



AIRMANSHIP – A QUALITATIVE APPROACH

Vegard NERGÅRD

*Department of Engineering and Safety, Faculty of Science and Technology, University of Tromsø, N-9007
Tromsø, Norway
E-mail: vegard.nergard@uit.no*

Received 20 November 2013; accepted 20 August 2014



Vegard NERGÅRD, *Acoc. Prof.*

Education: PhD educational psychology 2005, University of Oslo Assistant Professor, University of Tromsø, Norway, Dept. of Psychology 2006–2009.

Corporate experience: instructor in human factors and CRM at two airlines since 1996 – Lufttransport A.S. and Norwegian Air Shuttle (NAS).

Present position: Associate professor, University of Tromsø, Faculty of Science and Technology 2009–2014.

Specialisation and research interest: human factors and CRM.

Publications: author of ten scientific articles.

Abstract. The purpose of this study was to investigate how pilots themselves characterize a good pilot and airmanship, and how safety is created by the practice of knowledge. The purpose of this study was to get the insiders' understanding of the concept of airmanship. Results indicate that the formulation of the concept of airmanship is complex, and it is first and foremost comprised of the knowledge about flying an aircraft. Moreover, the relationship between practical knowledge and an individual applying this knowledge is embedded in the concept of airmanship.

Keywords: pilot, airmanship, safety.

1. Introduction

After decades of safety improvement in aviation, a horizontal trend has been established. It seems that the aviation industry will be unable to improve its safety performance until operational quality control measures are implemented more widely. Estimates point to human error as the main contributing factor in 80% of all aviation accidents due to the captain's authority, crew morale, and decision making skills. While advanced equipment has been placed on the flight deck to aid the pilot's flight duties by improving access to information, it has not necessarily improved the *use* of this information. A case in point is the persistence of the most common type of civilian commercial aircraft accident: the Controlled Flight into Terrain accident (CFIT), in which an aircraft with no mechanical problems despite being under control is flown into terrain without the crew's awareness. While CFIT can occur during any phase of flight, it is most prevalent in the approach and landing phases. It is

a fact that CFIT does not occur often, though when it does, it has a high fatality rate usually owing to the speed of the aircraft upon impact, and CFIT ranks as one of the leading causes of fatalities among air carriers.

Inspiringly, modern safety researchers have shifted their perception of the reasons why accidents occur (Antonsen *et al.* 2008). Safety is no longer seen as being achieved by reducing the contribution of human error, but is created through, and not in spite of, human practice instead (Dekker 2006). Before this shift in perception, it was assumed that safety is achieved by building systems, defences and procedures which diminished the effects of human unreliability and error. Accidents were perceived as a result of an individual culprit who caused the accident (Antonsen *et al.* 2008). The modern approach to understanding how safety is created through human practice represents a fundamental perpetual shift of the skilled pilot. For pilots, however, the perpetual shift in the understanding of how safety is

achieved is not revolutionary, and this perception has a long tradition among pilots: it is the individual's own practice that creates safety *on every flight*. Safety is an individual responsibility, and each pilot has to take responsibility for his or her actions. Therefore, in an Aristotelian sense, the pilot is morally and ethically obligated to perform as safely as possible, and even more importantly—safety is the very basis for the knowledge of flying an aircraft. In aviation, the concept of how human practice creates safety is intimately linked to the concept of airmanship. Within the pilot community, historically and currently, the term “airmanship” and “an airman's personal attitude” are undisputedly the concepts used to define a skilled pilot.

The actions of pilots who have performed remarkably well have often been cited as examples of good airmanship, and pilots whose actions have been one of the key factors in saving their own and many others' lives are often referred to as being good airmen. On the other hand, poor airmanship is often cited as a contributing factor when determining probable causes of aviation accidents, although it is implicit in many of the causes of a pilot's error that are identified in the investigation of aviation accidents.

From this the following can be concluded: a good airman has the ability to perform well, because he or she has the knowledge to deal with situations in which safety is an issue and has the proper knowledge to fly an aircraft.

What is it to be a skilled and competent executor of knowledge? What is airmanship? Does the concept of airmanship help to formulate how human practice establishes safety?

The purpose of this study was to get an insider's understanding of how safety is created by the practice of knowledge. As I will try to illustrate, a fundamental prerequisite for learning the practical knowledge for flying an aircraft is the individual's adaptation to airmanship. The formulation of the concept of airmanship is complicated, and the concept is first and foremost comprised of the knowledge about flying an aircraft. Moreover, the concept of airmanship rests on the relationship between the individual and practical application of this knowledge.

From interviews, fieldwork and my own work experience in civil aviation over the course of 13 years, it is my firm belief that the practical knowledge of flying an aircraft was founded upon, as in every other type of practical knowledge, an underlying relationship between the knowledge, the individual and the execution of the particular knowledge.

From this perspective, airmanship concerns a certain mentality situated within a community of knowledge, namely the pilot community and pilot culture.

This article is based on a qualitative research project conducted in the period 2005–2010. Airline pilots from two Scandinavian civilian airlines were asked to formulate their knowledge as they themselves perceive it. In interviews, pilots often use terms from the aviation culture when speaking of their own knowledge, being good at flying an aircraft. Good in this sense means that a pilot is able to conduct a flight as safely and efficiently as possible. Pilots and flight instructors were asked to answer the following research questions:

1. What characterises a good pilot?
2. What is airmanship?
3. How is airmanship related to performance?
4. What interpersonal factors are viewed as necessary to become, or to be considered, a good pilot?

