

PRACE POGLĄDOWE

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PSYCHOLOGICAL CONDITIONING AND HUMAN FACTOR MANAGEMENT AS CRITICAL ELEMENTS OF AN EFFECTIVE FLIGHT SAFETY ASSURANCE SYSTEM (WITH VOLGA-DNEPR GROUP AS AN EXAMPLE)*

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ABSTRACT: *The concept of effective flight safety assurance system based on psychological conditioning and human factor management is presented. The role of proper personality oriented crew training in the area of human factor is stressed. The major aim of this training is to identify hidden risks pertaining to flight operations. The awareness of ones limitations as far as individual features such as reactions, rate of information processing, attention, memory, thinking, stress resistance are of major importance as it can ensure resistance to impacts of adverse factors in flight. In the second stage of training the stress is put on CRM (Crew Resources Management) ensuring that pilots realize critical role of well-coordinated teamwork at the flight deck in controlling aircraft with required level of flight safety under various operating conditions, including high pressure and stress levels. Finally the recommendations for individual psychological corrective work are presented. The concept of psychological "Compatibility Matrices" is presented and the application of flight data recordings in the training process is discussed*

KEY WORDS: *psychological conditioning, human factor management, flight safety*

A member of US FAA management once said: *We have spent a lot of time and enormous resources to create up-to-date and completely dependable aviation equipment. Now it is time for us to focus on people.*"

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Current global air transport incident and accident rate statistics also confirm that for most regions in the world most air incidents and accidents occur due to human performance, with share of such incidents and accidents almost constantly being at 70-80% of total occurrences over many years.

As we see much evidence to the fact that policies of operators must target human performance, we have attempted to set up a system to manage the Human Factor in the company. Most human errors stem from human psychology and behavior and thus require a psychological approach to flight safety challenges, more focus on human factor issues, psychological conditioning and training for aircrews and psychological support to air operators' activities. There are some lines along which we build our effort.

Trainings

The first one – covered in the previous report – is training. Dr Ponomarenko wrote: “On the one hand, there are laws of nature and laws of aerodynamics, and on the other – laws of human mentality. For a pilot, to be unaware of these laws is a risk, for an instructor – a double risk.” Therefore, we consider personality-oriented flight crew training to be one of our top priorities. This effort is focused on helping flight crew members understand better those risks pertaining to flight operations which are often unnoticed at first sight and, consequently, avoid many situations that are associated with such risks.

General airline human factor training course for air crews comprises three major phases:

STAGE 1. Awareness of basic human factor concepts known in aviation. And how our human psychology influences on flight safety. This stage mostly bases on classroom training and sessions, making flight crew members aware of their abilities.

Though human behavior is affected by various environmental factors, finally it all comes down to ultimate decision-making where we are on our own. Sometimes too much depends on an individual. That is exactly why the individual must know well his own specific features and abilities which may be either facilitating or detrimental in a difficult situation. Flight crew members often have to operate to the best of their abilities under extreme pressure sometimes pushing it to the limit, where it depends on personality and psychophysiological features of a pilot. This stage is focused on helping flight crew members learn to identify hidden risks pertaining to flight operations and, consequently, take appropriate measures in situations which are associated with such risks. Individual features include nervous system performance such as reactions, rate of information processing, attention, memory, thinking, stress resistance, etc. Knowing these, pilot will be able to realize his own operating qualities, which ensure resistance to impacts of adverse factors in flight.

STAGE 2 (CRM) is a component of corporate culture shared by all airline staff and is aimed at:

- Developing and improving communicational and behavioral leadership qualities and also situational awareness and decision-making skills;

- This stage focuses on crew as a team where personality features of each individual member affect teamwork and aims at developing CRM-based practical skills. Knowledge gained during the first stage is projected here onto teamwork;
- Training crew members in behavior strategies to be followed in cases when there are indications that actions of Captain jeopardize flight safety;
- Ensuring that pilots realize critical role of well-coordinated teamwork at the flight deck in controlling aircraft with required level of flight safety under various operating conditions, including high pressure and stress levels;
- Streamlining crew operations at the flight deck and assessing human factor considerations.
- During exercises, non-commanding members of crew take a 4-stage interference approach in cases when simulated actions of pilot-in-command begin to jeopardize safety of aircraft and crew. This principle is applied to make each crew member able to speak up in appropriate situations.

STAGE 3. Flight crew training on the basis of LOFT guidelines and practices which involves intense simulator exercises.

Training programs and their targets and contents are intended for line pilots, flight crew members, flight instructors and pilots in command. Airline staff who implement the programs have received specialized training at domestic and international training organizations and hold certificates authorizing them to engage in training activity of this type. Trainers are: an aviation psychologist, an aviation medicine specialist and flight instructors.

And very important part is – Human factors course for top managers, which works in a discussions manner.

Individual phonological work

The second part of our effort is psychologist's work with flight crew members based on individual approach. It includes:

- pre-employment psychological testing,
- psychological testing of flight operations staff,
- individual corrective work.

Practical experience accumulated in the field of aviation enables application of Standardized Personality Study Method (SMIL) for these staff categories.

SMIL is a modification of Minnesota Multiphasic Personality Inventory (MMPI) developed to support selection of pilots. MMPI was modified and nationally implemented by L. Sobchik, a Russian psychology researcher and works Air Force and Civil Aviation.

Testing results are - psychological profiles of aviation specialists.

