

Ana Maria Vieira
 Technological Institute of Aeronautics
 São José dos Campos – Brazil
 marianav@uol.com.br

Isabel Cristina dos Santos*
 University of Taubaté
 Taubaté- Brazil
 isa.santos.sjc@gmail.com

*author for correspondence

Communication skills: a mandatory competence for ground and airplane crew to reduce tension in extreme situations

Abstract: *Communication skills have been considered a strategic asset for any kind of organization. However, technical-oriented enterprises usually emphasize the virtues of a cluster of technical competences and technological resources availability. So, this paper aimed to discuss communication skills development beyond technical communication in a high technology and technical-based operation, such as ground and flight operations. To do so, this article describes some tragic-ending cases in commercial aviation in which the poor quality of interpersonal communication was identified as the one of the most influential causes of the aircraft, or at least that was seen as a compelling force for creating the perfect backdrop for a disaster involving civilian aircrafts. Methodological procedures were basically addressed to a qualitative approach, supported by a documental research considering some of the most documented cases of aircraft accidents reported by the Aviation System Safety Report, issued by Federal Aviation Administration (FAA), USA, as well as reports of accidents provided by The National Transportation Safety Board (NTSB), USA, and by the Center for Aircraft Research and Prevention (Cenipa), Brasil.*

Keywords: *Airplane operations, Communication skills, Flight safety, Managing risks.*

INTRODUCTION

As estimated by the Federal Aviation Administration (FAA), human error accounts for 60-80% of accidents and incidents of flight (FAA, 2004). And the dysfunctions related to human communication appear as substantial part of the causes highlighted by the Aviation Safety Reporting System (ASRS), the FAA system that collects voluntarily submitted aviation safety incident/situation reports from pilots, controllers, and others.

According to research conducted by Sexton and Helmreich (2000), since the creation of ASRS, over 70% of these reports have directly or indirectly accused problems associated with failures in interpersonal communications. The authors concluded that an effective communication system is not enough to overcome the lack of technical competence in flight operations. But, on the other hand, they also found that technical competence is not sufficient to prevent the catastrophic effects of poor communication.

Krifka, Martens and Schwarz (2003, p. 1) postulate that “factors related to interpersonal communication have

been implicated in up to 80% of aviation accidents in the last 20 years”.

A recent study performed by Kutz (2000) has detected a significant deficiency in the aviation community’s ability to communicate. To overcome this gap, the author recommends that communication skills should be developed from the basic writing skills, including grammar, spelling and punctuation up to interpersonal relationship.

Although the Corporate Resource Management (CRM) may have both positive and detectable effects on the behavior of the crew, its failures continue to be the cause pointed in almost aviation accidents (Wiegmann and Shappell, 2001).

According to Shapell et al. (2006, p. 3), “preconditions associated with aircrew were also frequently observed within the accident record. For instance, *crew resource management* failures were identified in nearly one out of every five air carrier accidents examined. Even more interesting, the nature of the CRM failure differed between the two commercial operations. That is, whileover 60% of the CRM failures associated with air carrier accidents involved “inflight” CRM failures (inflight crew coordination, communication, monitoring of activities,

Received: 03/07/10

Accepted: 22/08/10

etc.), over 80% of the CRM failures observed during commuter operations involved “preflight” activities (such as planning and briefing).

CRM training has shown to be efficacious for pilots, flight attendants and ground staff, but when viewed separately, according to Baron (2010). “Unfortunately, in real flight operations, there are cognitive and physical factors that cause these disparate groups to work less than efficiently between their groups, particularly when a cohesive environment is critical, such as in an emergency”, says Baron. (2010, p. 1).

What are the possible causes of communication failures? CRM training is provided by airline companies, focusing on the performance of employees as members of a team. Professionals of this area believe that any feature of management resources, such as CRM training, has strong roots in individual performance. For this reason, there is the need to insert the subject “communication skills” in aviation courses, in which the level of individual communication skill should be the focus of development. This is because everything starts in the individual and, if the individual does not possess such skill, previously developed and assimilated, knowing beforehand his/her own strengths and weaknesses, it will become very difficult for him/her to think and interact in group, as oriented by the CRM philosophy.

If future aviation professionals are not trained and evaluated on their interpersonal communication and social skills, that is, in the significant involvement with others, the result will be, very often, that this professional will represent a serious latent failure, when accepted by an airline company. “Perhaps no other essential activity is as vulnerable to failure through human error and performance limitations as spoken communication”. (Monan, 1988, p. 3).

If the ground staff and air crew have not learned, assimilated and developed their individual necessary communication skills, how will they know to properly use the communication tools needed in the practice of their profession? It would be like building the roof before the house. That is, the air crew needs to master this skill, learned and developed in the course they attended, before being hired by an airline company. Without this ability, the CRM will not be efficient, because communication is the key tool to use available resources (human resources, equipment and information) that interact in this situation. The ability of communication supports CRM, by providing means to achieve the team’s situational awareness, problem solving, distributing the workload and many other management functions.