2. Theoretical background: what is airmanship?

The interpretation and perceptions of a good pilot have varied both historically and culturally, and many factors have been perceived as being important in order to become a skilled pilot. The selection process and tests used over the years may serve as indicators of the different interpretations and perceptions of what makes a good pilot (Hunter, Burke 1994; Martinussen 1996; Hunter 1989; FAA 1998). Common to these (academic) perceptions and interpretations is the assumption that a good pilot has a variety of cognitive and psychomotoric abilities as well as motivation and personal qualities. The evolution of CRM modernized the perceptions of skills that are needed and desirable of a skilled pilot (Benison 2000; Helmreich *et al.* 1999; Driskell, Adams 1992). The contemporary perception of a skilled pilot is that he/she has a reciprocal mixture of technical and non-technical skills (Dekker 2006; Eid *et al.* 2008; Martinussen 2005; Hedge *et al.* 2000; Franz *et al.* 1990; Kern 1997; Driskell, Adams 1992; Helmreich *et al.* 1999; Benison 2000; Franz *et al.* 1990; Cannon-Bowers *et al.* 1993).

Skills and abilities in these areas have been formulated and studied as a pilot's “attitude”. The term “attitude” dates back to the writings of Jung (1971) and can be found in contemporary usage as a behavioral marker in the cockpit (Flin, Martin 2001; Salas *et al.* 1999). Researchers as well as practitioners have searched for *behavioral markers* that may serve as an indicator of a pilot's non-technical or CRM related skills in the cockpit environment. Behavioral markers are defined as observable, non-technical behaviors which contribute to superior performance within a working environment, and can be observed within teams or individuals. Behavioral marker systems are based on the assumption that certain attitudes lead to certain behaviors in the cockpit. The verification of this assumption has proven to be a complicated matter (Ostrom *et al.* 1994; Kraiger *et*

al. 1993; Wilson *et al.* 1989). Nevertheless, M. Thomas (2001, 2006) justified the use of behavioral markers because they gave access to what would otherwise be hidden cognitive processes. Implementation of behavioral marker systems had an important objective: namely, to identify and assess both a pilot's attitude and behavior in the cockpit in terms of their importance to the aircrew's performance. Behavioral marker systems gave instructors the opportunity to influence pilot behavior, which enabled CRM and, thereby, increased safety.

Currently, there seems to be an optimistic belief in the aviation industry regarding the implementation of behavioral marker systems as an assessment instrument to directly or indirectly increase a pilot's competence in communication, cooperation and interaction. Nevertheless, there are still substantial challenges that need to be addressed in order to succeed in this effort.

Historically, pilots and the pilot community have more or less been forced to accept the CRM concept and adapt to the behavioral markers, standards and understanding of human performance that these systems were founded on. Pilots' resistance to accept the behavioral marker systems has presented a substantial challenge in implementing CRM and put a greater emphasis on non-technical skills, both historically and currently (Simpson, Wiggins 1999; Flin, Martin 2001; Helmreich *et al.* 2001; Beaubien, Baker 2002; Seva *et al.* 2007). Several studies have revealed little empirical evidence of the effects that supported strategies such as human factors in general, and CRM and behavioral marker systems in particular, and their efficacy in training critical aviation crew competency (Salas *et al.* 1999; Simpson, Wiggins 1999; Flin, Martin 2001; Helmreich *et al.* 2001; Beaubien, Baker 2002; Seva *et al.* 2007). Therefore, the evolution of and effort to implement CRM and behavioral marker systems became the significant starting point for this study.

The pilot community has its own understanding of what it is doing as far as skills, abilities and the knowledge needed to become a good pilot are concerned. Within the pilot community in civil aviation, airmanship is undisputedly the concept that has been used to define a skilled pilot.

The concept of airmanship has played an active role in the philosophy of knowledge that is operative within the pilot community both historically and currently, but does not play an "official" role. "We only hire those who we perceive to be the best pilots.

Approximately 15% of the applicants who do not receive a job offer from us lack the necessary basic cognitive skills and ability, and most of them lack the basic spatial ability. The majority of the applicants that we refuse to hire lack the attitude of an airman", said the flight manager of a major Scandinavian airline.

The definitions of airmanship are somewhat indistinct. Even so, there are several descriptions of airmanship. It is described as "a sound acquaintance with the principles of flight. Furthermore, it is the ability to operate an airplane with competence and precision both on the ground and in the air, and the exercise of sound judgment that results in optimal operational safety and efficiency". There have only been a few attempts at defining airmanship (Kern 1997). In an effort to construct a definition, airmanship has been defined as "the art and skills of operating an aircraft". Unlike many other arts, operating an aircraft requires a high degree of professionalism at every level of the art. Airmanship combines the overall knowledge, skill, judgment, and demeanour of an airman" (Summers 2007). A blog on the Internet described good airmanship as: "that indefinable something, perhaps just a state of mind that separates the superior airman/airwoman from the average. It is not particularly a measure of skill or technique, nor is it just common sense. Rather, it is a measure of a person's awareness of the aircraft and its flight environment, and of his/her own capabilities and behavioural characteristics, combined with good judgement, wise decision-making, attention to detail and a high sense of self-discipline".

