Reliability of forecast of successful flight training based on professional psychological selection

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Abstract. *Today's military aviation imposes ever increasing requirements on the pilots' professional qualities, thus complicating the problems related to the improvement of the quality of professional selection and training of military pilots. The research conducted by V.A. Ponomarenko and V.A. Bodrov introduced the term "prolonged selection" into aviation psychology, meaning professional psychological support of flight training. The forecasting of successful training at the early stage is an important part of this support and is the focus of this paper.* **Methods.** *The aim of the study was to verify the forecast of successful flight training based on the professional psychological selection (PPS) at early stages of professional training and feasibility of such forecast in the form of integral estimation. For that purpose the authors used the academic progress estimates, the results of piloting skills development using flight simulators, the dynamics of professionally important qualities (PIQ) of cadets during the first two years of training in comparison with those indicators obtained during the PPS. The sample included 143 cadets. The test subjects were surveyed at their admission to the flight school and in the first two years of the course according to programs prescribed by the regulatory documents of the Russian Ministry of Defense and command of the Aerospace Forces. The survey is an obligatory condition for enrollment in a flight school and the subsequent flight training and does not contradict today's ethical standards of scientific research. The surveyed cadets were distributed into two groups per categories of professional aptitude based on the results of PIQ survey conducted during the professional psychological selection: the 1-st group (55 people), the "fit" with good professional aptitude indicators, and the 2-nd group (88 people), the "conditionally fit" with acceptable professional aptitude indicators. Statistical analysis was carried out with Microsoft Office 2007 Excel descriptive statistics, Student's t-test criterion for unpaired samples.* **Results.** *The survey showed that the "fit" group, as compared to the "conditionally fit" are better adapted to the conditions of military service, have higher indicators of cognitive mental processes and sensorimotor abilities. They master course content and simulator training better. At the same time, in terms of their physiological and physical qualities the cadets of the two surveyed groups are indistinguishable and all show good results, which is confirmed by their grades in physical education and shows their good physical development and fitness.* **Conclusions.** *The forecast of successful flight training made at the stage of professional psychological selection as a category of professional aptitude is confirmed at the initial stages of the cadets' training during professional psychological support activities. The integral estimation composed of the results of academic progress, psychological, psychophysiological inspection survey data, results of simulator training can be used in subsequent flight training as the input for individual professional training programs. In order to improve the reliability of training, integrated automated methods are planned to be developed for the purpose of diagnosing current flying PIQs, as well as methods of their improvement and development [4].*

Keywords: *professional psychological selection, professionally important qualities, professional training, professional aptitude, forecast of successful flight training, professional psychological support of flight personnel training.*

Introduction. Today's military aviation is characterized by the rapid development of aviation technology and the nature of flight operations becoming more complicated. In these conditions, the requirements for the pilots' professional qualities are increasing and the system concept of reliability and safety of flights is becoming more and more complex [1, 7]. In this context, the problems related to the improvement of the quality of professional selection and training of military pilots arise. At the initial stages of training in the flight school the professional psychological selection (PPS) specialists continue to dynamically observe the indicators of the professional aptitude level (category) and update the initial forecast of successful flight training. The study of the changes in the socio-psychological, psychophysiological and other characteristics (and traits) of the future pilot during the training in the flight school was carried out at the end of the last century by the well-known scientists V.A. Ponomarenko and V.A. Bodrov. They complemented PPS with the term "prolonged selection" as the implementation of the principles of dynamic, differentiated forecasting of the professional aptitude during the flight training process [2, 9, 10]. In today's conditions the "prolonged selection" is called professional psychological support of flight training. It includes the assessment of the dynamics of professionally important qualities (PIQ) of cadets, updating the structure and compensation of PIQ during their professional development, aggregation of individual recommendations, preparation of psychological profiles, optimal assigning of cadets to flight professions [3, 6, 8]. The professional psychological support of flight training in the flight school is carried out by specialists of the research department (professional psychological selection and professional psychological support of flight training). It effectively improves the quality of professional flight training and is constantly developing.

Thus, in order to optimize recommendations for the cadets' flight training, the development of an integrated assessment of forecast of successful flight training at the initial stages of training studies are being conducted. The study sets the following tasks:

- Whether the flight training is confirmed to be successful at the initial stages of the training of cadets as predicted during PPS?

- Whether the forecast of the successful flight training can be presented as an integral assessment including academic and simulator-based learning results as well as psychological and psychophysiological examination findings?

