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**SOLUTIONS FOR INCREASING THE SAFETY OF
AERONAUTICAL ORGANIZATION**

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Abstract:

At the level of aeronautical organizations there were recorded a series of concerns regarding safety during flight activities. Instead of traditional approach to finding out causes that generated events and the separate recording of events, nowadays, a systemic organizational approach is promoted for preventing, raising awareness, understanding and controlling hazard. The real challenge for leaders of aeronautical organizations is to develop professional initiatives toward performance and at the same time to improve safety level.

Key words: Aeronautical safety, safety culture, management, flight, organization, accident, programs, strategies.

1. Introduction

The latest analyses in the field of aeronautical management foster the concept of “Organizational accident”, according to James Reason (1997), which abort the simplistic consideration of individual accident involving one person or a small group of people, whereas the event consequences are attributed to him/them. The new concept proposes a complex causality that involves a higher number of individuals, through associating some organizational dysfunctions, with technical or environment conditions, thus considering each factor’s contribution in turn.

In other words, there was a proposal to eliminate the tendency of focusing on ‘human error’; instead, the focal point should be on latent causes, on factors favoring accidents, which could have increased the chances of preventing an aviation event if they had been identified and corrected in due time.

This new approach relies on continuous collection and analysis of data regarding the organization as a whole, using both proactive and reactive methods for risk monitoring and elimination of safety errors. The new concept leads to a permanent implementation and improvement of safety management, in order to optimize activities within an organization.

Aeronautical safety management represents the coordination action of all activities and resources in an anticipative manner, proactive, planned and supported explicitly by procedures and operational documents, followed tightly, at all organizational levels (up to the highest hierarchic level) and in all stages of the flight activity. Flight safety management includes a variety of systems, practices and procedures that are not yet sufficient if applied artificially. This type of management requires improvement in two directions: **technology upgrade** at the same pace with the state-of-the-art technology, and

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implementation of an efficient organizational culture, in which individuals gain their abilities of recognizing hazards, of being careful and preventive, of knowing what needs to be reported, whereas the top management learn how to prove their commitment and involvement through real and correct actions.

Taking into consideration these characteristics specific to an organization that employs a positive safety culture, a series of attributes and organizational requirements are being developed to maintain a high level of “Safety Culture” in the aeronautical activity. These are both simple conditions, easy to achieve, as well as safety management strategies, which require special attention and a certain amount of time for their assimilation. Thus, the basic conditions of the aeronautical safety culture include:

- commitment to taking actions for the reduction of error favoring conditions, by stressing the issue of safety and promoting reasonable and applicable rules;
- encouragement of feed-back, data diagnosis and transmission of relevant safety information;
- an optimal ratio and perfect balance between efficiency (productivity) and safety;
- accomplishment and preservation of an efficient system of correlation with situations and events with risk potential;
- openness on behalf of the top management toward criticism and contradictory opinions;
- designing and preserving an image of the organization’s performance line;
- training for applying personnel, stress, decision-making, risk and error management strategies;
- permanent conduct of surveys that are able to offer the personnel’s perceptions of safety;
- the idea that a ‘safer’ organization learns from its own experience, its own achievements but equally from its own errors.

2. Modern aviation safety increase programs and strategies, from the flight crew’s perspective

a) Crew Resource Management (CRM) programs include strategies and conducts adhered to by the personnel/employees/crew in order to achieve safety. These strategies develop concepts such as trust, open communication between subordinates and superiors, team work and coordination; they fight against the idea of pilot’s invulnerability and encourage recognition of human being’s limits. Because error is omnipresent and inevitable, CRM supports error reporting and sharing of information related to operational errors. A well known saying, which concentrates in it the core of the CRM policies is “To err is human, to forgive is divine”, transformed into “To err is human, to forgive is essential”. At the core of CRM is the training and qualifying of instructors and evaluators in risk avoidance and error management.

b) Threat and Error Management differentiates the aircraft’s undesired states from consequences. The former are the transitional states between a normal situation (for example, a stable gliding slope) and a result. Consequences, on the other side, are final states that present notable results (for example, incidents and accidents). Such an example would be: a routine approach (normal operational state) turns into a non-routine, unstable approach (aircraft undesired evolution) that leads to the aircraft runway excursion (consequence). Through threat and error management, the flight crew has the possibility to solve a risky evolution and to reset safety limits. Once the undesired states become consequences, the return to routine operations or safety reset is no longer possible.