Clifford Geertz's (1983) distinction between "experience-near concepts" and "experience-distant concepts" inspired the effort to understand and enlighten the challenges in implementing CRM and the behavioral marker system in aviation. Could pilots' reluctance to adapt CRM and behavioral marker systems reflect a general resistance towards the "experience distant" concepts of CRM and behavioral marker systems that were founded on more than the contents of approaches? If so, do the pilot community have "experience near" ways of understanding and formulating the relationship between a pilot's personal attitude and his or her behavior in the cockpit, the crew and the company environment?

The main purpose of this study was to embrace the pilots' point of view and use their "experience near" conception of how safe operations are constructed through a pilot's practice. A qualitative research design was outlined. Since this study aims to identify a pilot's own conception and perception of a good pilot: the quality of being a good airman, the plan was to conduct interviews with pilots and have the pilots formulate their own accounts of a good airman.

3. Data and methods

A qualitative research project was designed, the first step of which was to perform a set of pilot interviews in order to collect different formulations and variations in the perception of a skilled pilot (Massey 1999). The aim was to bring the pilot community's own understanding of a

good pilot into prominence, with the intent of obtaining an insider or skilled understanding of what pilots themselves regard as important factors influencing the pilot and crew's attitude, behavior and performance.

4. Participants

A total of 250 pilots participated in company held CRM courses in two different Scandinavian commercial airlines from 1997 to 2007 and were interviewed in groups. In addition, 50 individual interviews were also performed. The participation in-group or individual interviews were voluntary. The decision on the persons asked to participate in individual interviews was random, but had certain logic. The first author of this study met several flight crews at the airport and asked whether he could sit in the jump seat and observe a flight. Over a period of time, he collected 920 hours of observing the performance of flight crews. After the flight, he would ask whether the pilot would allow to be interviewed individually, and 50 accepted the invitation. All interviewed pilots held a current pilot's licence (JAR-FCL, ATPL), and were professionals in the sense that they were employed as pilots. The range of experience was between 650–27.500 flight hours.

5. Procedure

The pilots were asked about their perception of the increased emphasis on CRM and on pilots' interpersonal and social skills, and their influence and impact on aircrew performance. During the interviews, the pilots were asked to pinpoint factors and formulate in their own words what they regarded as being important requisites and prerequisites for becoming a skilled pilot. A total of 15 group interviews were performed and the number of participants in these group interviews ranged from 9 to 15. All participants had had previous experience with attending CRM courses. For practical reasons, group interviews were performed before, during and after an annual mandatory company held CRM or technical refresher course. The first author of this study was the CRM instructor for some of the groups that participated in this study. In each of these groups, the participants were asked to sit in even smaller groups to discuss and define what makes "a good pilot". All of the groups used the term "airmanship" and "the attitude of a good airman" in describing a good pilot. The groups were asked to define the concept of airmanship and attitude, to write down the definition of attitude, and to formulate the definition of a good airman with a good attitude. After working in small groups, the participants in the CRM course met in a plenary session and discussed what the various groups had come up with. The data was recorded and collected.

6. Study results: the pilot's point of view

It has been proved that airmanship is a complicated concept to define. A young captain proposed the following definition: "airmanship is a way of being aware of and conducting action according to the conditions in aviation. In order to become a good pilot, you have to have the attitude and eagerness to always want to learn more. You must also have a well-thought through understanding of what you have going on in your life" (Nergård 2004–2006, interview number 6, 2005).

Pilots themselves do not use terms such as cognitive skills and ability when they refer to good pilots. Be that as it may, differentiations between those who have what it takes and those who do not in many other activities were identified similarly to what we find in other communities of knowledge. Among seafarers or seaman in maritime operations in the coastal areas in northern Norway, seafarers distinguish between a "seaman" and a "brackish water sailor". A similar distinction can be found in the petroleum industry where members of the community distinguish between a "roughneck" and a "softneck". Within the military pilot community, historically, there has been a conceptual difference between good and poor pilots. For example, scientists searching for future astronauts initially started their search among test pilots in the U.S. Air Force and found that test pilots themselves had their own distinctions between those who had the "right stuff" and those who were "left behind". In other words, pilots had their own definition of who had what it took to be a good pilot, and who did not. The concept of "the right stuff" has been objectified and mythologized, e.g. in Tom Wolfe's novel "The Right Stuff" (1979).

Skills constituting a good pilot in one flight operation were not necessarily skills defining a good pilot in another. The standards used in defining whether a pilot is good were closely related to the flight operation itself, and these standards were specific for each operation. A pilot that is characterized as being good in a military flight operation is not necessarily defined as a good pilot in a civil flight operation. Several pilots have said: "in certain military flight operations, a good pilot has very different skills and abilities from commercial pilots. Being a good pilot in military flight operations is something very different from being a good commercial pilot" (Nergård 2004–2006, interview number 4, 2005).

