POOR COMMUNICATION SKILLS MEANS HIGH RISK FOR AVIATION SAFETY

HABILIDADES PRECÁRIAS EM COMUNICAÇÃO GERAM ALTO RISCO PARA A SEGURANÇA NA AVIAÇÃO

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ABSTRACT

This article analyzes different types of communication used in the aviation operational environment. This research has a qualitative approach underlined by a documentary analysis based on reports by national aviation agencies. Communication is a complex system consisting of verbal, non-verbal, written, spoken and eletronic comunication. It is a crucial factor in managing critical situations. The results of the study show that lack of communication skills among individuals involved in air operations contributes to the bulk of accidents and incidents in aviation. Conclusions pointed out that avition activities require high skilled people in communication with a solid technical profile. The results also stress the necessity of implementing communication skills training to aviation professionals, to develop abilities to detect threats and communicate clearly the need for support to manage risks. It is imperative to certify that all the actions required by the Safety Management System's philosophy have been implemented to develop safety behavior.

Keywords: civil aviation; complexity; communication skills; safety-oriented culture.

RESUMO

Este artigo analisa diferentes tipos de comunicação no ambiente de negócios da aviação civil. Para tanto, utilizou-se uma abordagem qualitativa, delineada por análise documental dos relatórios das agencias governamentais. A comunicação é um sistema complexo que consiste em comunicação verbal, não verbal, escrita, falada e eletrônica. Na aviação, ela é um fator crucial ao enfrentamento de situações de alto risco. Os resultados obtidos indicam que lacunas de comunicação entre os indivíduos que atuam nas operações aeronáuticas e aeroviárias contribuem para a maior parte dos acidentes e incidentes ocorridos. As conclusões pontuam que as habilidades de comunicação são tão importantes quanto às habilidades técnicas e enfatizam a emergência do treinamento em habilidades de comunicação aos profissionais da aviação, possibilitando-os detectar ameaças e comunicar claramente a necessidade de apoio para o enfrentamento de riscos. É imperativo adotar as ações requeridas pela filosofia do Sistema de Gestão de Segurança, visando gerar comportamento seguro.

Palavras-chave: aviação civil; complexidade; habilidades de comunicação; cultura de segurança.

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1. INTRODUCTION

A system can be defined as a set of interconnected elements that interact with each other to perform a function. Clearly, every organization is basically a system that embraces people, structure, process and technology. Generically called resources, it is recognized that organizations are notably social entities. People are a spiritual force in any kind of business.

According to Senge (2006), developing a systemic thinking demands a holistic vision of the organization. It requires abandoning linear thinking and working with different levels of influence. A lack of systemic thinking contributes internally to form ghettos and unbalances the flow among activities, losing quality in the information process and in the communication flow.

Integrating all the components of a system successfully is called synergy. It is a phenomenon that determines that changes in any part of the system will produce effects on the whole system. The bigger the synergy is, the higher the achievements of a system will be, thus resulting in better efficiency in reaching the objective. On the other hand, the lack of synergy results in bad performance causing systemic failure, at least.

Under a humanistic perspective, the organizational communication works toward mediating employees' expectations and hopes, mitigating conflicts and balancing behaviors, and stimulating perceptions and attitudes.

In high-risk operations such as those seen in airlines, systemic communication must work toward promoting cooperation among all sectors and performing organizational functions safely. Safety is the reason that makes it fundamental to clearly comprehend the communication contents as part of an extremely complex whole.

The paradigm of the systemic view on communication is the interactive–communicative understanding that presents continuous steps of input, throughput and output. Thus, the general systems theory offers a conceptual base that justifies communication as an open, interactive and essentially relational system. An open system receives information from its environment, which is used to interact back dynamically. In the interaction process, communication must be seen as an integrated process that establishes a network of information and influences all around.

Considering how complex the airline operations are and how much diversified the agents are, communicating and interacting positively into the network is mandatory to manage systemic risks. A systemic understanding of communication in the aviation field is helpful in properly responding to the risky situations and in figuring out compromised behaviors, as well as to controlling risks in the aviation communication process. Also, it is helpful in developing better skills toward an assertive and respectful style of communication, which will significantly reduce the negative effects of miscommunication and enhance aviation safety.

In daily working, for better or for worse, issued organizational communications have a great impact on the employees, but just a few of them can change their attitudes due to a normative statement. Some communications may cause confusion because they have not clearly expressed the contents. Others may never reach their readers because the sender was not specific on the subject to be stressed. Considering that in aviation a high-risk situation can easily become a tragedy, communication skill is a key competency for those who work in this sector.

