

**ISCKMC 2020****International Scientific Congress «KNOWLEDGE, MAN AND CIVILIZATION»****INDIVIDUAL PSYCHOLOGICAL CHARACTERISTICS OF  
PILOTS AS AN EFFICIENCY FACTOR IN PROFESSIONAL  
SELECTION**

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**Abstract**

The article presents the description and results of a study aimed at comparing the indicators of psychophysiological (cognitive) and psychological (personal) characteristics of pilots. These studies can be used to improve the organization of psychological selection of civil aviation pilots, both to assess the psychophysiological and cognitive characteristics of candidates, and to identify the individual and generalized characteristics of their personality. In order to obtain more valid results concerning the comparability features for pilots' cognitive and personal quality values, it is necessary to 1) expand the selection of subjects; 2) expand the list of diagnostic instruments used by including in it the techniques for assessing pilots' professional aptitude. At the same time, the results obtained confirm the informative value of methods employed in identifying individual psychological qualities of pilots during professional selections. They allowed us to get the data facilitating the understanding of interconnections between the values of psychophysiological (cognitive) and psychological (personal) qualities of pilots.

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*Keywords:* Air transport, civil aviation pilots, professional and psychological selection, reliability of aviation personnel



## **1. Introduction**

Air transport today is the most promising and important means of transportation in the world. That being said, jobs in aviation are undoubtedly among those with major hazards connected to the nature of the work of those employed in this field. Despite the high priority of ensuring flight security, the increasing demand in air trips, numbers of airlines, and the volume of traffic, as well as the appearance on new airline companies lead to the increase in the number of incidents, emergencies, and disasters in civil aviation that go hand in hand with casualties and significant material damages.

The quality and level of psychological assessment of professionals employed in hazardous jobs is one of the top pressing problems in psychological diagnostics and selection.

In the context of civil aviation, the psychological assessment of personnel, who are responsible for the lives of dozens of people during each flight, gains a special significance.

## **2. Problem Statement**

Concerning the current state of the development of air transport, the requirements for personal and professional qualities of all kinds of aviation personnel, including pilots, increase irrespective of the brand-new computerized and automated flight control systems. When analyzing the “aviation incidents”, all experts underline that the overwhelming majority of those happen due to the so-called “human factor” manifested in some of its numerous variants (at one extreme, it is the psychological and physical condition of the aviation personnel, at the other, its the character of people’s interactions between themselves, as well as with machinery, procedures, and surroundings (Lysakov & Lysakova, 2012; Zinkovskaya, 2007). These characteristics can be represented in the notion of professional reliability of aviation personnel. The reduction of this factor leads to mistakes under extreme conditions, such as at night, during long-haul flights, bad weather, the change from one time or climate zone to another, fatigue and exhaustion, body aging, acute (chronic) health problems, etc. (Bodrov, 2001; Bodrov & Lukyanova, 1981).

To improve the accuracy of professional reliability assessment and forecasting in emergencies, it is necessary to take into account individual psychological qualities that support them. At the same time, this kind of assessment cannot be limited by the identification of these qualities.

## **3. Research Questions**

Some Russian researchers of the first half of the XX century developed the problem of pilots’ professional qualities. Within the framework of contemporary aviation psychology, the problems of self-assessment and self-regulation in pilots’ activities were studied by Bodrov (2001), the problems of professional burnout were investigated by Sechko (2009).

## **4. Purpose of the Study**

The problems of professional selection in aviation were covered by Bodrov (2001). Other significant works in this area include those of Butuzova (2016) who studied the problems of diagnosing

and molding the professionally important qualities in civil aviation students, and the work by Slavinskaya (2018) who investigated the problems of organizing a comprehensive approach to the psychological assessment of civil aviation personnel for the fitness for duty (Butuzova, 2016; Slavinskaya, 2018).

## 5. Research Methods

The theoretical analysis of the publications on the problem showed that professional psychological selection in major risk jobs is one of the types of professional selection that consists of a set of actions aimed at the proper appointment of potential employees based on the compliance of their professionally important social, psychological, and psychophysiological qualities with the requirements for the desired position. The psychological analysis of pilots' activities and personalities based on the works of Russian authors in the fields of psychophysiology, personality, labor, aviation, and emergency psychologies must have a key role in improving the professional selection for civil aviation employees. The psychological assessment of aviation personnel must be based not only on diagnostics (identification) of their professionally important qualities but it must also take into account a number of linked parameters that complement and confirm the psychological assessment of pilots' fitness for duty directly or indirectly (Kokurin et al., 2020).

## 6. Findings

*The goal* of the empirical study performed was to compare the indicators of psychophysiological (cognitive) and psychological (personal) characteristics of pilots.