The standards that define whether a pilot is good are closely related to the flight operation itself, and are specific for each flight operation (Westby 1990). An experienced pilot elaborated: "I'm flying a Boeing 737 flight operator. Boeing operation is quite different from other domestic flight operations, i.e. from Widerøe and Lufttransport. There are also many differences between airlines that use the same type of aircraft in their operation. In Norway, we have many so-called short field

operations (landing fields down to 840 meters). Pilots flying short field operations need other skills than those flying relatively long field operations. Pilots flying short field operations need good manual flying skills. When flying bigger airplanes, there are other skills that are more crucial. We don't need to be as good as them at manual flying. We only need to be good enough at manual flying. There are only a couple of airfields, like Alta and Trondheim in certain weather conditions, where pilots flying larger aircrafts have their manual flying skills put to the test" (Nergård 2004–2006, interview number 1, September 2005).

When pilots referred to a good or a skilled pilot, they referred to pilots who had the right "attitude" and pilots who performed like "airmen" are supposed to. A good pilot has the attitude of an airman: "a good pilot has the competence to perform well. A good pilot acts and performs according to his level of knowledge", a chief pilot stated.

Good performance was pinpointed as the mark of a good airman by all groups and in all individual interviews. However, good performance was seemingly a relative concept, and several pilots distinguished between "flying by the book" and "flying by the seat of one's pants".

To "fly by the book" is to perform a flight operation as it is officially described and defined. "The book" (e.g. SOP, OM, POH) was often used as a super structural concept for all procedures and checklists. A good airman has the discipline to execute everything by the book: "most procedures, rules and regulations, checklists, etc. are written in blood. They are the developed and accumulated experience of incidents and accidents. By following the book, pilots are less likely to commit the same deadly or lethal mistakes that others have done before them", a senior captain claimed.

The skill of flying by the "seat of one's pants" is the ability to fly on instinct. It is a type of knowledge a pilot "cannot get through theoretical studying", one experienced pilot claimed. The pioneers of flying only knew how to fly by the "seat of their pants", for obvious reasons, since there was no other way to fly, and they only had their instincts to depend upon.

A chief pilot explained that being a good pilot is different and at the same time similar in various flight operations: "to me, there is one thing that is similar with all good pilots. They use their aircraft to operate like it is designed to do. Good pilots are those that execute a flight the way they are supposed to. In the company that I work in, we have defined a safe and efficient flight. The flight and all the elements of the flight are defined in our operations manual (an operations manual is the modern version of the SOP – Standard Operation Procedure). In my view, good pilots are the ones who have the skill and ability to operate our aircraft the way the aircraft is de-

signed to and the operation is defined" (Nergård 2004–2006, interview number 8, November 2005).

The distinction between "flying by the book" and "flying by the seat of one's pants" is in fact a different way of executing a flight and operating an aircraft (in a single flight mission or a flight operation). It is not the case that a pilot only uses one of the skill based features, i.e. that a pilot only flies by the "seat of his pants" or that a pilot only flies "by the book", as a good airman does both.

To fly by the "seat of your pants" or to "fly by the book" is not only a distinction between traditional and modern knowledge. It is also a distinction between two different ways of flying. In the modern version of being a good pilot, being good is not only related to flying by the book. It is also related to having an instinct of knowing when to stop following the book and follow your own instincts. A younger pilot said: "to fly by the seat of your pants means that you are allowed or allow yourself to use your head. It is not a question whether to either fly by the book or to fly by the seat of your pants. The trick is to know what to do when" (Nergård 2004–2006, interview number 2, 2005).

The point of flying is to move an aircraft from one destination to another as safely as possible, and every flight has a distinct logic: a flight consists of a series of reciprocal actions that are organized within different standard operation procedures (SOP). Aviation is an activity in which every procedure has a practical purpose, with deviations from standard operation procedures also defined by procedures. Ideally, a good airman flies the aircraft from one destination to another as safely and efficiently as possible. In order to safely accomplish a flight, pilots have to control the aircraft, the flight path, monitor the weather and the aircraft's condition and capabilities.

Several pilots emphasized that the airman must master different flying techniques, and that he or she must master the aircraft as well. In addition to mastering of the aircraft in practice, the pilot must have an abstract understanding and insight into his/her own skills: "the pilot who "flies" instead of "hanging on to his aircraft" has the mental capacity to master theory, mechanical understanding, meteorology, and put it to work. Knowing how to fly is putting your physical and mental skills, and abilities into practice" (Nergård 2004–2006, interview number 14, 2005).

Good airmanship was pinpointed as based on practical application, and several pilots defined good practical application of skills and knowledge as the essence of airmanship: "a good airman must have the ability to think at the same time as he is manually controlling the aircraft. Knowledge in flying implicates the ability to manage the workload connected with the single tasks in flight operation. At the same time, your thoughts should be elsewhere: in front of the aircraft. You have to

have the ability to be on top of every situation and have the ability to identify a potentially hazardous situation. Moreover, you need to see the big picture in your flight but also have the big picture of what is going on around you. Individually, the abilities to think at the same time and to be in control are different challenges. My first flight instructor taught me to always try to stay 10 miles ahead of my propeller” (Nergård 2004–2006, interview number 4, 2006).