In this way, development of communication cannot be taken casually or be seen as an extra option in preparatory courses in aviation, addressed for pilots, crew and ground professionals. Lack of a satisfactory communication skill can easily decay intellectual and technical knowledge and may negatively affect the decision-making process in such a dynamic environment.

Risk management in aviation is based on the assessment of danger and possible consequences of the threats and errors caused by miscommunication. To develop communication skill to an appropriate level, many tools can be applied, starting from diagnoses based on the resources developed by Organizational and Social Psychology, complemented by a specific training program addressed to those with particular needs and a general training program for those who work in aviation operations environment. That latter is the focus of this article.

There is a consensus that behavioral training program based on communication must meet the need of identifying and changing risky behaviors, preventing and reducing communication errors, and proactively contributing to business performance, and in aviation, it means mostly, to reach safety, among other contents. Developing communication skills is a must to prepare future professionals to prevent risks caused by poor communication, rather than to respond after they become a problem.

To achieve a desirable level of aviation safety, we must develop a program that has a powerful safety objective to be shared by all sectors involved in aviation operations. To reach this common objective, individuals have to learn how to integrate and coordinate their duties with other team members. To do so, all relevant information has to be effectively shared as well as performance indicators.

Dickinson and McIntyre (1997) define communication as the focal point of the teamwork, i.e., communication is one of the most relevant components to connect other elements of a system. Communication enables people, processes, structure and technology, including systems, to interact simultaneously and cooperatively to achieve safety in all sectors, creating a safe system.

Communication skills not only include verbal behavior and evoke usage of the right words, at the right time, in an appropriate tone of voice; they also include non-verbal behaviors, i.e., body expression, the look and the gestures, and written communication (VIEIRA; SANTOS, 2010).

2. COMMUNICATION AND THE SAFETY CULTURE

Torquato (2004) highlights two key elements in the process of communication: effectiveness and efficiency. Referring to effectiveness, he suggests that, to be effective, the message has to present characteristics such as credibility, appropriateness, relevance, understanding and synchronicity. Torquato defines efficiency as the ability of the issuer to affect other people's behaviors, perceptions and feelings, so as to make them follow the issuer's intentions. In addition, the author stresses the fact that the message issuer can also be affected by the

individual's changed behavior, since the message aims to be advantageous to the issuer and to the organization.

Communication effectiveness and efficiency represent the most important pillars to maintain safety in an airline operation. Therefore, aviation professionals have a great responsibility and they ought to be concerned in providing a fully understandable communication process, otherwise the consequences can be catastrophic. Organizations that continuously address resources and make efforts to build up a real safety operation through a reliable and shared communication process will create the so-called safety-oriented culture. The safety-oriented culture is guided by values and reinforcements, not by punishment. Therefore, managers have to be able to encourage and recognize communicative actions.

The safety culture is usually defined as a combination of attitudes and open communication. According to the Federal Aviation Administration (FAA) estimates, human errors are responsible for 60–80% of flight accidents and incidents. These numbers give a real dimension to the relevance of developing effective communication skills and positive attitude.

It is universally accepted that human beings will inevitably make mistakes, and that the psychological barrier between error and accident is the ability to recognize, to capture and to correct failures before they spill all over. Thus, so-called ability of learning lessons comes with experience and mainly with experience sharing, which increases critical knowledge on risky or tragic situations without individuals having to experience those situations.

However, it is usual that companies highlight more the errors than the lessons learned from a bad experience. This management style, which is focused on error and punishment, gradually strengthens a culture averse to risk situations, a culture in which workers choose to hide their mistakes, exposing them to the same type of error again. The communication process in aviation should be treated professionally.

An example of the culture based on risk and error omission, which gained the headlines of an important national newspaper, can be seen in the contents of an e-mail sent to the crew of a Brazilian airline. In

this communication, the leader of flight attendants justifies the action saying that the formula for achieving success in the airline operations was "keeping the mouth shut" (*sic*). The meaning of the message taken is described in the following quote:

> "This memorandum aims to inhibit the crew to report technical airlines situations of any kind," concluded Garcia, Secretary of Cabin Crew Members of the Pilots Union of the state of São Paulo. (O ESTADO DE S. PAULO, 2007)

This sort of communication reveals a total lack of social skills and interferes with flight safety because it restricts the reporting of important and hazard information, which is the basis of the aviation Safety Management System (SMS) especially designed to assist air transport to achieve better safety indicators through risk analysis and establishment of preventive measures. The SMS concept is based on a productive operational safety culture, which promotes free flow of information to improve the flight safety system.

The workforce must rely on their leaders to carry out prevention reports, without fear of reprisal or embarrassment. Leaders must show that all reports concerning safety procedures and situations are considered valuable, respected, appreciated and rewarded (International Civil Aviation Organization 2009).

