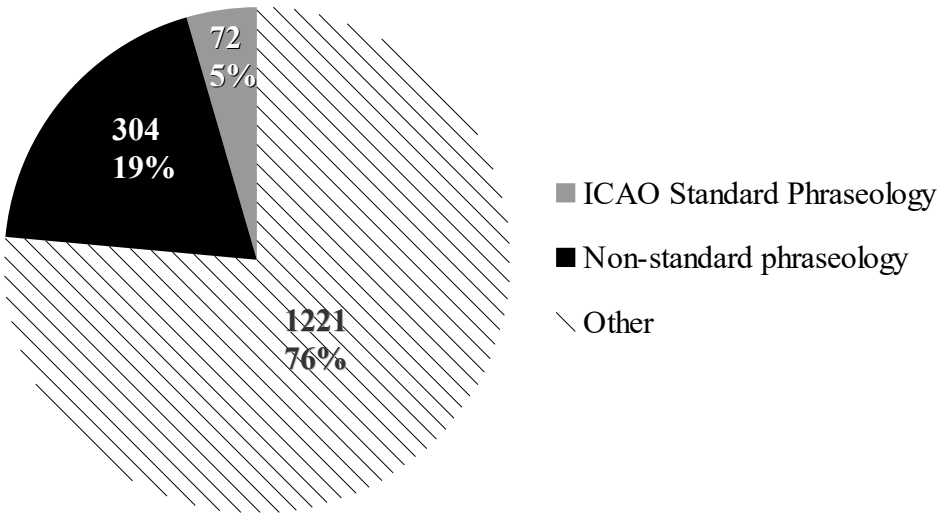
### 5.1.3 Non-standard phraseology:

The present study displays many deviations from the use of ICAO Standard Phraseology. Pilots tend to depart from prescribed words and phrases and instead use non-standard expressions (see Section 3.4.5). These include politeness markers e.g. greetings and thanks, pronouns, articles, modal verbs and unnecessary prepositions. According to the ICAO manuals, fillers such as 'eh', 'er' and other sounds of hesitation should be avoided, therefore they were also classified as non-standard. All cases of non-compliance with standard phraseology that appeared throughout the collected 33 transcripts were grouped and are presented in Table 12 together with the number of their instances.

| Linguistic element | Number of instances |
|---|---|
| Politeness marker | 83 |
| Pronoun | 27 |
| Article | 11 |
| Modal verb | 8 |
| Unnecessary preposition | 40 |
| Filler | 21 |
| Other | 55 |

Table 12: Non-standard linguistic elements and the number of their instances

The total number of words used by pilots in the 33 obtained transcripts is 1.597, of which 304 represent non-standard phraseology, accounting for 19% of the total number of words used.



Graph 3: Share of ICAO Standard Phraseology and non-standard phraseology in the total of words used by the pilots (In phrases containing more than one word all words were counted)

### 5.1.4 Other examples of non-adherence to ICAO recommendations

The International Civil Aviation Organisation does not only issue recommendations in terms of phraseology to be used in communication between pilots and air-traffic controllers, but also sets norms in many other aspects concerning air-ground communication.

In the course of the transcripts' analysis I noted that pilots do not always comply with all prescribed rules e.g. in terms of transmission of numbers and readbacks. Since non-compliance with these regulations may lead to serious communication issues, I decided to look at them more carefully.

The technique of transmitting numerical data is subject to strict rules, however in 4 out of 33 transcripts errors concerning this aspect occurred. Further details will be discussed in Section 5.2.4.

The issues arose in the matter of presence and correctness of readbacks (see Section 3.3) as well. Almost half of the transcripts (16 out of 33) contained one or more errors as regards readback rules. These included partly correct readbacks (omission of some parts), the language used in the transmission of this important element or even lack of thereof.

## 5.2 Results of the qualitative analysis

This section in divided into four subsections. Section 5.2.1 describes dominance in the number of words produced, while Section 5.2.2 concerns the use of ICAO Standard Phraseology and both sections provide and discuss examples from the obtained transcripts. In Section 5.2.3, we look into deviations from standard words and phrases, discuss the examples and present correct versions of utterances with the use of standard phraseology. Section 5.2.4 presents problems with readbacks and transmission of numbers.