The personal features of a good airman were also pinpointed in the group interviews. When participants were asked to describe what they regarded as the important features that define a skilled pilot with a desired attitude, the descriptions of a good airman included several common qualities. For example, “a good pilot is perceived as a *good communicator*. A good pilot communicates without difficulties with all members of the crew and pax (passengers) and is able to discuss operative, as well as personal matters, regardless of the length and broadness of experience, cultural, economic and occupational differences. A good pilot is inclusive and also good at setting the bottom line. He is *attentive* towards the ones he can gather information from, but he also makes sure that the people he needs to have in the communicational loop feel welcome to do so. People surrounding this pilot feel welcomed and respected. A good pilot allows people around him to be themselves, but he is also good at letting people know the boundaries of his limitations, both personal and operative. He also informs when and why these bottom lines are set. This way the pilot can lead the flow of information in the right direction. This leads to other crewmembers relying on him, because he is predictable. Other crewmembers always know how and when to act. *A good pilot knows his trade well*. A good pilot is aware of his and the aircraft’s limitations. He has technical insight and understanding. A good pilot knows rules and regs (regulations). He has insight and a thorough understanding of the company, as well as governmental rulings and regulations. *A good pilot is a good leader*. An important prerequisite for a pilot who wants to become a captain is that he uses the period as first officer to acquire certain leadership skills. Certain social skills are desired. First and foremost, a good pilot gains *authority and respect* as a result of the fact that over time he *applies knowledge and performs well*. Second, a good pilot shows the *initiative* to become better at what he is doing, and he takes the initiative to *apply good airmanship*. A good pilot becomes a role model for other pilots, because he always *thinks ahead of his own actions*. In this sense, a good pilot and a good commander have an attitude that is relevant to a situation. They apply *situational leadership*” (Nergård 2004–2006, group interviews, 2006).

The group interviews revealed humbleness to be an overwhelming perceived precondition for a desirable

personal attitude. At the same time, self-awareness, self efficacy and self-esteem were brought into prominence: “a good pilot is *humble* enough to acquaint himself with his own errors and limitations with regard to his own trade as well as to the other crewmembers. Also, humble enough to help others when they face problems, both professionally and personally. A good pilot is so sure of himself that he has no problem with asking others for help. A good pilot has *self-awareness*. He has no problem of stating “I don’t know” instead of trying to get out of a situation where he doesn’t know what he is talking about and embarrassing himself by elaborating on things besides the matter at hand. A good pilot is someone that is aware of himself, his flaws and errors so he can easily interact with others” (Nergård 2004–2006, group interviews, 2006).

The individual interviews revealed a common perception among pilots that an integral part of being a good pilot was being a good crewmember, and being a good crewmember was an integral part of being a good pilot. Being a competent crew member is regarded as a type of knowledge: “being good at working closely with other people is important knowledge in aviation. On a day-to-day basis on every leg, you have to feel your way to finding when and how to deal with the other guy”, a pilot stated (Nergård 2004–2006, interview number 12, 2005). Cooperation and interaction are perceived as essential aspects of the desirable qualities of a skilled pilot. “Being a good crewmember is certainly not something that you can read your way to. You have to experience it. Being a good crewmember is a part of being human. It’s a social thing”, a pilot said (Nergård 2004–2006, interview number 12, 2005).

Being a competent crewmember was regarded to be a type of knowledge itself: “Being good at working closely with others is an important type of knowledge. In this knowledge, timing is everything. Knowing where and when to bring up a subject is cardinal. A good pilot corrects his partner when the timing is right. If things occur during take-off, you might want to wait until you’ve reached cruising level before you bring it up. Sometimes you have to wait to correct the other guy until you’ve reached the ground again, while at other times you have to react instantly. If you’re on your way straight into granite, you take instant control of the situation, regardless of whether you’re the captain or first officer or not” (Nergård 2004–2006, interview number 14, 2005).

The key factor differentiating a good pilot and a good captain is the ability to achieve good communication: cooperate and interact with the ones he or she flies with.

One captain said: “cooperation is the basis of everything that goes on in the cockpit. In one instance, the guy you’re flying with can make you perform poorly.

By his attitude, lack of competence and so forth he can make cooperation impossible. That can be a safety matter in itself. On the other hand, the guy you're flying with can make your day, help you through and get you back on track again. As a captain, I instruct my first officers that I expect them to guide me, help me and challenge me whenever necessary" (Nergård 2004–2006, interview number 12, 2005).

7. Discussion: flying and knowledge

Becoming good at flying aircraft evolves individually as a result of reciprocal interaction and developmental processes between an individual's abilities and learning through experience. First and foremost, the individual has to acquire the practical knowledge of flying aircraft. Integrally, the evolvement is intimately related to the individual adaption to a certain mentality. This mentality is situated within the pilot knowledge community as the term and concept of "airmanship".

From the pilots' point of view, safety is perceived as a creation and result of the pilot's own practice. The pilot is a knowledge maker who creates safety in every flight through his or her practice.

Being or becoming a good aviation pilot is intimately linked to acquiring the knowledge of how to fly an aircraft. Flying contains several aspects, the most important of which is practical knowledge according to B. Molander (1998). The practical knowledge of flying an aircraft is embodied in every pilot within the pilot community and in the practical application of their knowledge. The analysis of interviews indicated that when pilots referred to their own knowledge, their claims had substantial connotations with what L. Wittgenstein (1971) labelled as "the act of knowing": the essence of knowledge in flying an aircraft was referred to as the ability to establish and maintain a mental state, or certain awareness "to mentally be ahead of the aircraft". In relation to B. Molander (1998) and S. Dreyfus and H. Dreyfus (1980) perception of the skilled executor of knowledge (i.e. the boat builder or the expert in Dreyfus' view), a pilot in modern civilian airlines faces another challenge, which is the fact that in order to perform a flight, a pilot has to rely on others. An integral part of being a good airman is to be a good crewmember, and being a good crewmember is an integral part of being an airman.

