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COMMUNICATION IN AVIATION

Effective communication in aviation is an essential pre-requisite to safety. The article analyses various types and forms of communication which are used in aviation today, the content, peculiarities and functions of all these forms and their importance for aviation safety.

Effective communication is an important process in our everyday life. People must be able to communicate effectively with each other on both a personal level and a business level. Breakdowns in the communication processes can lead to misunderstandings. Misunderstandings and communication failures can cost money, loss of an important contract or a post, etc, but in aviation these misunderstandings can lead to a disaster. That's why there is no doubt that the communication process is most important in the cockpit of an aircraft than anywhere else. As history shows, a breakdown in the communication process between air crew members, a pilot and an air traffic controller is the major contributing factor in aviation accidents. It is considered to be the main cause of fatal air accidents because it is much more frequent than technical problems that could affect aircraft.

In the given article we will focus on different types and forms of communication used in aviation, their peculiarities and functions and highlight their role for aviation safety.

Several forms of communication characterize the field of aviation. D. Spinner distinguishes one-way communication and two-way communication. The former is, for example, from cockpit instruments to the pilot while the latter is also called 'interpersonal communication' and includes communication between individuals on the flight deck, in the cabin, and anyone involved in the operations, such as management and regulatory authorities [6].

M. Maddox [4] and some other authors [7] also divide communication in aviation into synchronous and asynchronous. Synchronous communication implies that the individuals exchanging information are dealing with each other in real time. The most common type of synchronous communication is the face-to-face conversation. However the participants do not have to be co-located to engage in synchronous communication. Telephone calls, instant messaging, chat rooms, and texting are all forms of synchronous communication. The synchronous verbal communication used by an airport attendant and a crew develops on a person-to-person basis. So, it is different from the verbal communication between pilots and air traffic controllers that is synchronous but has not physical presence. In this case, the tone of voice and the words issued are the most important elements. In synchronous verbal communication with the physical presence of the issuer and receiver, the non-verbal communication is also important [7].

Asynchronous communication implies that the individuals exchanging information are not dealing with each other in real time. In asynchronous

communication, the receiver typically responds to the sender after a time delay. E-mail is one of the most common types of asynchronous communication.

The most general classification of communication forms is the division into written, verbal and non-verbal communication. One of the forms of communication used in the aviation industry is **written communication**. It involves any type of interaction that makes use of the written word. In the aviation environment, a large amount of information is transmitted through written texts and that is why written communication is a common form of communication through the use of standard operating procedures, flight deck documentations, flight manuals, flight plans, checklists, operational bulletins and other documents between management and operational personnel. The use of these documents significantly influences the management and the operational personnel performance. The main benefit of these documents is to provide people involved in standard and non-standard processes of communication in aviation with the most precise, concise and direct information or instructions directly related to the situation encountered.

This communication can be one-way. There are some methods that relate in one-way communication. Aircraft maintainers use written procedures every day. Some of these procedures contain checklists designed to help complete tasks in an orderly and serial manner. The checklist or documents send the information but it is up to the pilots to interpret the message and then take actions based on their understandings. Thus, aircraft documentation is an essential tool to achieve the goal of safe flight. That is why the ability to write and understand these documents is vital for the flight safety.

The most critical form of communication within the aviation operational context between ATC (Air Traffic Control) and pilots, management and operational personnel is verbal interaction or **verbal communication**. Verbal communication can take place through various channels, such as face-to-face, telephone, radio, etc. The ability to communicate effectively will contribute to the reduction of aviation accidents. Verbal communications is one major media for communicating within the aviation operational context, and it needs to be improved along the practical drift for all employees. Communication errors between air traffic controllers and pilots is the main factor into aviation disasters, and it should be considered with great concern.

In a general meaning, verbal communication is the most common communication medium, because it is easy to perform. Verbal communication is an important part of the aircraft operations as well, as it happens everywhere from cabin crews greeting passengers onboard to pilots communicating with air traffic controllers, and between ground departments, etc.

First of all, let's consider the content of term "speech". According to H. Orlady and L. Orlady, speech is formed by the four primary characteristics (intensity, frequency, harmonic composition or quality, and the time or the speed with which words are spoken) which shape the meaning and emotions of the information being communicated [5]. Intensity is measured in decibels and results in the sensation of loudness. Sounds generally become annoying at about 80 to 90 dBs and can become damaging at 85 to 90. Frequency is measured in Hertz and gives rise to the sensation of pitch. Voice frequencies range from 1000 to 9000 Hz; and uninterrupted exposure to loud noises can cause hearing loss. Pilots who have spent

many years in noisy cockpits develop a characteristic hearing loss of higher frequencies because of long exposure to the noisy environment. Harmonic composition often means the quality. A change in the harmonic composition of speech can change the expression or meaning of a phrase, this quality is important in aviation. The harmonic composition of speech either from the crew or from the air-traffic controller can convey urgency as well as just conveying a routine communication. Time is related to the rate at which the words are spoken, the length of the pauses, and the time spent for different sounds, this characteristic is particularly important in ATC communications [5].

Communication between pilots and air traffic controllers is crucial. In fact, airplanes always need support from air traffic controllers so that safety often depends on an effective exchange of information between them and pilots. Although modern high-tech equipment used by operational personnel manages flight operations, the importance of radio-communication remains significant.