Countermeasures adopted by pilots against threats, errors and undesired states of the aircraft are based on their actions, as well as on technologies existent on the aircraft

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board (Airborne Collision Avoidance System –ACAS; Ground Proximity Warning System –GPWS; Standard Operation Procedures –SOPs; checklists, briefings, trainings etc.)

The human contribution to the countermeasure system may be achieved through individual or collective strategies and tactics that include knowledge and aptitudes developed through training. There are three categories of countermeasures:

1. Planning countermeasures: essential for managing anticipated or unexpected threats (for example, defining roles and responsibilities in case of non-routine situations; the make-up of an interactive and focused briefing from the operational perspective);
2. Execution countermeasures: essential for error detection (for example, the operational requirements are followed strictly; the board avionics balance the work load);
3. Control countermeasures: essential in case of changing conditions of a flight (for example, evaluations of existent work plans and their amendment if needed; reporting problems without any hesitation and finding optimal solutions).

c) Decision making management, known and studied as ADM (Aeronautical Decision Making), represents the essential decision making process in the flight safety, 52% of the fatal accidents resulting from piloting errors being the result of the decision making behavior, also known as cognitive reasoning. The aeronautical decision making is the systematic approach to the mental process used by pilots in order to find out the best action variant in response to specific given circumstances. Through the ADM techniques a better reasoning develops and it allows the pilot to perform an intelligent recognition of risk factors, such as weather, weight and balance, own experience, cockpit background and stress and a clear judgment of critical situations. When the pilot has too many actions to perform, he is exposed to the risk of making a wrong decision. A relevant example, in this respect, highlights the comparison with the economic reality, where, there is sufficient time for taking all risk factors into consideration, time for demanding explanations, for requesting information or for postponing a decision of great importance. Although it seems absurd, in aviation, decisions referring to equipment that costs tens of millions Euros, and most important, decisions referring to one's own life, have to be made, sometimes, in 2 – 5 seconds.

The steps involved in making an optimal decision include:

- identification of hazardous attitudes for the flight safety;
- identification of attitudes that represent hazard for the flight safety;
- learning some behavior control and modifying techniques;
- learning manners through which pilots can recognize and face stress;
- development of risk evaluation competences;
- use of all available resources;
- evaluation of one's decision making competences.

Larry Prentiss and James B. Brownfield propose a decision making model destined to provide the pilot with a logical variant in his decision making process [1]. The six elements represent a continuous loop of the cognitive process, focused on the intellectual component, but having impact on motivational component, too:

- D**etect (Be aware of/ Detect situational change)
- E**stimate (Estimate the need to react against a situation change)
- C**hoose (Choose a desired flight result)
- I**dentify (Identify actions that control the situation)
- D**o (Do what is necessary)
- E**valuate (Evaluate the effect of the action you are about to take to combat the critical situation).

Initial instruction for maneuvering and controlling an aircraft requires an interval of time of several months for work and training, but the training for the total and intelligent

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control of the flight implies one or two decades of experience, regular training, rapid switches from physical to mental requirements. ADM can reduce the long process of learning the manner in which optimal decision are being made for the success and safety of a mission.

d) Stress is a term used to describe the unusual response of one's body to requirements applied on one. In a pilot's activity there are numerous physical and psychical requirements, coming from his/her personal or professional life, which affect his/her action capacities at an optimal level and his/her decision making abilities. Although it produces unspecific effects on behavior, stress is an inevitable and necessary state in the pilot's activity; it motivates him/her to face the challenges and risks he/she meets, forcing him/her to adapt in order to control the situation. The difference between the pilot's capacities and the requirements of the task is the limit of safety. There is, also, a limit of the pilot's capacity to adjust, named the level of stress tolerance, based on his/her abilities to face a critical situation. If the number or intensity of stressing factors rises too high, the pilot is susceptible of background overworking. In this case, his/her performance starts to decrease and his/her sensibility starts to deteriorate. Practicing stress management, the organizational culture promotes various techniques to reduce and combat stress. Thus, in his/her personal life, the pilot need to:

- acquire as much knowledge/information as possible about stress;
- self-assess realistically;
- approach problems systematically;
- develop a lifestyle that may reduce stress effects;
- practice techniques of behavioral management;
- establish and maintain strong social relationships.