A training program of two or three days does not change immediately inappropriate habits that have been acquired since the beginning of professional training. Furthermore,

although the CRM training is sufficient to adjust behaviours and attitudes, according to Helmreich, Hines and Wilhelm (1996, p. 5), “not all of its provisions have left the classroom to reality”.

Due to the problems raised by the referenced authors, this article aimed to discuss the relevance of training communication as a skill of social interaction to follow the training of all professionals in aviation field throughout the course, identifying the students’ individual skills (not only when they are hired by airline companies and get CRM training), in order to mitigate these errors related to communication skills and thus improve flight safety.

COMMUNICATION SKILLS

Communication is the main tool of relationship technologies, able to generate best life quality and safety in the work environment. According to Harms (2005), in the Operations Safety Program Manager of FAA, communication is a personal responsibility. One of the factors that contribute to error control is effective communication. Most of us have never received any formal training on effective communication when we learned how to fly except for radio communication.

The concept of communication skills expresses social and interpersonal skills. In literature, these terms tends to be used interchangeably. Some scholars have tried to differentiate among these terms; however, such distinctions have not been widely recognized, according to Greene and Burleson (2003).

Communication skill, according to Wiemann (1977) is the ability of choosing between different available communicative behaviors, those that successfully fulfill their own interpersonal goals. Brooks and Heath (1993) defined the process by what information, meanings and feelings are shared by people through the exchange of verbal and nonverbal messages.

In academic and professional spheres, the term “communication skills” reflects the verbal and nonverbal competence, written and social strategies, used to interact, influence and solve problems within the group (Dickson and Hargie, 2004).

The importance of communication skills in aviation safety

“There is a general agreement about the importance of interpersonal communication in technological environments and the need for training these skills (sometimes called non-technical skills) to complement the technical education” (Klampfer et al., 2001, p. 5-6).

Johnston (2003, p. 2), from the Aerospace Psychology Research Group, said that “emergencies are rare; however, abnormal situations are common in aviation. An abnormal situation, if not properly addressed, can become an emergency situation”. When operations are no longer routine, action planning, the process of delegating responsibility and monitoring of tasks should be fully explained by an accurate and timely communication. Failures in interpersonal relationships make the team’s synergy difficult, especially in emergency situations, affecting the decision-making process and also making the task of delegating functions more difficult.

A research conducted by Segrin and Flora (2000) showed how communication skills can generate benefits in people’s lives. Those with higher levels of skills deal with stress more easily and are more resistant to the harmful effects of a risk, while individuals with few skills suffer a worsening of problems when faced with stressors.

The need to start training communicative skills in the initial stage of preparatory courses is similar to the training requirements of football players. We must first determine what specific needs should be developed to work in teams. The abilities of each professional in the field of aviation are different as in a football team (for example, goalkeeper, center forward, forward etc.). Each one has to develop specific skills and understand his or her importance within the team to the best performance; otherwise, it may result in waste of time teaching skills they already have or will not be as useful and end up not really developing skills that are needed or need improvement.

Hawley, administrator of the U.S. Transportation Safety, believes that the evolution of security at airports currently focuses on the social skills training of agents. Part of this training is geared towards maintaining a calm state of mind and the recommendation to ensure an organized working environment in order to reduce the occurrence of aggressive approaches in the way of speaking and behaving, mitigating the disruption which may provide answers disproportionately violent, as in the case of terrorist actions (Sharkey, 2008).

In contrast to the industrial operations, where teams work with the same people over months or years, the flying commercial crew works with a different team in each flight as well as medical staff who also work with different people in stressful environments, such as the surgical centers. “Therefore, we can make an analogy with the medical professionals and the flying crew” (Spencer, 1976, p.1177-1183).

Recent researches have shown that the overheated atmosphere of an operating room generates enormous problems, and almost all of them are the result of lack

of communication skills. Believing that communication skills can be taught and improved, aiming at more assertive future doctors who know how to communicate effectively with patients and colleagues, Lloyd et al. (1996, p. 6) emphasize that this learning process should begin as soon as the students enter to the medical school, and should continue throughout the course.

Some studies developed states in which students who receive training are better at communicating with patients than untrained students. Another question must be asked. Are the skills which these students acquired through training retained, or are they lost over a period of time? As part of these studies, the same experimental design was carried out on both groups, four to six years later. These studies showed that the doctors who had received communication training as students retained their skills. They were more empathic, more self-assured, and had better communication skills, including the use of an open style of questioning and responding to verbal cues. “The conclusions are that communication skills can be learned, and doctors who receive training retain the skills” (Lloyd et al., 1996, p. 5).