The quality of verbal communication between ATC and pilots has a direct effect to the safety and efficiency of flight operations, therefore ICAO has developed "The ICAO alphabet" to regulate the language used to communicate and these standard alphabetical words have been advised to increase intelligibility, especially when communication conditions are poor, and therefore reduce the risk of misunderstanding.

Moreover, the communications procedures should be in accordance with Volume II of Annex 10 "**Aeronautical Telecommunications"**, and pilots, ATC personnel and other ground personnel should be thoroughly familiar with the radiotelephony procedures. Here are some examples of such words and phrases and their meanings: AFFIRM (meaning "Yes"), APPROVED ("Permission for proposed action granted"), CLEARED ("Authorized to proceed under the conditions specified"), HOW DO YOU READ ("What is the readability of my transmission?"), I SAY AGAIN ("I repeat for clarity or emphasis"), READ BACK ("Repeat all, or the specified part, of this message back to me exactly as received"), ROGER ("I have received all of your last transmission") [2].

The method that is commonly used between flight crews and air traffic controllers is readback. It is a form of verification from the receiver to the sender of information that the information has been accurately transmitted. The example below illustrates the application of this procedure:

Station: TWA NINE SIX THREE MADRID

Aircraft: MADRID TWA NINE SIX THREE

Station: TWA NINE SIX THREE MADRID − ATC CLEARS TWA NINE SIX THREE TO DESCEND TO NINE THOUSAND FEET

Aircraft: CLEARED TO DESCEND TO NINE THOUSAND FEET − TWA NINE SIX THREE

Station: MADRID [2].

Verbal communication between the air crew and the air traffic controller has significant safety implications. Because of these safety considerations, a formal structure and restricted vocabulary have evolved to ensure that unambiguous messages are sent and received.

Thus, one of the obvious factors affecting interpersonal verbal

communication is language. In particular, if the spoken language of the sender and that of the receiver differ, the chances of misinterpreting the message are fairly high. Unlike the verbal communication that occurs among flight crews and air traffic controllers, which always takes place in English, there is no international agreement regarding a common language for maintainers. Even among people having a conversation in the same language there is ample opportunity for ambiguity, confusion and misinterpretation [4].

One more form of information exchange often used in flight procedures is **non-verbal communication**. As its name implies, non-verbal communication is any method of conveying information that does not involve speech. It is an essential part of all person to person situations. Non-verbal methods commonly include facial expressions, body language, and even the setting chosen for the information exchange. Non-verbal elements affect only synchronous face-to-face communication.

Body language is the dominant form of non-verbal face-to-face communication, which is highly intuitive and very effective. It includes gestures, postures and facial expressions by which a person manifests various physical, mental, or emotional states and communicates nonverbally with others. Body language requires that the people who are communicating can see each other. In aviation, body language is employed in procedures requiring hand signals from the ground to the cockpit, between crew members during certain routine operations or even between the cabin crew and passengers during or after an encounter with air turbulence. During taxiing operations not all aircraft are met by ground staff with headsets. In this case, the signals can be also used.

Without a language barrier and being clear and concise, these signals can also eliminate some problems of verbal communication. In fact, not all staff working around aircraft are supposed to know English very well, while they are more likely to understand hand signals. The use of non-verbal communication between the cockpit and ground crew is indeed a tried and tested method of communication. Moreover, particularly in case of an emergency, hand signals cannot be considered any less safe than using headsets, which are not always 100% reliable [3].

Visual communication between the ground marshaller and the pilot is a very complex issue for the safety of marshalling aircraft and helicopters. Communication of the visual kind in this context requires a level of common knowledge shared by both the pilot and the ground marshaller. There is a list of standard signals set out by ICAO that pilots and ground marshallers use to communicate. Some examples of these signals are represented below:

1. *"Straight ahead"* (Bend extended arms at elbows and move wands up and down from chest height to head).

2. *"Turn left"* (With right arm and wand extended at a 90-degree angle to body, make "come ahead" signal with left hand).

3. *"Normal stop"* (Fully extend arms and wands at a 90-degree angle to sides and slowly move to above head until wands cross).

4. "*Start engine(s)"* (Raise right arm to head level with wand pointing up and start a circular motion with hand; at the same time, with left arm raised above head level, point to engine to be started) [1].

Since the safety of any flight depends on effective development of such standard procedures, it is important to make all the personnel involved in such operations more and more aware of the fact that the non-respect of standard signals may create misunderstandings and have disastrous consequences.

Conclusion

Communication in aviation is a complex system consisting of verbal, non-verbal and written communication. We also distinguish some other forms such as: synchronous and asynchronous (depending on whether the information is exchanged in a real time mode or with some time delay), one-way or two-way communication (only in one direction or interpersonal communication, respectively), formal and informal, etc. Verbal communication takes place through various channels (face-to-face, telephone, radio, etc), written communication often requires electronic communication link and non-verbal communication (body language, in particular) requires that all parties of communication can see each other. Because of the extreme importance of accurate information exchange in aviation, the main objective of people involved in such activities should be to tune all these forms in order to transmit messages in the fastest and the most effective way. The more accurately messages are exchanged through complementary forms of communication, the more likely flight safety will be guaranteed.

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