A correct analysis of a flight accident or incident can show that risk situations work as a source of learning and provide strategies to improve communication within the company, which literally means sharing information. The crew-oriented communication in the airline field, as currently followed, seeks much more to provide control and mastery on situations and to establish a positive flow of information and guidelines to the crew than to simply promote safety.

Owing to its operational complexity, an airline's communication process has certainly more peculiarities in comparison to other organizations in sectors that are considered less complex. And, when it does not work properly, problems can arise and culminate in an unexpected incident or even in a tragic accident. The capacity to keep working safely in an airline is directly associated with how prompt is this company structure

to maintain well-sustained flows of communication to ensure the decision-making process.

In a context characterized by continuous risks, it is fundamental to make sure that people will make use of a relevant communication at the right time. This particular characteristic has significant implications for what can be defined as one of the most important functions of communication focused on safety: to work as a reminder that helps to access the memory storage of how to deal with emergencies.

Following is an example of internal communication without any risk management approach and its impact on safety. The subject was about the maintenance prediction.

> Dear Managers,
>
> We have been informed by the Interior Engineering/Design that at A and B aircraft start-up operation moment, there were no portable ELT models in stock. Therefore, these aircraft went into operation with the old ELT models already supplied for these aircraft. According to information from Maintenance, this material is easy to handle.
>
> Thanks,
>
> Training Management (Testimony A 2008)

An emergency locator transmitter (ELT) is a device that transmits a signal on a particular frequency to locators, making it possible to identify and carry out rescue operations. It can be observed from the above message that the equipment was changed without any kind of prior notice. The phrase "this material is easy to handle" is worthless because it does not give a clue on how to handle it.

The expression "easy to handle" shows a total disregard to the safety of the equipment and the lives of the passengers on board. Even being a typical case of a device that nobody would use in a regular situation, it would be literally vital in a possible rescue operation. According to the testimony of flight attendants and management staff, it was considered unnecessary to keep an on-the-ground crew just to give instruction on a specific and rare-usage equipment.

When communication about the interests of the company does not highlight flight safety, some kind of interference that can be misinterpreted commonly arises, permitting the result and not the safe action, as happened in the previous example.

Poor communication can lead to tragic consequences. However, it is still true, as shown in the literature review, that efficient and effective communication can lead to positive outcomes including improved information flow, ensuring more safety to the processes. Developing communication skills is possible through a well-structured training program aiming to facilitate team communication, which includes a substantial improvement in quality and prevention of errors.

Managers and leaders who show low-level interpretation skill usually have teams with low expectations and incomplete skills due to lack of information-exchange practice, which leads the team to err or not to perceive its previous signs, which are called red flags. Even the caring professionals tend to be underestimated by the culture.

Detecting red flags on possible risky situations, and being able to communicate the signs of an imminent accident, can be seen as criticism rather to be seen as a proactive attitude by the low-skilled professionals. The situation expressed below is an example of how a proactive communicative action can be seen as a criticism:

> I reported directly to the Safety Managers a risk situation that could cause an accident (in Aviation Operations). As a result, I received a "harsh" response from my manager warning that I should have first reported the risk situation to the Marketing Managers whose is the responsibility to lead flight attendants. For this reason, I was punished and totally discouraged to report new red flags that I would observe in the future. (Testimony B 2008)

In aviation, every worker should have in mind the same goal, which is the safety, no matter what department they work for. In aviation, safety comes first and must be put on a pedestal, above any other organizational priority and also has to be seen as a valuable asset to support business philosophy, which holds everyone accountable as a member of the Safety Team. Safety is rather a concept than a functional body and supports the company's mission.

So, for safety to become a fundamental concept to the business, which may express the customer's main expectation, and an attitude in daily life, calls for a developmental program for social skills improvement that allows members of the team to reach high standards of performance and walk through the same challenges, which is security of the flight.

The main objective of communication skills training (CST) is to train individuals with a high degree of interpersonal relations by encouraging communication skills and improving social competence so that conflicts are resolved without anxiety, fear or other emotional losses (VIEIRA; SANTOS, 2010).

2.1. The butterfly effect in communication

Lorenz (1979) found that insignificant factors can amplify as the time passes by. They can also radically change the state of being. So, minor changes or minor errors in a pair of variables can produce tremendously disproportionate effects. Lorenz named his discovery as the Butterfly Effect.

People with highly developed communication skills are able to figure out how a message can generate a negative butterfly effect, influencing the operational chain and affecting aviation safety.