### 5.2.1 Dominance in the number of produced words

We have to bear in mind that there are many factors contributing to the communication process and the number of words produced including the workload in the cockpit, variable weather and traffic conditions. Nevertheless, we can observe a tendency in which the majority of pilots produce longer transmissions than the ATC controllers. In many cases the reason for this situation is the excessive use of plain language i.e. non-standard phraseology, which renders the utterances lengthy. Let us now look more closely at an example of excessive use of plain language, namely communication with a Ryanair crew, which had to go around (abort the approach) because of bad weather conditions and position for another approach. In this situation, very high workload in the cockpit could have contributed to the fact that the pilot had departed from the use of ICAO Standard Phraseology and therefore the whole transmission was unreasonably long (pilot: 212 words vs. atc: 148 words).

> ATC: Ryanair61KM, Approach?
> PILOT: **Eh, Ryanair61KM, can we, eh, you want us to position for another approach? We need some time to prepare the aircraft for another approach, Ryanair61KM**.
> ATC: Vector is for spacing.
> PILOT: **OK, so turning left... Say again heading please, Ryanair61KM.**
> ATC: Three four zero.
> PILOT: **Heading three four zero to the left, Ryanair61KM.**

The above fragment of communication between the Ryanair pilot and the air-traffic controller illustrates the difference in the length of utterances between the two interlocutors.

In other cases differences in the number of words produced between pilots and controllers are not that distinct, however situations similar to the one presented above occur.

### 5.2.2 Standard phraseology

The transcribed interactions proved that ICAO Standard Phraseology is applied in routine communication between flight crews and air-traffic controllers and is used in the appropriate context with the prescribed meaning. It is, however, impossible to distinguish at least one transmission in which only standard or non-standard phraseology is used, as

pilots use both types interchangeably. The examples below were carefully chosen to illustrate the widest possible range of ICAO standard words and phrases used in the transcripts.

(1) PILOT: OTMUL WA533 descending seven thousand, **confirm**?

In Example (1), the pilot seeks verification of the instruction issued by the air-traffic controller by using the standard verb 'confirm'. The ICAO Standard words and phrases list (see Table 4) clearly describes the aim of this word usage: “I request verification of: (*clearance, instruction, action, information*)”. Therefore, we can consider that the pilot used this word correctly.

(2) ATC: Ryanair61KM, established?
PILOT: **Affirm** Ryanair61KM, but we are too high. We're **going around** Ryanair61KM. **I say again going around**.

Example (2) presents an aborted approach situation (go around). The pilot uses the word 'affirm' to answer the controller's question in the affirmative (yes) and adds the phrase 'going around'. ICAO Doc. 9432 states: “In the event that the missed approach is initiated by the pilot, the phrase “GOING AROUND” shall be used.” (ICAO, 2007b, Section 4.8.3) Additionally, the pilot uses the phrase 'I say again', to emphasize his utterance. The ICAO Standard words and phrases list (see Table 4) describes the meaning of this phrase as: “I repeat for clarity or emphasis”. We can therefore agree that the pilot used all the ICAO standard phrases correctly.

Let us now take a closer look at Example (3).

(3) PILOT: OK, so turning left... **Say again** heading please, Ryanair61KM.

In Example (3), the pilot uses the phrase 'say again' in order to receive the instruction from the controller again. According to the ICAO standard words and phrases list (see Table 4), this phrase should be used to convey a message of the following meaning: “Repeat all, or the following part, of your last transmission”. The pilot adds the item of the instruction (heading) that he wants to receive again.

(4) PILOT: We **request** VOR approach runway 26, Ryanair61KM.

As illustrated in Example (4), the verb 'request' was used to receive the approach clearance for selected runway. As stated by ICAO the meaning of this verb is: “I should like to know...” or “I wish to obtain...”.

(5) **Cleared** RNAV approach runway 26, Ryanair4741.

The final example of standard phraseology (Example (5)) represents the use of verb 'cleared'. In the presented situation the verb was used as a part of readback and serves as authorization to perform the approach for runway 26 following the ICAO meaning: “Authorized to proceed under the conditions specified”.

### 5.2.3 Non-standard phraseology

The transcripts also revealed many deviations from standard phraseology. The examples below were chosen to illustrate the broadest possible variety of deviations that occurred in the transcripts and are provided with correct versions in version with the letter (b).