"Airmanship" or an "airman's attitude" seemed to serve as an abstraction for several features which are demanded from pilots. The implications of learning to fly an aircraft were pinpointed as the ability to adapt to certain behavioral standards or attitudes, and these behavioral standards were referred to as the attitude of an airman, or the airman's attitude. These standards have to be personal, and have to be an integral part of the "rules" by which to live. To learn to fly an aircraft as expected

of an airman is to learn the hidden or unspoken values and rules of conduct and behavior; how to act and how to socialize, how to interact with respect for other people's boundaries both personally and professionally, how and when to say what, and understanding the unwritten codes of conduct. These are all distinguished as important features of airmanship. When pilots spoke of attitude, they discriminated between an individual's attitude towards others and the individual's attitude towards him/herself.

Yet, when pilots refer to good or skilled pilots, they are referring to pilots who have a certain type of "personal attitude". This personal attitude is stressed as the mark and characteristic of a good airman.

The descriptions and normative conceptions of airmanship have a lot in common with the definition of professionalism. Within the everyday task of flight operation, pilots face the challenges of experience, emotions and feelings alongside an ideal of being cooperative, communicative, assertively empathetic and stable; they must also be able to relate to symmetric interaction despite hierarchical differences, while at the same time maintaining a mental state in which their emotions do not influence them in a negative way that can affect flight safety.

Pilots must sometimes display or actively deal with feelings differently from the way their emotional capacity enables to since the daily task of flight operation demands them to do so. There is no room for emotions from pilots' personal and social life in the cockpit. The environment allows few openings for individual emotion, as the cockpit and cabin are first and foremost a practical setting. Pilots and crew members must have the ability to think in bionic terms while controlling the aircraft, regardless of whether they are manually flying the aircraft or using the flight director and letting the autopilot do the steering. Pilots and flight crew must create safety in every flight through their practice (Dekker 2006; Antonsen *et al.* 2008). Pilots must manage the workload connected with individual tasks in flight operation. In addition, they must formulate and potentially reconsider their mental picture of the flight and their planning process at all times, which allows the crew to be mentally ahead of the aircraft. Their thoughts must be in front of the aircraft, thereby giving them the ability to identify and deal with a potential problem in order to avoid any hazardous or dangerous situations (Canon-Bowers *et al.* 1993).

The ideal of airmanship functions more or less as a cultural "dictionary" of how to deal with one's emotions. In the piloting profession, it is the flight operation and professional ideology that sets the rules for how, where and when to cope with your feelings. The individual crewmember has to feel his way through and decide

for himself what these limits are, because the pilots are not trained in adequately displaying their feelings or the right way of conducting themselves, whether an airman or crew member. It is an individual task to learn the more or less unspoken rules of conduct, and if the individual pilot does not have this relational capability, he or she must learn it. As a result, pilots must be in an experiential cycle and continuously evaluate and re-evaluate the ways in which they construct emotional experiences, and “perform” their emotions in ways that are acceptable within everyday life in the cockpit and crew environment within the specific airline they work for, as well as within pilot culture in general. This operative rule is so strong that it can easily reveal feelings of fear or anxiety in terms of not being able to live up to the task at hand. Even more importantly, this emotional competence is an essential criterion for being hired as a pilot in the first place. It is a fundamental prerequisite for being upgraded from a “First Officer” to “Commander”.

8. The rationale of airmanship: the consequence of error

The results indicate the existence of strong concurrent perceptions among pilots about desirable non-technical skills. Pilots in this study had a high degree of awareness of how their own actions were directly linked to the creation of safety on every flight.

During this qualitative research project I have come to terms with maybe the most prominent rationale for the strong concurrence of the perception of airmanship. Several pilots explained the rationale for airmanship: “as a pilot, ultimately, you can die as a result of your own mistakes. Furthermore, you are not necessarily alive to legally defend yourself when the airlines and accident investigators are constantly searching for the culprit”. The statement reveals an important reason for the high degree of awareness of airmanship. In every activity, it is relatively easy for insiders of the activity to identify poor executors. There are poor doctors and nurses. There are poor musicians. What most of these activities have in common is that the result of an error is fatal in both the moral and ethical sense. However, in most cases, the executor of the error survives and, thereby, lives to tell and teach others and can learn from their mistakes as well. Pilots die of their own mistakes. A pilot commented: “safety doesn’t come accidentally. An important awareness among us is that a safe flight is not just something that happens. It is an effort. Everyone in aviation including me, the rest of the crew, ATC, the operations department, the meteorologist – everyone – has to take part in creating a safe flight. To me, that is the essence of airmanship. The rationale for doing things according to procedures and going through the check list every time is that we know that the procedures and the check lists

are written in blood. The items in the procedures and the check list are there for a reason: all the items in both the procedures and on the check list are accumulated experiences from previous incidents and accidents. We know Murphy’s Law, which states that everything that can go wrong eventually will. Both the whole group and each individual must, therefore, always be ahead of what goes on in the moment. We have to be prepared for situations that can occur” (Nergård 2004–2006; interview number 25, 2005).

9. Conclusions

The strong concurrence of the pilots’ perception of airmanship indicated that the research design approach implemented by the pilots, who formulated the questions in a tone and way familiar to themselves, proved effective.