It is highly recommended to estimate the impacts of a decision, and its effects on the operational system, as seen in a formal memorandum below whose subject was a clam for more synergy among different working teams — operational, commercial, cabin crew — and the operations coordinator

> The Airlines Company is pointed out as the first company in the flight delays ranking.
>
> Coming with the perception of changing this awful position, we will adopt some initiatives and we count on the collaboration of all managers to implement them.
>
> The group responsible for the largest number of delays will be punished with the non-receipt of the profit-sharing (PPR). A survey will be leaded to verify

what have motivated further delays and sector, the sector that is named as responsible, will not receive the PPR. Pilots, Chief cabin and supervisors shall submit reports as soon as possible, pointing out the team responsible for the delay (dispatch, maintenance, technical crew, crew, and others). Let us work towards the synergy of teams to end up with the delays and our company will be recognized as the most punctual in the world.

Challenges will transform our good employees today in great employees tomorrow. (Testimony C 2008).

To assess the contents and the main consequences generated by lack of communication skills in this internal memorandum, we analyzed its top six mistakes:

1. The CRM (customer relationship management) philosophy was corrupted: what primarily should work to strengthen synergy actually ends up segregating groups. The decision to reward only one group of officials damages the sense of the whole involvement in improving the management of threats and errors, turning collaboration into competition among team members as if they were participating in a great rally;

2. Blame cycle: dispatcher points out how responsible is the commercial crew, pointing to technical crew, who blames the maintenance which, in turn, blames the flight operations dispatcher, resulting in, what Reason (1997) defines, how to blame, which does not solve the cycles of delay and contribute to the errors and violations;

3. To win the extra payment, shortcuts are taken and some working stages are eliminated. Consequently, some checking points are ignored, resulting in uncompleted maintenance, which is made under pressure, superficial emergency check, briefing elimination, among other emergency issues that are relegated;

4. Uncompleted reports are carried out "at the door of the aircraft" only to show the consequences. The delay is the result, and the root problem remains latent. Some questions would be made in this case: Which factors would be causing delays? Is the number of aircrafts in operation sufficient? Are there missing parts to run with the maintenance? Is the manpower in charge of dealing with the airplane on the ground and passengers check out enough? Do the personnel have an appropriate training? Is there any kind of communication problem? Is there a combination of two or more of these factors?

5. Stress between those professionals involved in the flight with everyone willing to solve the problems quickly and concerned about the punishment instead of worrying about safety;

6. This lack of communication skills raises the hurry-up syndrome: team performance is degraded due to the pressure to which tasks are fulfilled quickly. Hurry-up syndrome is a negative factor often pointed out in reports of accidents and incidents.

In a flight of this airline, as a result of the hurry, an employee became trapped in the airplane's luggage area. Luckily, a passenger who was on the toilet heard muffled screams coming from the aircraft floor. The airplane had to come back to the airport, further delaying the flight because they lost their time in takeoff, going back to the end of the row.

Considering the human side, it is mandatory that airline professionals have a clear understanding of the contents of any communication in high-risk environments and perceive its peculiarities. Techniques of communication skills must be taught and practiced in CST, to generate a more assertive communication, in order to prevent an accident or incident in aviation operations.

2.2. Types of communication

In the aviation field there are several sorts of communication. The most commonly used are the written communication as internal communication, e-mail, bulletin boards, newsletters, reports, posters and signage.

The synchronous verbal communication used by flight dispatchers, airport attendant and crew is developed on a person-to-person basis. So, it is different from the verbal communication between pilots and flight 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, commonly referred to as body language, is also important. If a person, engaged in a person-to-person communication, shakes hands, smiles or blinks, this person is communicating or responding to a message with other individuals.

Another type of communication, which is intermediated by automatic systems, is the communication developed between pilots — cabin — and the command of the aircraft. This communication can be one way, when referring to reading navigation instruments, or involve the usage of vision, hearing and talking capabilities aligned with judgment. We must recognize that different approaches are required for different types of communication and situations.

2.2.1. Written communication

The written communication is widely used in air transport operations, such as reports, documents, logbook, and operation manuals. However, for an effective written communication, it is necessary to be clear, to be objective and to know the language used by the receiver.

Anyway, to express by way of writing, ideas, guidelines and information requires ability to write clearly, what should be common among professionals in aviation. Usually, the goals regarding writing practice are focused on obtaining and providing standard information and promoting a specific action.

The usage of a flight dispatcher to fill up the forms and process the flight plans is a daily practice in aviation. Flight dispatchers and the crew are expected to have high writing skills, which is considered necessary to correctly process all the required forms and to provide a clear understanding on the written information therein.

For aircraft maintenance personnel, for example, the communication includes a lot more information than verbal interaction. That is because communication does not include just the face-to-face interaction, but also,

and mainly, the written communication such as documents related to the procedures, orders and reports.