To avoid stress in aviation activities, the pilot should act as follows:

- avoids situations that divert his/her attention from flight;
- reduces his/her workload in order to reduce the level of stress when the tolerance limit is exceeded;
- remains calm in distress situations;
- thinks, weighs alternatives, then acts;
- preserves his/her competence, which provides him/her trust in the aircraft, systems and emergency procedures;
- knows and respects his/her limits;
- does not allow for small mistakes to become serious, or to generate an error;
- after landing, he/she takes part in debriefing and his/her own flight analysis.

The efficient management of the actions in progress does not permit for the flight activity to become a stressing factor. Nevertheless, if flight becomes a stress factor, it is recommended that the pilot take a break and benefit from professional help for combating stress.

The organizational culture of flight safety determines the orientation, style and efficacy of an organization, in order to maintain safety programs. It designs the progress of activities so as to avoid incidents, to detect and combat threats, to raise awareness related to vulnerabilities and it is based on the lesson learning principle. In an ideal world, the vision of air accidents perceived as socio-technical phenomena should be followed by an investigative attitude able to explain how it happened, more than who the guilty one is. Practice has proven that an investigation seeking for the guilty has but little chances to find pertinent explanations, based on which efficient preventive measures can be taken. Starting from this premise, the U.S. military aviation adopted the solution of air accidents investigation by two parallel [2] commissions, an "investigation" one, focused on responsibility allocation, and a "flight safety" one, whose objective is to highlight causes

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and propose preventive measures. It is interesting that testimony given in front of the second commission does not fall under the incidence of any administrative or judicial penalty. "Ignoring" authorities (in fact, its self-interruption) holds, in this case, a beneficial effect, greater than its direct engagement.

3. Dysfunctions in the aeronautical safety culture

At the level of aeronautical organization, there can appear hazardous attitudes and behaviors on behalf of the pilots. Pilots have always been regarded as elite, capable and invincible, not feeling like admitting their failures. The entire aviation history relies on the pilot as a hero who can often compensate for technology's lacks. This attitude prevents information, the pilots disliking admitting that they were wrong, or refusing to hear about errors while considering those who made mistakes "unskilled", being far from "their standards".

Throughout their entire career, all experienced pilots were tempted by one or more of the following hazardous behaviors:

1. Pressure on behalf of the group (making a wrong decision, based on emotional response while under the pressure of work colleagues, without an objective evaluation of the situation);

2. Mental blockage (incapacity of recognizing and reacting to changes of situations different from those anticipated or planned);

3. Concentration on landing (mind blurring and concentration on landing, in hazard conditions, storm, strong winds, where the use of a different airport may be recommended);

4. Low-level flight, grazing flight (caused by the wish to "have a look", while flying at the minimum allowed altitude of each flight training);

5. Loss of control over the situation (the pilot's actions are determined by external factors and he/she cannot control them any longer);

6. Flight with insufficient fuel (it can be a consequence of exaggerated trust, of ignoring rules, of lacks in the flight plan);

7. Continuation of Visual Flight Rules (VFR) flight under Instrumental Flight Rules (IFR) conditions;

8. Exceeding the technical limits of the aircraft by overestimating own capacities;

9. Ignoring the flight plan, the aircraft check-out before flight, checklists;

10. Dangerous attitudes [3]:

- Anti-authority ("Do not tell me what to do!") – met with people who do not like to be told what to do; they reject what they are transmitted by radio and consider that rules and procedures are stupid and not necessary;

- Impulsivity ("Do something immediately!") – met with pilots who hurry in their decision making, they do not weigh alternatives and perform the first action that comes to their minds;