Medical students now must demonstrate technical proficiency, and have a new nationwide test of communication skills to become a doctor. “The Skills Exam, administered by the National Board of Medical Examiners and the Federation of State Medical Boards, is the latest addition to the Medical Licensing Exam” (Fromm, 2004, p. A03).

This article proposes that the same line of thinking used in the training of medical professionals should be applied in the training of aviation professionals, integrated training of communication skills, consistently, since the beginning. In aviation, as well as in hospitals, training of communication skills are crucial in emergency situations where the interaction among the group is essential, especially because it often requires that teams be helped by members of several other sections and strategic groups of the company, as well as members of external agencies.

There is a clear need to review the position of the flight schools that, in general, consider the technical content of their responsibility, not having, however, the same attitude about the formation of non-technical skills, which depend on the perception of the student’s need and his/her effort to overcome. In this case, the development of students will occur within their skills, getting on the margins of the development of subjective character skills, such as discernment, decision making and social interaction, which will be critical in circumstances of intense risk.

Flight Safety Foundation (2009) believes that technical and non-technical aspects of flight operations are just like two sides of a coin, and we cannot evaluate them separately.

So the first rule of this principle is that the technical skills and techniques should be considered together. That is why it is important to change the traditional teaching and training for a more holistic assessment of students.

Written communication skills and its importance to aviation safety

Taylor and Thomas (2003) highlight the importance of written communication in airline in all modes of communication operating in such a system. The authors see the written message at the core. The property of maintaining security within an airline is directly related to how this company is structured to keep the communication flows that support the processes of decision-making. Inadequate or poorly constructed documents could compromise security, create resentment and cause embarrassment. In an industry with very high risk, such as aviation, internal communication should be used as a tool to generate safety and interaction.

In aviation schools, writing activities do not represent the writing form expected by the aviation business, and students are not successfully trained to write reports or other documents that are important to their tasks. Ruiz (2004) argues that the writing assignments in flight schools need to realistically reflect the types of communication these professionals will find when they perform their functions.

Aviation Safety Reporting System (ASRS) reports, from July 1998 to March 2002, showed that in 1,182 maintenance incidents and accidents, around 8% had communication as one of their contributing factors. Failures in transmitting information may result in greater errors.

The work cards depict the work to be done and serve as a mean of documenting their completion in order to allow a release to service (RTS).

The study “Shift Turnover Related Errors in ASRS Reports”, conducted by Parke, Patankar and Kanki (2003), showed the work cards as a contributing factor in a much higher proportion of incidents involving turnover communication problems. This fact suggests that increasing the completeness and correctness in writing will result in a significant reduction in shift turnover communication problems.

The aircraft maintenance is an ongoing process carried out between shifts; thus, asynchronous communication (where there is a lag time between the responses) is used to a greater extent than synchronous communication (real time). During the professional training, it is important that one be trained in this specific form of communication,

knowing how to interpret what is written and knowing how to correctly write what should be done.

Poor instructions normally impose loads on working memory which are unnecessary to understand the meaning of the text; in this case, there is the danger of ambiguity, the working memory is challenged to discover the correct meaning of the instructions and run the risk of the message to be misunderstood, which, in aviation, can mean a disaster.

An example of poorly written communication can be seen in the crash of ValuJet. The manager who prepared the documentation of oxygen cylinders to send to the ValuJet headquarters in Atlanta, USA, wrote “Oxy Canisters” and then wrote “Empty”. The commander relied on the flight manifest, and believed that as the cylinders were empty, he was not violating FAA regulations prohibiting the transport of hazardous materials in cargo aircraft.

The National Transportation Safety Board (NTSB) determined that due to the pressure difference, the oxy cylinders, which were without the protective cover, have become true blow-torches, causing a fire and killing all its occupants.

In his work for an insurance company against fire, MacNeal (1997) has analyzed hundreds of reports involving accidents. At first, he considered only the physical conditions, such as faulty wiring, but it became clear that the linguistic meaning, residing in the name or linguistic description commonly applied to the situation was affecting people’s behavior. The word “empty” inevitably suggests a lack of danger. Its default language is associated with zero, void, negative, inert. The word “empty”, used in the analysis of physical situations, does not take into account, for example, steam or traces scattered in the container.

Due to the fact the aircraft is a high-technology product, which requires a very distinctive cluster of human resources qualification to work in aircraft and in the airport operations, it is difficult to accept the fact that a single misunderstood word can result in an air disaster, as previously explained.

Flight schools should offer specific training in risk communication and specific training in improving written communication included in the curriculum, calling attention to the characteristics of texts, since they influence the interpretation. In this case, where human lives are at stake, students should be trained to develop specific skills of written communication; they should know with whom they are communicating, what message they are sending and through what channels, what are the obstacles and noises of the process, and what effects it produces in the safe operational flight.