The aircraft maintenance is an ongoing process carried out in shifts. In this way, changing shifts, which is usually done through reports and working cards, is an asynchronous communication because it does not occur in real time. So, during training, it is important that the student is trained for this particular form of communication, knowing not only how to comprehend texts, but also to write correctly what should be executed in the next shift.

Nevertheless, in a study carried out by Parke *et al*. (2003), which approaches communication problems and which was based on maintenance incident reports, from July 1998 until March 2002, the work cards were singled out as a contributive factor to a greater percentage of incidents involving communication problems. That is because the works cards are related to transmission of written information to guide the next shift turning on the tasks that need to be performed. Therefore, gaps in understanding in written orders may result in errors.

The current practice of hiring foreign airlines mechanics, aiming to reduce operational costs, is becoming a growing problem. Harris and Smith (2009) pointed out that a majority of foreign airplane mechanics cannot communicate in English. They present difficulties in writing and understanding written instructions manuals and working cards. They have difficulty in understanding even verbal communications of their supervisors, and this is a big problem for security.

Goglia (WFAA-TV 2009), who is a member of the U.S. National Transportation Safety Board, said that when you bring in a person who cannot read the manual, you raise the risk. When you bring in a person who does not understand the verbal instructions from a co-worker to his supervisor, you raise the risk. Of course, the downfall is when a person cannot read, write or even understand English. In this case, there is a serious safety problem going on there.

If the mechanics do not have the required skills to interpret what is written in the papers and books, this affects the security as a whole and not just the maintenance sector. For example, one of the reasons

cited by investigators in a plane crash was incorrect connection of cables of aircraft control surfaces.

Normally, when mechanics repair a part of the aircraft, they open the manual, consult the logbook and carry out the repair step by step, as if it were a cookbook. Instructions and illustrations should be clear, otherwise it may induce the mechanic to commit mistakes, as in the case of the example below.

> August 2010, I was assigned to the tail cone Emergency Escape Slide (EES). I had not completed this job before. I followed the Job Instruction Card (JIC) and finished the task. As I remember, the job card images were small and hard to read. I signed the logbook and job cards thinking this job was complete and correct. The aircraft was one hour late for the original ready time. I was informed today (June 2011) that this aircraft had a misrigged slide lanyard on the tail cone slide. (ACN: 954070, 2010)

Aircraft documentation is an essential tool to achieve the goal of a safe flight. The ability to write and understand this documentation is vital to the safety of airlines. So, efforts are needed to develop written communication skills of all involved.

2.3. Internal communication in air operations

An accident results from a combination of latent failures, organizational aspects, and active failures, human performance (Reason 1990). Such failures, whatever their nature be, need to be detected in time.

> It is good to note that the latent failures, which can lead to a catastrophic event in Aviation, are not unique to aircraft projects. Many times, they are included in faulty or obsolete communication processes, which are ot changed in an appropriate timing. Concern is also in badly written messages which lead to errors in procedures, which are executed and assumed as true, along the time. "Thus, latent failures may accumulate invisibly." (REASON, 1990)

The excerpt below has been taken from the Final Report Number 067, which attributes to the lack of communication among organizational sectors as one of the most contributive factors of a Brazilian aeronautical accident.

As an worsening circumstance, as the safety management in each sector organized autonomously, there were different approaches and distinctive criteria to proceed within the company, what denotes a lack of standardization and implies no possibility of crossing relevant safety information across the sectors, such as in the cases of lack of communication between the "Safety (Dept.)" and the "Training (Dept)" and in between "Safety" and the "Maintenance". (CENIPA, 2009)

It is very risky to issue safety communications through e-mails. It can also become a problem if it is dissociated from an overall communication policy effectively designed, built and planned, which seeks key stakeholders' participation, especially, in this case, from the staff of an airline operation. This lack of ability in internal communication is illustrated in the excerpt below, which taken from the Final Report Number 067, for a Brazilian plane crash:

> "Safety Communications" with the crew were made only through corporate e-mail, without an instrument of control that would certify that the information provided would be effectively read, giving away an important element of communication: feedback. (CENIPA, 2009)

Mouden (1992) emphasizes the need for imparting proper training to the professionals handling internal communication in an airline. He noted that internal communication is less effective than it was believed. Nevertheless, the matter is to be found out just after an undesirable event.

Despite the fact that organizations define collecting information as a routine to assist assertive communications process, most of them never use that information. Managers seem to suffer from a "communicative rush ill," eventually deciding to communicate before evaluating the best way to do it and how this communication can affect the airline operations.

It is also important to develop methods and techniques for auditing internal communication in aviation, a tool that allows making a complete assessment of safety issues, detecting the origin point and probable causes for errors committed by a crew member.

