



THE IMPORTANCE AND EFFECTIVENESS OF CREW RESOURCE MANAGEMENT (CRM) IN RUSSIAN AVIATION



From the Editorial Board

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The modern air transport system is characterized by a great dependence on humans and the safe functioning of all its elements is determined by the "human factor", which plays a major role in the management and stability of the entire system. With the passage of time and the development of the aviation industry, the role of the human factor in aviation accidents has significantly increased and changed. This article is devoted to the need for effective management of the resources of the crew (cabin) of an aircraft, in particular, the formation of systematic knowledge about the basic requirements and features, ensuring the safe operation of civil aviation aircraft.

Keywords: aircraft crew resource management, aircraft captain, teamwork, competent team, flight safety, human factor in civil aviation.

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In 1979, NASA psychologist researcher John Lauber introduced the idea that the aircraft crew members must use a team approach during flights operation. This idea implied a less authoritarian culture in pilot's cockpit – co-pilots were suggested to openly comment the actions of pilots-in-command if they saw that they make mistakes. Lauber has defined this interaction with the term CRM – (cabin) Crew Resources Management.

The goal of CRM is to use all the possible resources including human ones for reducing mistakes while in flight and thereby to increase its safety. CRM recognizes the critical role of human factor in determining the effectiveness of technically experienced crew both in normal and in contingency situations and offers a practical approach which can help in changing the attitude/behavior for forming of not only individual competent crew members, but of the competent team as a whole [1].

Methodology of crew training is aimed at:

- improving understanding of the situation. Planning, priority setting and lowering stress;
- increasing communication skills. Aviation activities include constant coordination between the crew and air-traffic control service, for which reason the crew members must have excellent communication skills;
- improving of team interaction. Teamwork skills is the main skill in aviation;
- task distribution. It includes division of duty between the crew members for effective goals achievement;
- decision making. Crew members must be able to act confidently in any situations, keeping safety as a priority.

Every one of these directions of training helps to increase team effectiveness and flight safety. So, for example, rules and regulations of “Aeroflot” air company require that in order to maintain certification, every crew member must receive 30 academic hours of training in CRM for three years (for instructor personnel, the training includes 72 hours). In the air company a practice of combined training of cabin crew together with the flight crew is utilized over several years already. In a group of 10 people, 2 flight attendants, 4 pilots-in-command and 4 co-pilots are present. Analysis of the flight crew behavior has revealed that the effectiveness of training sessions has increased by 50–70% on average. Theoretical part of training is done in a form of lecture with the use of presentations. Practical part consists of flight imitation. For example, flight crew is provided with initial circumstances: severe weather conditions (turbulence), chief flight attendant must inform the pilots about breakdown in health of one of the passengers – the situation is unfolding during a critical (manual) flight stage (landing). The role of the air traffic controller during the imitation is vested with the CRM instructor. The crew must make a decision regarding landing in unsuitable weather conditions. During acting out of this episode, psychological nuances of the aircraft cabin and flight crews, using of the procedures, documentation, organization of the crew work by the pilot-in-command are considered, and the CRM schemes and models are trained [2]. For example, NTR (Nature, Time, Risks), FORDEC and “Swiss cheese model”.

So, for example, the “Swiss cheese” model developed by Professor James Reason in 1990 clearly demonstrates that aviation accident assumes successive breach of the multi-level protection system and is premised on the idea that such complex systems as aviation have exceptionally good protection, whereby internal singular malfunctions rarely have serious consequences. Breach in the safety protection system more often has the form of delayed consequence of the decisions taken by an individual which do not manifest themselves up until the moment when their impact or destructive potential is initiated by a specific combination of operation circumstances [3].