VERBAL COMMUNICATION PROBLEMS

The NTSB and the Transportation Safety Board of Canada have both found out that inadequate operational control and inadequate collaborative decision making have been contributing factors in air carrier accidents. The greatest causes of these accidents happen due to a lack of vision of the joint responsibility of pre-flight planning, necessary among all those involved. Many problems encountered by flight crews and aircraft dispatchers have very little to do with the technical aspects of flight operations. Instead, most problems are associated with ineffective communication (FAA, 2005).

In his book *Fatal Words: communication clashes and aircraft crashes*, Cushing (1995) raised the main problems of communication in aviation:

Much of what we take for granted about language and communication in everyday life is simply false. The processes through which people communicate and understand each other are much more complex than they superficially appear to be. Training should include some sophisticated discussion of the social and cognitive aspects of these processes and the ways these aspects can interact to lead the processes themselves awry. (p. 90).

According to the International Civil Aviation Organization (ICAO), between 1976 and 2000, more than 1,100 passengers and crew lost their lives in accidents where language issues played a contributory role (Mathews, 2004).

Eurocontrol (2006) organized in Europe a survey among pilots and air traffic controllers to evaluate the communication problems. The survey revealed a large number of reported occurrences of problems of air-ground communication in Europe between March 2004 and April 2005. Problem areas reported included communication loss (due to change of frequency, sleeping VHF radio receivers and equipment failure) and readback errors/hearback (because of call signs similar expectations of the pilot, changing frequency). Language (accent, speech rate, ambiguous phrasing) was involved in a number of communication problems and could generate major problems if not corrected by the crew or controller.

It is crucially important to conduct research in each country in order to provide an effective survey, which allows studying the emotional, cognitive, structural variables, and the components present in the communication process, in order to increase understanding of these variations in the way language is used. Through this research, like the place in Europe by Eurocontrol, it would be possible to isolate aspects of effective communication from the negative ones that present themselves for training aspects and specific

behaviors, producing significant improvements in the preparation of aviation professionals since their training, and developing the ability to communicate more assertively, not based on “what” people say, but “how” they say.

If the training is carefully planned to mitigate the problems caused by the negative effects of communication skills related to strong patterns of cultural behavior (e.g. not to question top decisions, to speak more than necessary, not comply with norms and standards etc.) it will certainly transcend negative regional influences to the profession and compete for the creation of an standardized assertive behavior. Cultural habits that may negatively influence communication skills can be tracked in an attempt to transform incongruent behaviors in job performance skills that can contribute to develop a safer flight environment.

The hearing perceptive development to detection of red flags

Two important elements in human communication are verbal expression, or speech, and non-verbal expression, or body language. We believe it is the power of verbal persuasion that makes the speaker credible, but actually what most influences the credibility is body language. In other words, the best way to listen is through our eyes. And when visualization is not possible, as in the case of radio communication, the ear should play the role of the eyes.

“Speech conveys more than syntactic and semantic content of the sentence. It also has prosodic cues that are used by speakers and listeners to express and decode the spoken message” (Mozziconacci, 2002).

The communication skills training must sensitize students to hear beyond the voice. It must instruct them to detect speech variations and develop their hearing perceptive capacity to establish the following prosodic aspects: voice quality, pitch, volume, articulation, speech rate, rhythm and pauses. The ability to detect and interpret these non-verbal resources is essential for safety communication, and can serve as an efficient method to evaluate the emotional variables present in the conversation, and to increase understanding of these variations in the way verbal language is used.

While it is clear that the intonation, stress and changes in the rhythm of the pilot and the controller’s voices contain valuable information, according to Karlsson (1990), little or no training of prosodic analysis is performed in training courses. Bolinger (1986) reported that intonation is a phenomenon that interests not only linguists, but also all professionals working with communication, for whom the emphasis of an utterance is as important as its content.

There are a significant number of voice qualities that are universal in all human cultures, according to Karlsson (1990). The training goal of the hearing perceptive is to increase sensitivity and create greater awareness in order to detect the red flags and understand their impact on security of communication. Developing this ability is particularly important when it comes to facilitate the processes of prevention and/or resolve misunderstandings. The expectation is that the hearing perceptive training will develop in students a more professional approach, focused on their security tasks in the future.

Nevile (2006), in his study entitled “Communication in context: a conversation analysis tool for examining recorded voice data in investigations of aviation occurrences”, shows the importance of analyzing the recorded conversation by the cockpit voice recorder (CVR) for aviation investigations, in order to increase the level of understanding that researchers can obtain from a voice recording.

Conversation analysis (CA), proposed by Nevile (2006), should be used by investigators after the air crash/incident during the transcription of CVR. However, our proposal is to develop this sensitivity in aviation professionals through training perceptual evaluation of communication (PEC) that must be developed in schools of aviation for accident prevention.