This tool can reveal serious risks to safety if it is proven that the communication raised by the company is dissociated from a safety policy. Communication auditing should cover some issues as such as those listed below:

- Do the managers demonstrate a systemic vision of the communication? Do they have communication skills to generate messages?

- Is the safety communication written in a comprehensible form?

- Is there a communicative feedback?

- Is there an open access to the upward communication (lower hierarchical levels to the superiors) and horizontal communication (between people considered equal in the organization's hierarchy)?

- Does the airline generate a planned communication?

- Are there communications regarding the rewards schemes, production and productivity? If so, how do the professionals are committed to security?

- Is the information clear, in particular when it comes to orders and instructions?

- Are the messages set to the values of safety in aviation regulations?

- Is the pace of information changing fast-paced?

- Does it allow an intelligent decision-making process?

- Does the process generate some opportunities to correct errors and restore credibility?

- Is there an information overload? (noting whether the load is excessive or deficient or appropriate volume)

- Are the multiple outbreaks of internal communication causing communication conflicts? (several managers sending messages without consulting each other)

The incipience of internal communication can eliminate the credibility of published information. A lack of confidence in the information disclosed by the organization generates a natural channel and a parallel source of information that is perceived being more reliable than the formal communication — a serious problem, cited as one of the most contributive factors of a Brazilian plane crash in Final Report Number 067:

> As a result of this lack of integration, informal communication ended up prevailing in the company, made often in an embodied manner, rather than in formal procedures with the usage of previously established channels, which could not work in favor of an effective management of operational safety. And, once this atmosphere was reflected in the aircraft cockpit actions safety may be affected. In the case of the operator, the lack of integration in the communication between (companies) sectors was given the impression that communications were neglected, badly defined, conflicting, and the formal communication should be overcome by informal rules and values, generating confusion within the organization. (CENIPA, 2009)

The lack of adequate internal communication can generate the following undesirable consequences:

- The decay of the quality of the work and index of performance;

- Losses regarding time and money, considering errors that come from important information that never come, messages that are misread;

- Frustrations and high levels of stress.

Investment in training, to develop the communication skills, should be the priority of any organization in search of a solution to reduce conflicts that are widespread within the organization and that interfere directly in the safety approach.

2.4. Automation and communication

This kind of communication requires an interpretative capacity, experience and judgment. Even being nurtured by avionics control systems that, for safety,

are usually redundant, it is necessary to distinguish, at least, the inconsistencies between the pieces of information coming from different electronic tools and sources.

Studies on the incidents and accidents in aircraft with advanced technology have shown that the properties of the automation system can even create difficulties if they are not combined with effective communication and competences, which are required to coordinate the professionals involved in the operation (SPARACO, 1994).

The interaction and the search for results create the requirement of shared attention. This dyad "communication + shared attention" generates more effective decisions. Shared attention, according to Krieger (2005), is a state of consciousness achieved together in that communicative interaction in which the individuals involved will remain in an active state aiming to attend, respond and realize the information correctly. As a result, they remain continuously updating the incoming data, including the unexpected, unlikely, uncomfortable, implicit or controversial data, keeping them in line with their perceptions.

Since the beginning of the training of the future professional in aviation, it should be emphasized that computer-mediated communication does not replace the interpersonal communication, in the cockpit, between the pilot and air traffic controllers (ATCs), nor in other sectors of the airline.

People and automated systems, both in-flight and on-the-ground, are closely connected to each other and have to work in harmony to solve tactical problems: if there is a breakdown in the communication process between people and automatic systems, the lack of information can lead to an accident, as in the case of the example reported below. It is based on the final report about the accident occurred on June 29, 2006, typified as in-flight aircraft crash.

From this moment on, the transponder will no longer broadcast until he returned, approximately 58 minutes later. In this situation, based on existing rules, the controller should inform pilot about the disability on the reception of the aircraft's transponder. However,

even with the directions displayed on the screen, in the aircraft's board radar, about the innefectiveness of the transponder, no measures to correct the problem were taken by the flight controller and pilot, or to increase the vertical distance between the two aircraft involved in the accident. During the interviews, the crew said they did not notice any warnings related to the transponder´ standy by condition (CENIPA, 2008, p. 39).

Although most pilots recognize the need for more cross-checking procedures and the need of changing computer systems and programs, the data collected by experts during some flights of commercial airlines indicated that, even after the training class when instruction have been given regarding the organization's philosophy about automation, there are many cases in which pilots do not communicate and take a long time to recognize programming changes (HELMREICH *et al*., 1996).