(6a) Ryanair61KM **can you** confirm **the new** runway **is** 26?
(6b) Ryanair61KM confirm runway 26.

In Example (6a), the pilot departs from the prescribed phraseology and uses plain language. His transmission resembles a regular English interrogative form rather than a short sentence in the imperative by containing the modal verb 'can', the pronoun 'you', the article 'the', the adjective 'new' and the verb 'is'. The correct form of this sentence is presented in Example (6b).

(7a) **OK**, RNAV approach **for** runway 26, **thank you**, Ryanair4043.
(7b) RNAV approach runway 26, Ryanair4043.

As shown in example (7a), the pilot unnecessarily uses the colloquialism 'OK', the preposition 'for' and adds the politeness marker 'thank you'. The same message could be transmitted without redundant plain English words and would look as in (7b).

(8a) **OK**, tower 123.925, **eh**, **and the** QNH 1005, Ryanair4741.
(8b) (Tower) 123.925, QNH 1005, Ryanair4741.

Example (8a) furthermore reveals that flight crew use hesitation sounds and the conjunction 'and' which both are not needed according to ICAO. The correct sentence is presented in (8b). The word 'tower' does not have to be used, as the radio frequency of the station is the most important part and therefore has to be read back.

(9a) **Dobry wieczór zbliżanie**, **kłania się** LOT33K **out of fifteen hundred**.
(9b) Warsaw Approach, LOT33K passing one thousand five hundred.

Example (9a) displays an evident use of non-standard phraseology. The pilot does not address the calling station properly ('zbliżanie' instead of 'Warsaw Approach'), uses two polite phrases: 'dobry wieczór' and 'kłania się' in Polish as well as adds prepositions 'out' and 'of'. There is also a mistake in the altitude transmission, but this aspect is discussed in Section 5.2.4. The correct version is shown in Example (9b).

(10a) **We're** crossing three thousand eight hundred feet now, Nortrans5141.
(10b) Crossing three thousand eight hundred feet now, Nortrans5141.

Example (10a) illustrates another type of irregularity in the pilot's talk i.e. he uses the pronoun 'we' as well as the auxiliary verb in the contracted form 're'. The use of both elements is considered non-standard according to ICAO.

### 5.2.4 Other examples of non-adherence to ICAO recommendations

As mentioned before, other examples of non-adherence to ICAO recommendations could be observed in the transcripts. One of the problems that occurred was the incorrect transmission of numbers (see Section 3.4.2). The examples below demonstrate the issue.

(11a) Lufthansa2TA we have information MIKE, eh, direct WA533, eh, speed **two hundred eighty** knots [laughter] or more, thank you.
(11b) Lufthansa2TA, information MIKE, direct WA533, speed two eight zero knots or greater.

In (11a) we can see an incorrect transmission of numerical data, namely the speed. The method of conveying messages that contain this type of data is extremely important for the sake of safety. Rules governing this aspect can be found in the ICAO manuals and are additionally summarized in Section 3.4.2.

The second problematic aspect that arose in the transcripts is the readback procedure (see Section 3.3). It is one of the most important ICAO rules in terms of communication that was established after the Tenerife crash (see Section 2.2.2) and should be complied with at all times. However, some pilots either do not obey this rule or comply with it only partly. The examples below display the occurrence.

(12a) ATC: LOT3LP, roger, contact Tower 118.3, dziękuję.
PILOT: Tower, dzięki, do miłego.
(12b) PILOT: (Tower) **118.3**, **LOT3LP**.

Example (12a) showcases a complete violation of the readback procedure. The pilot in his readback does not repeat the frequency he is instructed to change to and omits the call sign.

(13a)ATC: LOT459, ten right, I say again ten right to OLILO.
PILOT: **I w prawo kręcimy na OLILĘ**, LOT459.
(13b) PILOT: Ten right to OLILO, LOT459.

In Example (13a), the pilot reads back the instruction in the Polish language instead of the prescribed English.