Nonverbal communication

According to McHenry (2008), from Global Jet Services Inc., a U.S. aviation training company, 93% of the content of a message is nonverbal, and the words represent only 7%, while body language represents 55%, and tone, 38%.

The goal of the communication skills training (CST) is to make certain elements, such as the appropriate choice of words and gestures, an unconscious competence. Thus, we can learn to control what our bodies say as well as the messages sent through words. There are common occasions when someone may convey a non-consistent verbal message: the words suggest an interpretation, but body language depicts a different scenario.

The understanding of nonverbal signs (anger, fear, anxiousness, suspicion or sickness) is crucial to our orientation and safe resolution. Reading body language requires training and practice, so the CST might develop, in the future, professionals with ability to observe, interpret and take correct decisions to properly reduce tension, conflict and crisis.

The key to understand nonverbal behaviours is to observe them in the context in which they occur. The visual

perceptive sensitivity (observation, interpretation and action) is a proactive tool and should be developed and trained in all courses for aviation professionals, for an effective risk management.

Associate visual perceptive sensitivity in the first-aid training may be helpful. It should also be involved in illegal acts, emergencies and also for technical training. For example, when pilots are doing flight simulation training, they can detect signs of tiredness, nervousness and anxiety in the other pilot. They can therefore assess whether he or she is able to perform or not a landing, or perform any other task.

LACK OF COMMUNICATION SKILLS IN AVIATION: CASE STUDIES

For the present article, we have used some excerpts from the CVR, compiled from the NTSB. We have also used the Aviation Safety Reporting System database, which is the largest repository of voluntary, confidential safety information of the world provided by officials from the front line of aviation, including pilots, controllers, mechanics, flight attendants and dispatchers. Such narratives are rich sources of information for policy development, research, human factors, education and training. In these researched sources, we have used reports that indicate the occurrence of communication skills.

The case reported below shows a communication problem between the cockpit and the flight attendants during an abnormal situation, which, due to a lack of communication skills, could turn an emergency into a fatality.

Upon arr acft was met by fire and emer vehicles. It was not until i deplaned and asked a fireman what was going on that I was told that our #1 eng was on fire as we taxied in. Why, as fllt attendant, were we not told? Why were we not debriefed? Why did we not stop immediately and evac? This is poor communication and does not represent the safety professional image we were taught. The capt spent more time berating the purser as pax deplaned than informing and assuring the pax and fllt attendants as to the situation. (ACN 714718).

The most common examples of problems in communication during emergencies involve the flight crewmembers not informing the flight attendants of the nature of the emergency, the time available to prepare the cabin, and the necessary special instructions, for example, to use only one side of the aircraft in the evacuation. “This problem has arisen several times, despite instructions in flight manuals to relay such information to the flight attendants” (FAA, 1988, p. 1). The quality and timing of the information given to the flight attendants is extremely important in an

emergency. Communications from the flight crew should be clear, precise, and instructional. A vague description of the situation without specific instructions may be misinterpreted and result in valuable time being misspent. The timing of the information transfer is as important as the quality of the information.

When there is a break in the communication flow, especially in an extreme situation, this loss can be interpreted as a failure and lead people to believe they are considered inferior in office and, for this reason, not included in the exchange of information.

[...] I then wanted the Pilot Not Flying to show me the plot he made that proved we had passed the ETP. He did not say a word and stared at the plotting chart. He then threw the chart at me and said 'You do it.' Perplexed at that, I plotted our location and we were over an hour before reaching our ETP. At this time the cabin altitude began to fluctuate again, and I told the Pilot Not Flying to ask for a lower altitude again. The Controller asked if we declare 'Pan Pan,' and I said to say yes and we need time to advise. I decided to offset 4 miles right off course until we worked out a decision and prepared to descend further. I told the Pilot Not Flying to declare an emergency and request a descent to FL320. He refused to declare an emergency and told me to do that myself as well. The cabin altitude began climbing again so I started a descent to FL320. I got on the radio declared an emergency and descended to FL320. At that altitude we were able to maintain cabin pressure. I told the Pilot Not Flying to get back on the radio and request clearance to return. The Pilot Not Flying then asked to return to ZZZZ. The Radio Controller first cleared us direct XXXXX. I knew XXXXX was too far and told the Pilot Not Flying to ask for a revised clearance towards ZZZZ. The Controller then re-cleared cleared us direct ZZZZ. In conclusion, before the event occurred, the Pilot Not Flying 'who is also my employer' had been sitting in the cabin with the Flight Attendant doing nothing to assist me with the Oceanic crossing and was lost when I needed him most. During this flight I realized the importance of CRM and situational awareness of both pilots. If I hadn't plotted our route and maintained situational awareness I would have listened to the Pilot Not Flying and continued and possibly run out of fuel with no alternate airport for landing. One way to prevent this in the future is to make sure the Pilot Not Flying has been trained properly and knows how to assist the Pilot Flying with important duties. (ACN 818908).