Nonetheless, using the pilots’ formulation also represented a methodological weakness. Moreover, the design and interpretation of the results represent a weakness beyond that of a methodological weakness. As a researcher, I am an outsider to the activity of flying aircraft. Furthermore, an outsider does not understand what it takes to acquire the knowledge needed to fly an aircraft; therefore, I am unable to understand what is involved in executing this type of knowledge. As a consequence, I am unable to distinguish among good and bad performers, because I do not fully understand the activity itself. Even though, prior to and during this study, I accumulated 920 hours and 20 minutes (Block time) of experience sitting in the jump seat observing pilots flying aircraft, and have obtained my own PPL (private pilot licence). Even if I had the knowledge of how to fly an aircraft, I would not necessarily have the ability to tell others how to do it because some aspects of it are also tacit to me.

This study has succeeded in identifying the features of airmanship according to the pilots’ own understanding and perception. Overall, the findings in this study revealed that pilots’ perceptions are of interest to the perpetual shift in safety research. Pilots’ conceptions of airmanship possibly contain the most important solution to the challenge of developing new, or improving existing, instruments to assess cockpit behavior and, thereby, safety.

Pilots formulated this understanding from their point of view by employing concepts nearer to their own experience based on their day-to-day practice of flying an aircraft. Researchers, training professionals, accident investigators, the creators of CRM, behavioral marker systems and other systems, which have increased safety as their ultimate goal, have also formulated their perceptions of a skilled pilot in their own terms. The problem seems to be that these perceptions and the resulting

formulations have been perceived (experienced) as being distant by pilots, as they were founded on a different philosophy of knowledge. The challenge in implementing CRM and behavioral marker systems is the difficulty to assess pilots' cockpit and flying behavior in a manner that considers both parties' point of view. The challenges in implementing CRM and behavioral marker systems are manageable from this perspective. In accordance with studies exploring the difficulties in implementing CRM and behavioral marker systems (Simpson, Wiggins 1999; Beaubien, Baker 2002; Summers 2007), an important success factor for achieving a higher level of implementation of CRM and behavioral marker systems is accepting the pilot or airman's point of view as the starting point of training.

Future research must further address these issues. The factors identified in this study must be further elaborated on in order to be applicable for understanding how a safe flight is created through good airmen's practical knowledge. Can the findings in this study be identified through a quantitative research design? The results in this study are a good starting point. Future research must also address the relationship between attitude and cockpit behavior. In this research, the pilots' point of view may hold the most important clue to fully understanding the relationship between safety and behavior, particularly as it pertains to the matter of perception of the existence of a relationship between a pilot's personal attitude, his or her cockpit behavior and his performance of flying an aircraft.

Author's note

The author wishes to express his deepest gratitude to all the pilots who participated in this study. Fly safe!