# 6. Conclusion

Aviation is a relatively new industry, but from the very beginning of its existence there were many communication issues. Airman had to face problems caused by insufficient equipment available in the beginning of the twentieth century, and as soon as the radio became a reliable communication device pilots had to deal with lack of prescribed rules in terms of voice-based communication. With the establishment of the International Civil Aviation Organisation, which issued numerous recommendations, e.g. ICAO Annex 10 ICAO Vol I, 5.2.1.1.2, prescribing how to use the English language for international radiotelephony communications, the situation improved considerably. However, air crashes caused by miscommunication continued to occur, the most tragic of which was the Tenerife air crash in 1977 (see Section 2.2.2). It was noted that not the insufficient English competence of pilots as well as the lack of standardised phraseology contributed to communication issues and consequently to accidents. Eventually, ICAO established a worldwide minimum English language standard for use in civil aviation as well as phraseology to be used by aviation personnel in order to provide unambiguous, clear, efficient and intelligible flight communication. Because of the fact that safety is number one priority in aviation industry, all aviation personnel, especially pilots and controllers, should comply with ICAO recommendation and therefore use prescribed phraseology.

The examples provided in this study revealed, however, that pilots use standard phraseology interchangeably with non-standard words and phrases. In all the presented examples, the situations were routine approaches and thus pilots' transmissions could have consisted of standard phraseology only. Therefore, we can state that flight crews did not use standard phraseology in all applicable situations.

As regards the correctness of ICAO Standard Phraseology use, all the collected transcripts proved that pilots use standard phraseology in appropriate contexts with the prescribed meanings. None of the standard words or phrases that appeared in pilots' transmissions were used incorrectly or in inapplicable situations. For this reason, we can state that standard phraseology was used correctly.

This study also displayed many deviations from ICAO Standard Phraseology in routine communication with air-traffic controllers, as well as from other prescribed ICAO rules, i.e. transmission of numbers and readbacks.

Use of politeness markers, such as greetings and thanks constitutes the majority of

deviations from standard phraseology. It can be assumed that pilots wish to establish a friendly conversational tone with air-traffic controllers and thus render the contact more personal. However, we have to bear in mind that such unnecessary use of plain language deteriorates the efficiency of information exchange especially on a busy radio frequency. Deviations from standard phraseology also appeared in the form of unnecessary prepositions (their presence is limited in Aviation English), pronouns, fillers and other hesitation sounds, which had a negative impact on the effectiveness of communication as well. Less frequent, yet present examples of non-standard phraseology were modal verbs, interrogative forms, colloquialisms or even switching into L1 (here Polish). Transmissions that contained a lot of plain language seemed unreasonably long and often required clarification, which in this unique radio communication environment may have crucial influence on safety.

The level of stress and the amount of workload in the cockpit that could have contributed to switching into plain language were not taken into account as determining of this aspects was beyond the scope of this study.

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## Summary in Polish

Historia lotnictwa cywilnego nie jest długa, lecz z pewnością bardzo dynamiczna. Pierwszymi osobami, które skonstruowały maszynę latającą oraz dokonały lotu załogowego byli bracia Wright. Wydarzenie to miało miejsce w 1903 r. i od tamtej pory są oni uważani za pionierów lotnictwa. Już od tamtego momentu problemem stała się łączność między pilotami a osobami znajdującymi się na ziemi. Na początku XX w. nie istniały systemy łączności bezprzewodowej, dlatego komunikacja między pilotami a osobami na ziemi opierała się na pomocach wizualnych. Piloci wykonywali określone manewry swoją maszyną, aby przekazać wiadomość na ziemię. Z czasem samoloty były wyposażane w systemy telegraficzne i mogły wysyłać, jak i odbierać wiadomości za pomocą Kodu Morse'a. Dopiero w 1917 r. dzięki wynalezieniu nadajnika radiowego możliwa była pierwsza transmisja głosowa pomiędzy załogą samolotu a personelem naziemnym. W latach trzydziestych samoloty pasażerskie zabierające na pokład ponad 10 pasażerów musiały być wyposażone w odbiorniki radiowe, a na świecie istniało około dwudziestu wież kontroli radiowej. W 1947 r. powstała Organizacja Międzynarodowego Lotnictwa Cywilnego (ICAO), która do dziś jest jedną z najważniejszych instytucji regulujących bezpieczeństwo w lotnictwie cywilnym. W tym samym czasie wprowadzono ruchomą służbę lotniczą, której system łączności pozwalał nadawać wiadomości do wszystkich samolotów znajdujących się w jego zasięgu. Ta sama zasada działania stosowana jest do dziś tj. kontroler ruchu lotniczego nadaje wiadomość do jednego samolotu, ale jest ona słyszana przez wszystkich znajdujących się na tej samej częstotliwości.