Automation has created new needs of communication skills, which adds to the other requirements and skills. Training programs and devices can be designed, adapted and developed according to what is congruent within the local culture. An example is a Brazilian airline in which the on-board computer was programmed to issue warning signs in a female voice. This option caused surprises and problems for the pilots of foreign countries where men are not conditioned to obey orders from women.

The communication mediated by automatic machines and systems with pilots and crew is an extremely important issue. Psychologists highlight the necessity to properly fit an automatic system for those people ahead of the communication process, and not the other way around, as usually happens.

2.5. Communication *vis-à-vis*

The planning stage, the briefing and preparation of a pilot by a flight dispatcher are important tools to keep pilots updated and assist them in case of any questions. In this stage, both written and person-to-person communications occur between the issuer and receiver, and perfect understanding of what is expected to be executed is critical to aviation safety.

The person-to-person briefing is an important support for the understanding of written documents. The transfer of personal information when accompanied by gestures and tone of voice expressing intentions is more eloquent than the formal written documents specifying past events and initiatives to be accomplished.

Developing communication skills and include this item in the scholar curriculum for pilots, airplane crew and ground professionals is justified by information collected on flight recordings and safety reports, suggesting that many accidents are not due to failures of aircraft systems or technical failures on part of the crew.

In general, accidents are caused by interpersonal factors, such as, inadequate communication between the crew members and other sectors, which in turn leads to loss of situational awareness and takes the team relationship to deterioration, culminating in a wrong decision or a series of decisions that result in serious or fatal accidents.

Ultimately, better interpersonal communication between the Captain (CA) and First Officer (FO) is needed. A strong factor in this loss of radio communication with Air Traffic Control (ATC) was a high level of animosity between the CA and FO. Throughout this rotation the FO was consistently hesitant and slow to perform her duties and when she did so she was often inaccurate and defensive. On the final leg of a multi-day trip, this less-than-professional performance by the FO began to wear on the Captain. There was minimum communication between the two by this point and when the FO was not willing to update the Flight Management System (FMS) as the CA requested, the CA became very frustrated (ACN 860386, 2011, apud VIEIRA, DOS SANTOS & DE MORAIS, 2013).

The International Civil Aviation Organization (ICAO) encourages all professionals, in any situation, to listen, think and speak. These are the three major instances of verbal communication, and each of them is essential to create a message.

The potentially rich context of face-to-face communication can present risks of conflict when the words have a specific meaning and non-verbal indicators indicate the opposite.

Many companies advise employees to avoid approaching personally their leaders, suggesting the usage of the company's portal on the Internet. What the crews have to communicate frequently is very important and relevant for flight safety. Virtual communication has smashed face-to-face communication, contributing to lose a number of important non-verbal communication, gestures, accents and so on.

To increase the knowledge of management on security-related problems, an airline has a reliable and great source: its employees. Employees hold a considerable collection of experiences, troubleshooting cases and applied knowledge that, once analyzed, can provide indicators of the strengths and weaknesses of a system. This source is available to managers, without any additional financial costs (ICARUS COMMITTEE BRIEFING, 1998).

2.6. Communication between Air Traffic Controllers and pilots

Communication between ATCs and pilots continues to be a vital part of the aviation. Communication problems between them may result in hazardous situations. A first step in reducing the incidence of problems in communication between these is to understand how and why the problems happen.

The spoken word and the voice are the only interpersonal elements available while exchanging information between controllers and pilots. It is necessary to consider that they are in different environments, with different needs and expectations, and their attention is shared with other tasks that must be performed simultaneously — and the number of channels of communication between them is limited, according to the European Air Traffic Control Harmonization and Integration Program (EATCHIP, 1996).

According to ICAO, between 1976 and 2000, more than 1100 passengers and crew lost their lives in air crashes and accidents in which the issues of language had a contributive role (MATHEWS, 2004).

Incorrect or incomplete communication between controllers and crew is a direct or circumstantial factor in 80% of incidents or accidents, according to a survey

carried out by NASA using ASRS database (FLIGHT SAFETY FOUNDATION, 2000, p. 1).

The communication channels between pilots and controllers are limited, and despite numerous transmission networks, with highly technical data, the spoken word remains the most important tool in between these professionals: the speech is the only resource available for the interpersonal exchange of information between the pilot and the controller.

To be skilled in the communication process means that the pilot's information and requirements will be properly comprehended. The ATC communications will be formulated with accuracy and the possible ambiguities will be solved through active listening. Research and clarification, when necessary, will also help. A standard procedure to reduce and prevent accidents is to verify if the contents of a communication routine have been well received and comprehended. Did you copy that?