References

- Antonsen, S.; Almklov, P.; Fenstad, J. 2008. Reducing the gap between procedures and practice – lessons from a successful safety intervention, *Safety Science Monitor* 12(1).
- Benison, R. A. 2000. CRM- the aviation experience, in *Proceedings Airbus Industries*, May 2000, Paris, France.
- Beaubien, J. M.; Baker, D. P. 2002. Airline pilots' perceptions of and experiences in Crew Resource Management (CRM) training, in *Proceedings of the 2002 Society of Automotive Engineers' World Aviation Congress and Display*. Washington, DC: Society of Automotive Engineers.
- Cannon-Bowers, J. E.; Salas, E.; Converse, S. 1993. Shared mental models in expert team decision-making, in J. Castellan, (Ed.). *Individual and group decision-making*. Current Issues, Hillsdale, NJ: Lawrence Erlbaum Associates.
- Dekker, S. 2006. *The field guide to understanding human error*. London: Ashgate.
- Dreyfus, S.; Dreyfus, H. 1980. A five stage model of the mental activities involved in directed skills acquisition, in M. J. Atkins, J. Beattie, W. B. Dockrell (Eds.). *Assessment issues in higher education*. Sheffield, University of California.
- Driskell, J. E.; Adams, R. J. 1992. *Crew resource management: an introductory handbook*. Department of Transportation, Federal Aviation Administration, Washington, DC, U.S.
- Eid, J.; Johnsen, B. H.; Bartone, P. T., et al. 2008. Growing transformational leaders: exploring the role of personality hardness, *Leadership & Organization Development Journal* 29(1): 4–23 <http://dx.doi.org/10.1108/01437730810845270>.
- Federal Aviation Administration (FAA). 1998. *Advanced qualification program* (Advisory Circular 120-54A). Department of Transportation, Washington, DC, U.S.
- Flin, R.; Martin, L. 2001. Behavioral markers for crew resource management: a review of current practice, *International Journal of Aviation Psychology* 11: 95–118. http://dx.doi.org/10.1207/S15327108IJAP1101_6
- Franz, T. M.; Prince, C.; Cannon-Bowers, J. A., et al. 1990. The identification of aircrew coordination skills, in *Proceedings of the 12th Symposium in Psychology in the Department of Defense*. Springfield, VA, US: National Technical Information Services, 97–101.
- Geertz, C. 1983. From the native's point of view: on the nature of anthropological understanding, in: M. Freilich (Ed.). *The pleasures of anthropology*. New York: New American Library, Times Mirror.
- Hedge, J. W.; Bruskiwicz, K. T.; Borman, W. C., et al. 2000. Selecting pilots with crew resource management skills, *International Journal of Aviation Psychology* 10: 377–392. http://dx.doi.org/10.1207/S15327108IJAP1004_5
- Helmreich, R. L.; Merritt, A. C.; Wilhelm, J. A. 1999. The evolution of crew resource management training in commercial aviation, *International Journal of Aviation Psychology* 9: 19–32. http://dx.doi.org/10.1207/s15327108ijap0901_2
- Helmreich, R.; Wilhelm, J. A.; Klinec, J. R., et al. 2001. Culture, error and crew resource management, in E. Salas, C. A. Bowers, R. L. Helmreich, J. A. Wilhelm, J. R. Klinec, A. C. Merritt (Eds.). *Improving teamwork in organizations*. Mahwah, NJ: Lawrence Erlbaum Associates, Inc., 305–331.
- Hunter, D. R. 1989. Aviator selection, in M. F. Wiskoff, G. F. Rampton (Eds.). *Military personnel measurement: testing, assignment, evaluation*. New York: Praeger, 129–167.
- Hunter, D. R.; Burke, E. F. 1994. Predicting aircraft pilot-training success: a meta-analysis of published research, *International Journal of Aviation Psychology* 4: 297–313. http://dx.doi.org/10.1207/s15327108ijap0404_1
- Jung, C. G. 1971. *Psychological types*. Princeton, New Jersey: Princeton University Press.
- Kern, T. (Ed). 1997. *Redefining airmanship*. New York: McGraw-Hill.
- Kraiger, K.; Ford, J. K.; Salas, E. 1993. Application of cognitive, skill-based and affective theories of learning outcomes to new methods of training evaluation, *Journal of Applied Psychology* 78: 311–328. <http://dx.doi.org/10.1037/0021-9010.78.2.311>
- Martinussen, M. 1996. Psychological measures as predictors of pilot performance: a meta-analysis, *International Journal of Aviation Psychology* 1: 1–20. http://dx.doi.org/10.1207/s15327108ijap0601_1
- Martinussen, M. 2005. Seleksjon av flygere og flygeledere, *Tidskrift for Norsk Psykologforening* 42: 291–299. (in Norwegian).
- Massey, A. 1999. Methodological triangulation, or how to get lost without being found out, in A. Massey, G. Walford (Eds.). *Explorations in methodology, studies in educational ethnography*. Stanford: JAI Press, 183–197.
- Molander, B. 1998. *Kunnskap i handling* [Knowledge in action]. Göteborg: Bokförlaget Daidalos AB. (in Swedish).

- Nergård, V. 2004–2006. *Interviews 1–30, from Fieldwork*. Tromsø. Unpublished.
- Ostrom, T. M.; Skowronski, J. J.; Nowak, A. 1994. The cognitive foundation of attitudes: it's a wonderful construct, in P. G. Devine, D. L. Hamilton, T. M. Ostrom (Eds.). *Social cognition: impact on social psychology*. New York: Academic, 195–258.
- Salas, E.; Fowlkes, J. E.; Stout, R. J., *et al.* 1999. Does CRM training improve teamwork skills in the cockpit? Two evaluation studies, *Human Factors* 41: 161–172.
<http://dx.doi.org/10.1518/001872099779577255>
- Seva, R. R.; Gutierrez, A. M. J. A.; Duh, H., *et al.* 2007. An evaluation of CRM attitudes of Filipino pilots in four Philippine aviation companies, *International Journal of Aviation Psychology* 17: 285–298.
<http://dx.doi.org/10.1080/10508410701343532>
- Simpson, P.; Wiggins, M. 1999. Attitudes toward unsafe acts in a sample of Australian general aviation pilots, *International Journal of Aviation Psychology* 9: 337–350.
http://dx.doi.org/10.1207/s15327108ijap0904_2
- Summers, M. 2007. *Scenario-based training in technically advanced aircrafts as a method to improve risk management* [online]. Embry-Riddle Aeronautical University Daytona Beach, Florida [cited 10 November 2013]. Available from internet: http://www.faa.gov/education_research/training/fits/research/media/SBT_for_RM.pdf
- Thomas, M. J. W. 2001. Enhancing instructional systems: the development of a tool for evaluating instructor and student performance, in M. J. W. Thomas, G. J. F. Hunt (Eds.). *Enhancing professionalism in aviation*. Auckland, New Zealand: Massey University School of Aviation, 47–57.
- Thomas, M. 2006. Predictors of threat and error management: Identification of core nontechnical skills and implications for training systems design, *International Journal of Aviation Psychology* 14: 207–231.
http://dx.doi.org/10.1207/s15327108ijap1402_6
- Westby, R. 1990. *Annual safety review. Internal publication in Norwegian Air Shuttle*. Oslo, Norway.
- Wilson, T. D.; Dunn, D. S.; Kraft, D., *et al.* 1989. Introspection, attitude change and attitude-behaviour consistency: the disruptive effects of explaining why we feel the way we do, in L. Berkowitz (Ed.). *Advances in experimental social psychology*. New York: Academic, 287–343.
- Wolfe, T. 1979. *The right stuff*. New York: Bantam.
- Wittgenstein, L. 1971. *Philosophical investigations*. Oxford UK, Cambridge USA: Blackwell Publishers.