In the case above, we see two different styles of communication effectiveness, or better, opposed to a situation of cross communication.

The pilot not flying is an aggressive communicator, whose goal is to dominate the other. Its main features are: dominance, coldness, authoritarianism, intolerance, disregard for the person who is in a dependency position, and hostility. Communicators adopt aggressive behaviors to defend their rights, downplaying the rights of others. Pressure obliges viewers to react against their own wills or downplay the abilities of others.

According to Del Prette and Del Prette (2004), a person who has low level social skills can cause flaws in the balance of a positive and mutual communication. The main consequence would be the onset of aversive behavior to the others involved.

The pilot who was in command, on the other hand, is a passive communicator, whose goal is to please others, order to avoid conflicts. His weaknesses are: difficulty in solving problems, inability to self-assertion, poor self-esteem and anxiety. The passive communicators avoid expressing opinions, easily submitting themselves to others.

In CST, students learn how to identify the various styles of communication effectiveness and even identify their own style and apply techniques to improve their assertiveness.

Behavior changes according to time and situation. This finding confirms the idea that we can change a behavior if we perceive it is not worth; in other words, it does not satisfy our needs.

CST may help to develop assertive behavior which enables one to deal with the conflict with greater ease and satisfaction, feel less stressed, gain greater confidence. Then one can act with more tact, improve his/her image and credibility, express his/her disagreement in a convincing way, but without sacrificing relationship, besides resist the attempts of manipulation, threats, emotional blackmail etc. and make others also act with greater assertiveness.

CST will develop in students their innate abilities and skills to practice effective communication in difficult situations. In these situations, it is important that such professionals have already explored their feelings about these issues and developed through training a skilled behaviour for conflict resolutions.

The excerpt below is part of the final report concerning the accident on September 29, 2006, in Brazil, involving a regular air transport aircraft and another executive one.

The controller, by having mistakenly understood or not having understood, felt himself uncomfortable to ask again and did not respond to the pilot's question. This initial lack

of knowledge was the first link of the events chain that arose during the flight, which resulted in an accident.

PILOT: key, frequency one two six decimal one five, One three three decimal five for alternate. And what initial altitude for clearance?

ATC: ahn..., say again, please?

PILOT: altitude for take-off?

ATC: eh.... clear taxi to holding point runway one five, and report ready for take-off.

PILOT: okay, clear taxi to holding point one five, six zero zero x-ray lima. (Cenipa, 2008, p. 52)

In the dialogue transcribed above, the pilot asked about his initial altitude. The controller uses a marker of hesitation at the beginning of his response, signalling a red flag that he had not understood or was in doubt (“ahn...”), and then makes more general questions indicative of an understanding failure, used in aviation, denoting that the listener had not understood the wording of what he was told, and asked the transmitter to repeat (“Say again, please?”).

The repetition of the phrase (“Say again, please?”), by the controller, means a request for clarification. It is evident that there is a difficulty in understanding what was spoken. The pilot, therefore, should have repeated the question in a clear and paused voice, as follows: “What initial altitude for take-off?” When you receive the answer, consider whether this corresponded to what was asked.

The ability to process communication means that the information needs of pilot/ATC will be properly interpreted. Communication ambiguities can be resolved through a standard routine of active listening, which means to investigate and ask for clarification when and if it is necessary to prevent misunderstanding and fatal errors.

In the above situation, the controller did not answer the question of the pilot. There was a tangential response, the controller recognized the other in the communication process, but did not answer the substance of what was asked.

The pilot, at that very moment, realizing that there was no answer to his question should have called the attention of the controller for this failure. Pilots and controllers can avoid misunderstandings by providing timely information to each other in advance and asking again when they notice a lack of information, besides confirmation or correction.

Instead of calling the attention of the flight controller for the lack of an adequate response, the pilot chose not to clarify the altitude and went on performing the readback, neglecting to mention the lack of information about the altitude to be maintained during takeoff execution.

When callers did not seek to resolve such discrepancy, in which there is divergence between the question asked and answer that did not happen, they are communicating without using the skills of critical thinking, which is also part of the CST.

The perceptual evaluation of communication (PEC) aims to sensitize students to hear beyond the voice. Red-flag words sometimes cause minor differences or misunderstandings. When a listener disagrees or feels a reaction of uncertainty from the transmitter as, for instance, a different tone, a question rather than an assertion, even silence, which may mean a hesitation, he/she should immediately clarify the situation before too late.

In the narratives below, the reporters specifically referred to deficient communication in the form of work cards, maintenance manuals, logbooks, and turnover documentation. They have better written documentation improving communication especially in the work cards, since it would dramatically reduce communication problems.