Pilots and controllers can avoid misunderstandings giving each other timely information in advance and asking again whenever they notice the lack of any information, confirmation or correction. Therefore, the ATCs must be notified in advance as far as possible, so that they can make a timely recognition. When the interlocutors do not seek to resolve such discrepancy, in which there is an unanswered question, they are communicating without thinking critically.

Kanki and Smith (2001) stated that when the receiver does not understand an instruction, a feedback to the speaker can generate a correction or clarification. If the response does not match the need, the speaker should ask for clarification until the need is fulfilled: the insistence on the approach can ensure the correct understanding.

Red flags indicate disagreements or misunderstandings. Whenever a listener disagree or feel any reaction of uncertainty from the issuer, as different voice tone, questions rather than statements, or even the silence that might mean hesitation, the listener should immediately try to clarify the situation before it becomes too late.

The professional should be trained to understand words or expressions that set up red flags, although the dynamics of communication contributes to renew the collection of this type of words. In short, riders and drivers must learn to recognize the failures of communication processes and stay alert for the moments in which a red flag arises.

The training in active listening should be introduced early in the training of controllers and pilots in order to contribute to the identification of small details that can transform such failures in assertiveness rather than catastrophes.

Flight controllers and pilots must be skilled communicators and develop the sensitivity to capture the greatest range of signs available. They must be flexible enough to quickly change their own attitude, to change a communication that may deteriorate and cause an accident. Unqualified communicators tend to present a narrow range of behavior.

Flight controllers must possess the skills needed to establish immediate communication and against any kind of significant change, including weather conditions, wind speed or direction of the wind, surface, visibility, to name a few, in addition to convey other important information that may assist in the trial and pilot planning.

It is imperative to monitor and anticipate unwanted situations that may occur during the flight and communicate correctly the hazards and risks in a timely manner, to take appropriate measures to solve the problems detected.

Narrative 1: [...] Since both aircraft were northwest bound, I assigned the second aircraft a heading that would turn him inside the on course heading of the first aircraft due to the second aircraft going to further northwest then the first, I waited until the Departure Controller had the information on both of the aircraft prior to transferring communication of either aircraft. While both aircraft were initially separated and coordination was written on the strip of the second departing aircraft it was not written on the strip of the first aircraft or verbally coordinated, which would have prevented the Departure Controller from

turning the first departure on course before turning the second departure and prevented a loss of separation. Recommendation, call the RADAR Controller to inform him of the plan. (ACN: 931957, 2011/02)

Narrative 2: I was working RADAR with little traffic. The Tower sent to me 2 back to back departures. When the 1st aircraft called, I gave him a turn left on course to the north northwest and as he un-keyed his radio, the 2nd aircraft called about 600 FT lower and 12 mile behind and left of the 1st. Improper or missing strip marking and no verbal coordination. Recommendation, the Local Controller should not have tried to shoehorn the 2nd aircraft up the 1st because there was no need for it whatsoever. Thirty seconds of additional separation and it would not have happened. (ACN: 931957, 2011/02)

Therefore, it is essential to the safety of a controlled flight that there should be a perfect communication between the pilot and controllers in all phases of the operation to increase situational awareness, helping both to develop a mental picture of what is happening.

Also, in the context of the dynamics between controllers and supervisors, there is a need for efficient communication. Problems in this area can adversely influence the decision-making, resulting in inadequate and ineffective actions, which reflects an ineffective coordination of resources on the team.

According to Caballo (2006, p. 104), the CST makes it possible to develop cognitive skills that enable the development of more precise expectations about the behavior of others; expectations of more positive consequences; more tolerance in relation to conflicts; more positive autoverbalizations; looking at the situations from multiple perspectives and greater content knowledge assertiveness.

3. CONCLUSIONS

The theoretical approach and the cases here discussed allow visualization of logical foundations that support the approach of how crucial it is to develop communication skills for aviation safety, and managing teamwork with efficacy is a matter that should be emphasized in all training aviation professionals.

Effective communication provides a cohesive and supportive structure and helps promote a safety culture. The systemic vision of the communication provides a strategic understanding on the need of people from different sectors interacting to work cooperatively. CST provides the mechanism by which knowledge and understanding can be improved to avoid risky behavior, and this is illustrated through examples provided throughout this study.

People who have well-developed communication skills can effectively expressed themselves and develop other mechanisms that are essential to involve employees in safety activities and to obtain cooperation and support for maintaining a positive safety culture.

Leaders must generate positive models of integrated communication, aiming to reach: (a) assertive decision-making and troubleshooting; (b) emotional balance (sync); (c) cooperation, collaboration and connection; and (d) promotion of changes.

Communication should be audited and explored at all levels of the organization mainly to assess the quality.

All types of communications contribute to aviation safety. For this reason the industry need people with high communication skills in all sectors.

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