Human factor as the reason of aviation accident implies inability of an individual to timely react to the existing emergency situation in order to avoid or minimize the consequences of this event. One of the most important characteristics of an individual is the reaction rate. In civil aviation, the ability to react to the stimulating substances (signals, air traffic control officer's commands, situations in the aircraft cabin) is cultivated at the early stages of training in flight schools [4]. However, practical exercise of the reactions to the events, beyond doubt, plays the main role in developing reaction rate in the real flight circumstances. Tasks which are practiced on flight simulators and harness formation of the right reaction for avoidance of emergency situation development are included in the training programs. Nonetheless, it was noted during conducting training with the future pilots, that in the case of a series of similar training sessions it is easy to foresee the situation which will be set up by the instructor and is developed in the training process. In this case, the effect of "unexpectedness" disappears, whereas equipment failures or the other complications which may emerge in flight appear suddenly under real-life conditions. Foreseeing of the possible situation development scenario may significantly reduce the pilot's ability to react and solve the unforeseen problems and lessen the need in analysis and taking the right decisions regarding the unexpected concrete situation. As a consequence, the main skill of the pilot

– "to fly a few seconds ahead of the aircraft" – will remain without development, which effects the further safety of the flight. Thanks to the possibility of modelling of conditions of uncertainty in virtual space, the skills of fast reaction may be honed on the ground, preparing the pilot to the actions in practically any situation, moreover it does not matter whether the situation is occasioned by a human or by the environment.

Of all the crew members, pilot-in-command (PIC) has the final authority with regard to the safety of the aircraft and its contents. PIC must control and direct the other crew members in due fulfillment of their responsibilities by them. Greater accountability is an extremely hard task for any person, and PIC is first of all a human, and he has his capacities and limitations, just like anyone else. Human brain studies have revealed a large number of limitations, that of the memory in particular). Some of the most important problems with the memory which most of people, including pilots, suffer from are given below:

- blocking – dislocation of memory;
- transiency – forgetting the information in the course of time;
- false attribution – forgetting the source of the information;
- suggestibility – development of false memories because of the new information;
- bias – unconscious change of memory because of the personal beliefs or disposition.

Human attention resources are also limited, it is known that the things which we do not pay attention to are not perceived by us. Also, if we give attention to on task, then we might not have the attention resources to the other, maybe more important moments. As is said above, the PIC makes the final decision during the flight, but knowing about these limitations it is he who must make efforts in order to use all the possible resources for making the correct decision. Awareness of the situation from the viewpoint of position, spatial orientation, environment, aircraft-based systems, time and fuel requires all the input data. During investigation of many survivable crashes, it was established that it resulted from the situationally unaware PIC, although the other crew members were situationally aware. Therefore, the whole aircraft crew must be “integral whole”.

Without question, there are some exception cases when there is no time and PIC must take a decision on his sole discretion based exclusively on his training and experience. However, more often than not there is time for thinking and consultation regarding the situation, that's why the crew opinion regarding the problem should be sought, pros and cons should be evaluated before making the decision.

It should be noted that different opinions may lead to a conflict situation. The only way to resolve this problem is to weigh every one of these opinions from the viewpoint of "what" is right and not "who" is right under these circumstances. Based on the aforesaid a question emerges, how to insure the input data from all the possible sources? This can happen only provided that all the aircraft crew feel themselves authorized. That is why a substantial extending of rights and capabilities of the crew is needed in order to form a competent team. As a rule, all of the crew members are fundamentally trained, have licenses and possess proficient knowledge in order to perform their tasks well. However, it should be kept in mind that individual experienced professionals are not always able to competently work in a team. This aspect in particular requires more attention from every crew member's part before, during and after the flight.

It has to be said separately that the crew members must be able to consistently manage their workload. It is required that the workload is distributed evenly (without overtime and not underperforming) – an uneven workload influences the brain's ability to process data. High workload leads to stress, fatigue, whereas underperformance – to apathy, drowsiness and loss of attention span.

Incidents are encountered more often during flight on autopilot during long-range travel, when the workload on the crew is minimal (at this time the attention necessary for monitoring any changes in the systems is declining) [5].

On a gross scale, CRM is the understanding and appreciation of the fact that aviation is an extremely complex interrelated structure, and crew members are humans, that is why their physical and psychological characteristics constantly change, and the system of information processing has serious limitations (especially in critical situations). It is impossible to safely perform flight from point A to point B single-handedly, that is why crew members must provide each other with all the possible assistance, which makes it possible to create and maintain professionally healthy team and ensure maximal flight safety.

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