Synopsis: Callback conversation with rprr revealed the following info: reporter stated the cabin pressure controller on the dhc-100 is also the computer for this system. The lack of communication between the avionics group and the quality control inspectors, including the wording used on their maint write-up form for the pressure controller, contributed to inspection not accomplishing the required pitot/static leak check rii inspection. (ACN 803646).

Synopsis: A B767 was dispatched with an interim repair that required progressive inspections. Inspection was accomplished but deferred item was not updated in logbook or acft maint history. Communication between the depts was not adequate and there was no follow-up between the 2 depts. (ACN 681898).

Synopsis: A B737-500 during a ‘b’ chk upper wing fasteners were found corroded and written up by an inspector. Engineering wrote up a repair that was in conflict with the inspector’s write-up. (ACN 628475).

CONCLUSION

This paper can be identified as an experience report, whose central objective was to present a proposal to

integrate communication as a skill of social interaction in the curriculum of all schools focused on aviation, as a requirement for certification of the student, in order to mitigate these errors related to communication skills, especially in extreme situations and, consequently, improve flight safety. Therefore, the theoretical approach and case studies conclude that:

- communication is the biggest obstacle in an extreme situation, because interpersonal interactions tend to deteriorate. The key to prevent that an extreme situation turns into a disaster is to bring communication back on track;

- another basic rule for this principle is that technical skills should be evaluated in an operational context that allows the integration of communication skills to evaluate overall performance of flight crew/ground staff;

- schools must have pilots, stewards and flight engineers acting as instructors who will work in cooperation with professionals specialized in communication training, producing significant programs. The development team is essential to integrate communication skills with technical skills in training;

- typically, the process of training the future professional is focused more on technical development and less on interpersonal issues. It makes professionals face a new challenge when working, to communicate interactively and assertively with their peers, especially in an extreme situation, under continuing pressures;

- nobody chooses to be a bad communicator; however, practicing good communication skills are not easy, but it is possible. It involves personalities, styles and habits, and changing habits can be an overwhelming task, but training can break old habits and develop skills that lead to a reduction of accidents. Possessing excellent communication skills should be an important part in hiring staff;

- at least, the habits of good communication have profound effects on flight safety, which raises the question: why do not we train professionals committed to the excellence of communication? The communication has to be evaluated and attacked on all levels: managers, pilots, flight attendants, aircraft dispatchers, flight controllers and aircraft mechanics. These levels are all connected and poor communication is contagious.

In summary, communication skills should be incorporated into the curriculum – since the beginning of learning, through clearly defined goals in the evaluation process, with clear performance standards – and not just relegated to a curriculum module in human factors. It should be a

topic for further training, enabling students to become proficient in this vital part of their work. Inefficient communicators increase the possibility of human error.

REFERENCES

Baron, R., n.d., *The Cockpit, the Cabin, and Social Psychology Airline Safety*. Airline Safety.com, Available at <http://www.airlinesafety.com/editorials/CockpitCabinPsicology.htm>, Access on Sept 18th, 2010.

Bolinger, D., 1986, "Intonation and its parts: melody in spoken English", Stanford University Press, Stanford, CA, USA.

Brooks, W.D., Heath, R.W., 1993, "Speech communication", Dubuque: W. C. Brown.

CENIPA, 2008, "Relatório Final A-022/CENIPA/2008", Brasília: Cenipa.

Cushing, S., 1995, "Fatal Words: communication clashes and aircraft crashes", Chicago: Chicago University Press.

Del Prette, A., Del Prette, Z.A.P., 2004, "Psicologia das relações interpessoais: vivências para o trabalho em grupo", 3rd ed., Petrópolis: Vozes.

Dickson D., Hargie O., 2004, "Skilled interpersonal communication: research, theory, and practice", London: Routledge, pp. xi -3.

European Organisation for the Safety of Air Navigation (Eurocontrol), 2006, "Air-ground communication safety study causes and recommendations", Brussels: Eurocontrol.

Federal Aviation Administration (FAA), 2004, "Advisory Circular Nr. 120-51E. Change Description: Subject: Crew Resource Management Training", Federal Aviation Administration.

Federal Aviation Administration (FAA), 1988, "Advisory Circular Nr. 120-48. Change Description: Subject: Communication and Coordination Between Flight Crewmembers and Flight Attendants", Federal Aviation Administration.

Federal Aviation Administration (FAA), 2005, "Advisory Circular Nr.121-32A. Dispatch Resource Management Train", Federal Aviation Administration.

Flight Safety Foundation Assessment and Feedback of Non-Technical Skills. SKYbrary, Available at: [http://www.skybrary.aero/index.php/Assessment_and_Feedback_of_Non-Technical_Skills_\(OGHFA_BN\)](http://www.skybrary.aero/index.php/Assessment_and_Feedback_of_Non-Technical_Skills_(OGHFA_BN)), Access on Sept 24th, 2009.