*The object* of the study was the process of professional selection for aviation personnel, and its *subject matter* was the individual psychological characteristics of pilots in their professional selection.

*The hypothesis* of this research is that the indicators of psychophysiological (cognitive) and psychological (personal) characteristics of pilots can be interconnected in various ways:

- pilots with a higher level of cognitive development are more critical and less pessimistic, rigid, and anxious than pilots with lower cognitive development levels.

The study was based at the central aircrew medical review board for civil aviation in February and March of 2020.

The research participants included 15 pilots aged between 30.0 and 45.0. Their average age was 37.4, and all of them were men.

The study employed the following diagnostic *methods*:

1. MMPI (Minnesota Multiphasic Personality Inventory) (RF Department of Justice, 1998; Sobchik, 2008, 2009).

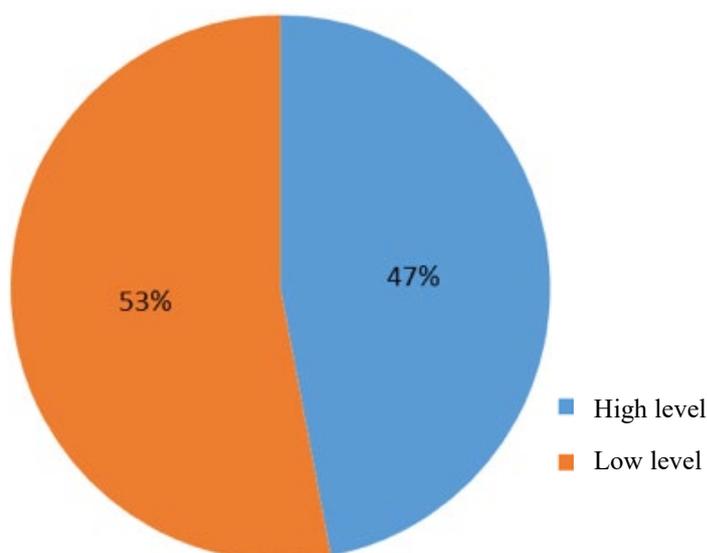
2. The diagnostics of higher psychological functions and cognitive abilities was carried out using a standard test battery for diagnostics, and it comprised the following five techniques:

- Landolt rings is a method used for the assessment of voluntary attention parameters, such as volume, distribution, stability, shiftability, and the stability of spatial inference;
- Scales is a method for the assessment of operative memory development;

- Compasses is an assessment method for the features of reproductive thinking and the ability to operate spatial inference;
- Moving object response is an assessment method for dynamic visual estimation accuracy and the balance of the main nervous processes;
- The labyrinth is an assessment method for extrapolation abilities, quick sensorimotor reaction, and emotional resilience (RF Department of Justice, 1998).

Pursuant to the research hypothesis, the divided the pilots into two groups according to the level of development of their professionally important functions and cognitive abilities based on the aggregate indicator of the standard test battery for diagnosing cognitive functions for civil aviation pilots. The first group included respondents with highly developed professionally important functions and cognitive abilities, 7 persons in total (hereinafter Highly Cognitive), and the second one - those with the medium level of development of professionally important functions and cognitive abilities, 8 persons in total (hereinafter Moderately Cognitive).

The results of group diagnostics are presented in Figure 1.



**Figure 1.** Research subject distribution according to the development of their professionally important functions and cognitive abilities

Thus, we can claim that the pilots we examined can be divided into two almost equal groups. A little less than half of the subjects have highly developed professionally important functions and cognitive abilities. They are characterized by high indices of voluntary attention, operative memory, reproductive thinking, dynamic visual estimation accuracy, extrapolation ability, quick sensorimotor reactions, and emotional resilience. A little over half of the pilots showed medium-level values of professionally important functions and cognitive abilities.

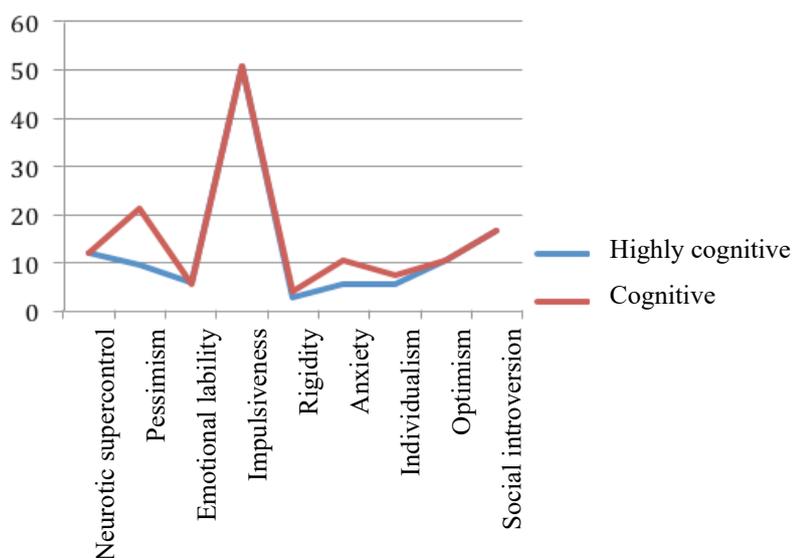
Thus, the examined pilots have high and medium levels of development of professionally important functions and cognitive abilities which is favorable for their professional activities.