Obecnie komunikacja między pilotami i kontrolerami ruchu lotniczego nadal opiera się na technologii radiowej. Najczęściej wykorzystuje się technologię jednokierunkowego systemu łączności, w której częstotliwość jest zajęta jeśli jedna osoba nadaje wiadomość. Z tego powodu transmisje muszą być krótkie. W dzisiejszych czasach wykorzystuje się również radar, który pozwala kontrolerom śledzić samoloty na ekranie komputerów. Pokazuje on rozmaite parametry lotu statku powietrznego, takie jak wysokość, prędkość i kierunek lotu, jak również znak wywoławczy, który musi być nadany każdej maszynie znajdującej się w kontrolowanej przestrzeni powietrznej. Głównym celem kontroli ruchu lotniczego jest zapobieganie kolizjom statków powietrznych, zapewnianie odpowiedniej separacji pionowej i poziomej, wydawanie instrukcji, pozwoleń oraz udzielanie informacji. Przestrzeń powietrzna podzielona jest na sektory, w tym kontrolę naziemną, lotniska,

zbliżania oraz obszaru. W trakcie różnych faz lotu załoga kontaktuje się z wieloma kontrolerami odpowiedzialnymi za dane sektory.

Dzięki globalizacji samolot stał się jedną z najczęstszych form podróży. Utrzymanie wysokiego poziomu bezpieczeństwa jest kluczowe, dlatego podjęto wiele działań w celu standaryzacji tego wyjątkowego przemysłu. Jedną z form ujednolicenia było wprowadzenie wspólnego języka do komunikacji między pilotami a kontrolerami. W 1951 r. ICAO ustanowiła język angielski międzynarodowym językiem lotniczym. Mimo podjętych działań wypadki i katastrofy lotnicze spowodowane przez nieporozumienia i błędy w komunikacji nadal się zdarzały. Jednym z przykładów tragicznych skutków nieporozumienia między pilotem a kontrolerem jest katastrofa na Teneryfie w 1977 r. Łańcuch tragicznych wydarzeń z dużym wpływem problemów komunikacyjnych między załogami samolotów a kontrolerem ruchu lotniczego doprowadził do zderzenia dwóch Boeingów 747, w wyniku którego zginęły 583 osoby. Do dziś jest to najtragiczniejsza katastrofa lotnicza i ukazuje ona jak ważne jest prawidłowa komunikacja i zrozumienie między kontrolerami i pilotami. Stało się jasne, że brak konkretnych reguł dotyczących porozumiewania się i brak podstawowego słownictwa stanową bardzo duże ryzyko, a skutki błędów w komunikacji są tragiczne. Dlatego Organizacja Międzynarodowego Lotnictwa Cywilnego (ICAO) ustanowiła i nakazała używania standardowej frazeologii lotniczej, która ma na celu zmniejszyć ryzyko nieporozumień i tym samym zmniejszyć liczbę wypadków spowodowanych przez błędy w komunikacji. Wspomniana standardowa frazeologia lotnicza to starannie dobrany zestaw słów i wyrażeń stosowanych w konkretnych sytuacjach ograniczający możliwość błędnego zrozumienia zarówno ze strony pilota, jak i kontrolera. Określa ona również sposób podawania liczb i liter ze zmienioną wymową mającą na celu uniknięcie dwuznaczności. W języku lotniczym stosowanym przez pilotów składnia oraz gramatyka wypowiedzi zostały znacząco uproszczone. Zdania w wypowiedziach powinny być pojedyncze oraz krótkie. Liczba używanych przyimków została ograniczona, a sposób ich używania został dokładnie sprecyzowany. Ponadto w 2003 r. ICAO ustanowiła minimum znajomości języka angielskiego lotniczego dla pilotów i kontrolerów ruchu lotniczego, a od 2008 r. wprowadziła obowiązek potwierdzenia tejże znajomości specjalistycznymi egzaminami.