- Fromm, M., 2004, "Medical Students Tested for People Skills", *The Washington Times*, June 28th, 2004, pp. A03.
- Greene, J.O., Burlison, B.R., 2003, "Handbook of communication and social interaction skills", New Jersey: Lawrence Erlbaum Associates.
- Harms, F., 2005, "Aviation Safety Newsletter", Available at: <http://www.rollanet.org/~mopilots/stlouis/nov2005nws.htm>, Access on Nov 4th, 2010.
- Helmreich, R.L., Hines, W.E. and Wilhelm, J.A., 1996, "Issues in crew resource management and automation use: data from line audits", Austin: University of Texas Aerospace.
- Johnston, N., 2003, "Responding to emergencies and abnormal events", Dublin: Aerospace Psychology Research Group. Trinity College Dublin.
- Karlsson, J., 1990, "The integration of automatic speech recognition into the air traffic control system", Princeton, NJ, USA: Mechanical and Aerospace Engineering Princeton University.
- Klampfer, B. et al., 2001, "Enhancing performance in high risk environments: Recommendations for the use of behavioural markers", Zurich: Group Interaction in High Risk Environments GIHRE Swissair Training Center.
- Krifka, M., Martens, S., Schwarz, F., 2003, "Group interaction in the cockpit: some linguistic factors", Berlin: Humboldt University.
- Kutz, M.N., 2000, "Developing future aviation leaders: Advice from today's leaders!", *The Journal of Aviation/Aerospace Education & Research*, Vol. 9, N° 3, pp. 24-32.
- Lloyd, M. et al., 1996, "Communication Skills for Medicine", New York: Churchill Livingstone.
- MacNeal, E., 1997, "Fatal words: bad mathsemantics can have fatal results", *ETC: A Review of General Semantics*, Vol. 54, N° 1, pp. 54.
- Mathews, E., 2004, "New provisions for English language proficiency are expected to improve aviation safety", *ICAO Journal*, Vol. 59, N° 1, pp. 4-6.
- McHenry, J.D., 2008, "Technical maintenance and maintenance management training classes. AMT Society MX Logs Update", Weatogue, CT, USA: Global Jet Services.
- Monan, W.P., 1988, "Human factors in air-carrier operations: the hearback problem. NASA Report CR 177398", Moffett Field, CA: National Aeronautics and Space Administration.
- Mozziconacci, S.J., 2002, "Prosody and emotions: speech prosody", In: *Proceedings of the Conference Aix-en-Provence*, April 11th-13th, 2002, France.
- Nevile, M., 2006, "Communication in context: a conversational analysis tool for examining recorded data in investigations of aviation occurrences". *ATSB Research and Analysis Report B2005/0118*".
- Parke, B., Patankar K. and Kanki, B., 2003, "Shift turnover related errors in ASRS reports", In: *Proceedings of the Twelfth International Symposium of Aviation Psychology*, April 14th-17th, Dayton, Ohio, pp. 918-923.
- Ruiz, L.E., 2004, "Perceptions of communication training among collegiate aviation flight educators", *Journal of Air Transportation*, Vol. 9, N° 1, pp. 36-57.
- Segrin, C., Flora, J., 2000, "Poor social skills are a vulnerability factor in the development of psychosocial problems", *Human Communication Research Journal*, Vol. 26, N° 3, pp. 489-514.
- Sexton J.B., Helmreich, R.L., 2000, "Analyzing cockpit communication: the links between language, performance, error, and workload", *Human Performance in Extreme Environments*, Vol. 5, N° 1, pp. 63-68.
- Shappell, S. A., et al., 2006, "Human error and commercial aviation accidents: a comprehensive, fine-grained analysis using HFACS. DOT/FAA/AM-06/18", Washington, DC: FAA Office of Aerospace Medicine.
- Sharkey, J., 2008, "New focus on behavior as airport security evolves", *The New York Times*, December 29th, 2008, p. B7.
- Spencer, F.C., 1976, "Deductive reasoning in the lifelong continuing education of a cardiovascular surgeon". *Archives of Surgery*, Vol. 111, N° 11, pp. 1177-1183.
- Taylor, J. C., Thomas R.L., 2003, "Written communication practices as impacted by a maintenance resource management training intervention", *Journal of Air Transportation*, Vol. 8, N° 1, pp. 69-90.
- Wiegmann, D.A., Shappell, S.A., 2001, "A human error analysis of commercial aviation accidents using the human factors analysis and classification system (HFACS). DOT/FAA/AM-01-3", Washington: Office of Aviation Medicine.
- Wiemann, J.M., 1977, "Explication and test of a model of communication competence", *Human Communication Research*, Vol. 3, pp. 195-213.