However, testing is not a goal in itself. It is only a tool used to correct personal features and professional qualities. Why conduct psychological testing then? Firstly, to help each flight crew member know him, show what features his nervous system, temper and character may be beneficial or detrimental in various situations in everyday life or in flight operations. This is a kind of self-study conducted by each participant. Secondly, this is done to study and evaluate individuals in order to integrate them in crews.

Compatibility

Next line of our effort is to ensure that flight crew members perfectly match each other. This work is based on testing methods discussed above.

Coordination issues may arise due to lack of knowledge of each other's capabilities, lack of team spirit, etc. To minimize weaknesses of an unbound crew, we attempted to develop our own "Compatibility Matrices" which could help flight crew planners match crews more efficiently. Development of Compatibility Matrices was based on results of conducted psychological testing. Compatibility assessment software was based on evaluated combinations of factors affecting crew operations and data derived from results of flight crew tests. The output of such computer assessment is "Compatibility Score" according to ten-point scale.

Flight data monitoring (recode all the flights)

Another significant line of activity is to provide pilots with opportunity to review flight data from their own completed flights with support under supervision of flight operations management.

To do this, crews must be able to review in a timely manner both records of flights that have just been completed by them and summary records showing the whole picture over a set of completed flights over a certain period, with flight operations management being also given access to such information so they could come up with appropriate management controls. From our practical experience, we know that:

If air crews are provided with results of computerized reviews of individual flights on a regular basis, and also made aware of systematic errors and deviations revealed by way of summarization of such results, then most air crews will be able to correct their systematic errors themselves, without management to interfere.

Data collection and monitoring in the process aimed at control and perfection of piloting skills of crews includes two essential components:

- identification of gross deviations from standard operating procedures and flight rules, i.e. situations where piloting parameters exceed limitation and tolerance values;
- detailed quality monitoring of flight performance with analysis of piloting accuracy at critical stages of flight (takeoff, approach and landing). Such monitoring allows detection of even minor errors in pilot activities with their quantitative description on a continuous metering scale of quality indicators as produced by 'Flight Profile' software.

How this concerns the human factor aspect

Pilots should not be under pressure that their flights are subjected to surveillance. They should rather conceive that they can always have open and honest discussion of their flights in empathic way between a flight data analyst and a pilot. A pilot's self-confidence and assurance of undisturbed working environment are further encouraged by the changed status of the piloting controlling person – now this work is vested in the independent flight data analysis within the Flight Department. The

communication between the flight data analysis and pilots are primarily structured as a private conversation in an informal atmosphere of strict confidentiality and built on the basis of objective information. In case of any violation from established procedures or exceeded limitations, the chief pilot is also invited to participate in the review and analysis of a flight in question. Debriefings are arranged in a pilot training classroom with reconstruction of flights on a big multimedia screen.

The process of pilot counseling is usually conducted as follows. After return from their flight assignment, pilots are empowered to browse through all their flights and define the scope of any errors and deviations in order to help them maximize their capacity to make their own judgment and to develop alternatives for the problems identified. Prior to departure for the next flight assignment, as part of the pilot counseling process. Crews visit the flight data analyst to study and learn from causes of deviations and/or violations (if any) gathered from statistics for all pilots within the Flight Department. Each aircraft captain has his own personal code and only these codes are used in logical and statistical analysis of flight data. Besides the captain, his code is only known to the flight data analyst. The flight quality analysis software enables the pilot to see his flight reconstructed and animated, return to and replay, if necessary, any element of piloting technique, and accurately identify why he made the error, i.e. the pilot himself is capable to analyze the flight and make his own judgment. The use of such approach has resulted in significantly less deviations occurring during flight operations. Quality indicators describing pilot techniques have improved considerably. The statistics also confirms the progress that has been achieved.

Sociological studies

The next area of human factor management focuses on social and psychological research of operational environment and personal potential of each staff member. Working in away-from-base conditions and having to endure long secondments, crews "accumulate" certain emotional background and problematics. These problem issues need to be thoroughly addressed to arrive at appropriate and feasible solutions to completely get rid of or mitigate them. This area of activity includes development of research approaches and techniques, conduct of research, and eventually implementation of resulting recommendations and solutions.

Corporate culture

Professional training of aviation specialists and development of permanent psychological readiness to act in various, including stress, operating conditions are prerequisite for successful and safe professional work. However, it is obvious that a pilot is not as just a disciplined procedure follower but also a proactive thinker capable to evaluate a situation quickly, anticipate the effects of his own actions and always remain in control of changing circumstances. It is essential to bear in mind that deviation from a standard situation should be viewed not as extreme but rather as being not uncommon in flying practice, and, therefore, a pilot should be able to handle with them in a routine manner. This entails working out and introducing a

corporate “blame-free culture” policy.

Such culture features the following actions:

- promote a policy of no punishment for a pilot error;
- implement corrections aimed at elimination of conditions contributing to occurrence of errors;
- human factors for managers;
- collect data demonstrating the nature and types of occurring errors;
- ensure that crews are well-trained and skilled in error prevention methods, as well as response strategies to counter error implications, crew trainings
- provide training in assessment of risks and errors, and how to recognize them quickly;
- train instructors and inspectors to deal with errors and threats

In any field of knowledge, only the systematic approach could lead to high results. And only the regularity could maintain this mechanism. Today we intend realizing the following:

- create an integrated Human Factor group for the whole Group
- extend our scientific research in this field
- combine theory and practice
- find new ways how to avoid pilot s errors

In dealing with human factor challenges, it must be remembered that they have a systemic nature. In other words, an individual human factor aspect should not be dealt separately from others, and the real success can only be achieved through integrated efforts consistently applied in all human factor areas in a coherent and concerted way.

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