- Invulnerability ("It cannot happen to me!") – these people know that accidents do occur, but they refuse to be aware that they could be involved in them; such an attitude leads taking increased risks;

- "Macho" ("I can do it!") – pilots who try all the time to prove that they are better than the others and therefore take excessive risks only to impress others;

- Giving-up/resignation ("What does it serve for?") – pilots who think like this do not consider themselves capable to decide;

Manifestation of hazardous attitudes is normal for each of the pilots throughout their careers, with certain intensity and at a certain interval of time. If these attitudes appear

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regularly or with extreme intensity, they can generate real problems. The problems need to be identified in order to be corrected and for measures against them to be taken.

In the system of flight safety culture there may be some deficiencies determined by the material and motivational state of the crew, by the level of their training and by the structural organization of squadrons/air bases. Dysfunctions causing accidents are classified into the following types:

1. Material, with reference to technical availabilities and the lifecycle of aircraft and specific equipment. At this level, there are often financial constraints, which makes that each deficiency be presented as “objective”. Nevertheless, it can be highlighted that it is all about the incorrect detection of priorities and a deficient planning of expenses.

2. Training. Assurance of an optimal education and training level for the flight crew is one of the basic attributes of an aviation organization management. Deficiencies may refer to the insufficient amount of training, or its surplus, to improper evaluations or to inadequacy to specific situations.

Mention should be made that risk involved by an improper assessment system of the flight crew performance is also present, the negative effects being remarkable.

3. The organization structure itself may be a source for accident risks. The absence of some important departments or their incorrect subordination may constitute a latent premise for the appearance of flight events. The effects appear as deficiencies in coordination, supervision and information assurance or improper feed-back. For example, the absence of a body with attributions exclusively in the area of safety or its subordination to an inferior level represents a major risk of accident.

4. Inefficient communications at the organization structures’ level. They can lead to wrong decision making at the level of various departments or to different evidence of the organization’s goals in its hierarchy.

5. Incompatible goals. The conflict between efficacy (productivity) and safety is the most frequently met example. And so is the one referring to pressures applied by organization, group or personal interests. Their adjustment into a coherent system represents one of the most important tasks of an aviation organization’s management. Here is a real example: adopting a payment regime for pilots, in which exaggerated focus is put on variable incomes, derived from flight hours or from complexity of the missions accomplished. The interest to assure an increased income, in this case, is in contradiction with safety. In time, this payment regime, apparently beneficial for the flight crew, becomes dangerous because it induces the pilots the tendency of “fighting” both for more flight hours and for more and more complex missions, which can be contradictory to the real training level at a certain moment.

Repercussions of such situations become evident and they materialize in accidents only when they combine with other factors, including those of individual nature, those caused by the background or are due to the flight task nature.

6. Deficient working conditions, consisting of aspects related to both the physical environment and the management style, working atmosphere, attitudes, crew’s motivation etc.

7. Operation procedures. Efficiency and safety of aeronautical activities depend decisively on the quality of the procedure system. They represent the spine of air activities. The insufficient coverage or conflict between various types of procedures, their excessive rigidity as well as excessive flexibility – all can contribute to the appearance of risk situations.

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4. Conclusion

The list of organizational factors that can constitute hazard premises represents a good analysis instrument, equally preventive and retrospective, in investigations cases.

Recommendations with regard to aeronautical safety:

- Analyze all air events occurring within your facility and other facilities, in order to identify dysfunctions that can lead to other incidents or air accidents;
- Approach the flight decision making process rationally and functionally, starting from interactions between human, technical and environmental factors that can lead to the occurrence of air events;
- Distribute effort uniformly, in accordance with training objectives and tasks, in order to eliminate overworking, inadequate perception of hazard or dysfunctions of motivational nature;
- Identify social factors with an impact on flight training activity:
 - social issues;
 - financial hardships;
 - family relationships;
 - relationships with work teams.
- Eliminate stress within organization and harmonize activities of compartments, starting from the premises that pilots, technical crews, other flight crew and navigators are the main preventers of aviation events.

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