The diagnosing of pilots' personal qualities was carried out using the MMPI method. The results of group diagnostics are presented in Table 1 and Figure 2.

**Table 1.** The percentage ratio of peaks in the profiles of pilots with high and medium development levels of professionally important functions and cognitive abilities based on the results of the MMPI L.N. Sobchik

MMPI parameter	Highly cognitive	Moderately cognitive	Difference validity assessment
1 (neurotic supercontrol)	12.1	12.1	-
2 (pessimism)	9.8	21.2	$p \leq 0.05$
3 (emotional lability)	6.0	5.7	at the level of statistical trends
4 (impulsiveness)	50.8	50.8	-
6 (rigidity)	2.4	4.1	$p \leq 0.05$
7 (anxiety)	5.8	10.6	$p \leq 0.05$
8 (individualism)	5.8	7.38	at the level of statistical trends
9 (optimism)	10.6	10.6	-
0 (social introversion)	16.8	16.8	-

When comparing test indicators using the Minnesota Multiphasic Personality Inventory method, the subjects from the Moderately Cognitive group had a percent increase of peaks in scales 2, 7, 6, and F as compared to the Highly Cognitive group (Figure 2). The increase in the 2nd scale implies pessimistic changes in personality and increased sensitivity. The increase in the 7th scale implies the increase in anxiety levels, the blocking of spontaneous presentations necessary for pilots to immediately tackle situations and make prompt decisions in emergencies. The increase in the 6th scale implies the reduction of nervous system lability, which reduced the speed of reaction in situations requiring a quick response, subjectivity in the perception of reality due to the low sensitivity to the effects of the surroundings. The increase in F values with Moderately Cognitive pilots implies the decrease in criticality, which can have an adverse effect on decision making in emergencies.



**Figure 2.** Results for MMPI (per group)

The testing of statistical hypotheses was carried out using Fisher's angular transformation between the values in MMPI scales of pilots with the high and moderate development level of professionally

important functions and cognitive abilities. It showed that there are verified differences between the groups in the scales of pessimism, rigidity, and anxiety to the tune of 5% of the values, and in the individualism scale, differences were found at the level of statistical trends. Other scales did not show any verified differences.

The results obtained partially confirm our assumption that the indicators of psychophysiological (cognitive) and psychological (personal) characteristics of pilots can be interconnected in various ways:

These studies can be used to improve the organization of psychological selection of civil aviation pilots, both to assess the psychophysiological and cognitive characteristics of candidates, and to identify the individual and generalized characteristics of their personality: neuropsychic resilience (NPR) / neuropsychic lability (NPL).

## 7. Conclusion

A little less than half of the pilots we examined had highly developed professionally important functions and cognitive abilities, and a little more than half had medium level indices for the professionally important functions and cognitive abilities under analysis. In other words, the examined pilots have high and medium levels of development of professionally important functions and cognitive abilities which is favorable for their professional activities.

The diagnostics of pilots' personal qualities in both groups showed verified differences in pessimism, rigidity, and anxiety. No verified differences were found for other indicators.

The testing of statistical hypotheses against the parameters of empirical research confirms that the indicators of psychophysiological (cognitive) and psychological (personal) qualities of pilots can be interconnected in various ways. Pilots with a higher level of cognitive development had higher values of criticality and lower values for pessimism, rigidity, and anxiety than pilots with lower cognitive development levels.

In order to obtain more valid results concerning the comparability features for pilots' cognitive and personal quality values, it is necessary to 1) expand the selection of subjects; 2) expand the list of diagnostic instruments used by including in it the techniques for assessing pilots' professional aptitude.

At the same time, the results obtained confirm the informative value of methods employed in identifying individual psychological qualities of pilots during professional selections. They allowed us to get the data facilitating the understanding of interconnections between the values of psychophysiological (cognitive) and psychological (personal) qualities of pilots.

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