Standardowa frazeologia lotnicza powinna być stosowana podczas komunikacji między pilotami i kontrolerami w celu uniknięcia nieporozumień. Nie można jednak przewidzieć wszystkich możliwych sytuacji, dlatego dopuszczono użycie języka potocznego, zwanego frazeologią niestandardową w okolicznościach, w których

standardowa frazeologia jest niewystarczająca do przekazania wiadomości. Zaznaczono jednak, że język potoczny powinien być stosowany z najwyższą starannością, a dobór słów powinien być przemyślany w celu uniknięcia nieporozumień. Zdarzają, się jednak przypadki, kiedy standardowa frazeologia jest w zupełności wystarczająca do przekazania wiadomości, a rozmówcy mimo to odchodzą od jej użycia i w zamian stosują język potoczny.

W niniejszej pracy podjęto próbę ustalenia, czy piloci używają standardowej frazeologii w poprawny sposób oraz w jakiej formie występują odstępstwa od jej stosowania. W celu przeprowadzenia analizy dokonano transkrypcji 33 rozmów kontrolerów z załogami w sektorze „Warszawa Zbliżanie". Łączna długość nagrań z dwóch losowo wybranych dni wynosi 1 godzinę i 45 minut. Zostały one pozyskane ze strony LiveATC.net za zgodą właściciela witryny. Następnie rozmowy zostały poddane analizie ilościowej i jakościowej. Wszystkie transkrypcje zostały umieszczone w arkuszu kalkulacyjnym w celu szybszej i dokładniejszej analizy. Podział arkusza na zakładki pozwolił dokonać kategoryzacji wszystkich słów wypowiedzianych przez pilotów na frazeologię standardową i niestandardową, jak również oznaczyć, czy w danej rozmowie pojawiły się błędy w sposobie wymawiania danych liczbowych oraz czy stosowano się do innych zaleceń ICAO.

Wyniki analizy ilościowej ukazują przewagę w liczbie słów wypowiadanych przez pilotów w stosunku do liczby słów kontrolerów w 21 z 33 przypadków. Jest to dosyć ciekawe, ponieważ przyjmuje się, że to kontrolerzy, którzy wydają instrukcje i pozwolenia zazwyczaj wypowiadają więcej słów. Udział słów reprezentujących standardową frazeologię w liczbie wszystkich słów wypowiedzianych przez pilotów wynosi 5%, co może wydawać się niepokojące. Należy jednak pamiętać, że wypowiedzi pilotów w większości składają się nazw pomocy nawigacyjnych oraz podawania danych liczbowych, które nie zostały sklasyfikowane jako frazeologia standardowa. Słowa reprezentujące niestandardową frazeologię stanowią natomiast 19% liczby wszystkich słów wypowiedzianych przez pilotów. W zebranych transkrypcjach zaobserwowano również inne błędy w kwestii stosowania się do przepisów ICAO, m.in. w sposobie wypowiadania danych liczbowych oraz procedury zwanej 'readback', zakładającej powtarzanie przez pilota instrukcji kontrolera.

Wyniki analizy jakościowej zostały przedstawione w formie przykładów zebranych z transkrypcji. Na ich podstawie można stwierdzić, że piloci używają frazeologii standardowej we właściwy sposób, tj. we właściwym kontekście i z przypisanym

znaczeniem słów. Co ciekawe, w zebranych transkrypcjach nie można było wyróżnić choćby jednej wypowiedzi pilota zawierającej jedynie frazeologię standardową, ponieważ załogi używały obu typów frazeologii przemiennie w swoich wypowiedziach. Przykładami odstępstw od frazeologii standardowej było m.in. używanie zwrotów grzecznościowych takich jak powitania i podziękowania, nadmierne stosowanie przyimków oraz stosowanie wtrąceń takich jak 'eh'. Przewagę pilotów w liczbie wypowiedzianych słów można natomiast uzasadnić używaniem frazeologii niestandardowej, która w znacznym stopniu zwiększa liczbę słów i tym samym wydłuża wypowiedzi.

Przeprowadzone badanie było dość okrojone w swoim zakresie ze względu na specyfikę pracy, lecz zwróciło uwagę na potrzebę prowadzenia podobnych analiz w przyszłości, które mogą pomóc wyeliminować błędy, a tym samym sprawić, że lotnictwo cywilne będzie jeszcze bezpieczniejsze.