In order to achieve the objectives of the study, the academic progress estimates, the results of piloting skills development using flight simulators, the dynamics of professionally important qualities of cadets during the first two years of training (the sample included 143 cadets) were compared with those indicators obtained during the PPS.

Methods. The following psychological and psychophysiological examination methods were used: to assess personal PIQ, the multifactorial personality questionnaire "Adaptability", "Risk Propensity", "Motivation to Success", "Motivation to Avoid Failure", "Level of Subjective Control", "Level of Aspiration" were used; to assess intellectual PIQ, "Working Memory", "Correction Task", "Red and Black Tables", "Regularity Test", "Audio-Verbal Memory", "Visual Memory", "Spatial Thinking", "Visual Thinking" were used. Sensorimotor characteristics were evaluated using simple sensorimotor reaction, complex sensorimotor reaction (lability of nervous processes) and reaction to a moving object tests. The physiological characteristics were assessed using Stange-Gench and Ruffier functional tests [5].

Statistical analysis was carried out with Microsoft Office 2007 Excel descriptive statistics, Student's t-test criterion for unpaired samples.

The surveyed cadets (n=143) were distributed into two groups per categories of professional aptitude based on the results of PIQ survey conducted during the professional psychological selection:

The 1-st group was named "fit" and had good professional aptitude indicators. It consisted of 55 people.

The 2-nd group was named "conditionally fit" and had acceptable professional aptitude indicators. It consisted of 88 people.

The survey showed that professional aptitude assessment during PPS directly correlated with the academic performance of the flight school cadets. Thus, there is a significant difference (p<0.05) between the "fit" and the "conditionally fit" groups in most academic courses taken during the first two years of the studies: the "fit" group was more successful in such principal subjects as mathematics, physics, computer science, mechanics, aerodynamics, aviation meteorology. The "fit" group was more successful at general subjects like national history, foreign language, health and safety, electronics and electrical engineering as well. There was no significant difference between the two surveyed groups in general tactics and philosophy.

The assessment of the psychological characteristics and traits showed there is a significant difference (p<0.05) in adaptability between the "fit" and the "conditionally fit" cadets. The cadets from the "fit" group adapt faster and more easily to military service conditions, they have higher indicators of communicative qualities and are more stable emotionally. There was no significant difference in such personality traits as pursuit of success and achievements and tendency to avoid failure between the two groups: both "fit" and "conditionally fit" cadets are equally motivated to succeed and to avoid failure, have an equally moderate level of aspiration. Meanwhile, the cadets from the "fit" group have a significantly higher level of risk propensity, higher level of subjective control of their behavior and higher level of socializing (p<0.05).

The intellectual PIQ diagnostics showed that the "fit" cadets have significantly higher indicators of cognitive processes: attention, memory, thinking, perception, that is, verbal logical thinking, visual and short-term memory, imagery ability.

Some sensorimotor characteristics were evaluated: reaction time, accuracy, reaction to a moving object. The "fit" group has significantly (p<0.05) higher sensorimotor reac-

tion indicators: reaction time to simple and complex signals, stability of the reaction to a moving object, coordination of movements.

In terms of their physiological qualities the cadets of the two surveyed groups are indistinguishable. At the same time, the average values of the cardiorespiratory system's reserve capacity indicators (Bogomazov's index) and the exercise tolerance of the cardiovascular system (Ruffier Index) of both groups are at a high level. Such results were obtained in both the first and the second years of training.

The high level of physiological characteristics is confirmed by the high level of physical fitness of cadets in both groups: the mean grade in physical fitness of all cadets is 4.5[1] or higher. They also have good physical qualities, i.e. strength, speed, stamina, dexterity, since the integral assessment of physical fitness is a combination of different exercises: running, pull-ups, gymnastic exercises, etc.

The results of simulator-based training turned out to be the most evident confirmation of the predicted successful flight training. The "fit" cadets had a significantly greater scope of attention than the "conditionally fit" cadets (6.09±0.51 and 5.52±0.45 respectively), they perform better at ground training (5.95±0.46 with 5.24±0.39 for "conditionally fit"), operate aircraft equipment more competently (6.14±0.46 with 5.41±0.37 for "conditionally fit") and act more confidently in special situations (5.95±0.47 with 5.13±0.48 for "conditionally fit"), their flight skill is developed faster and is more stable (6.09±0.45 with 5.55±0.41 for "conditionally fit"). The "fit" cadets have a higher overall grade at simulator-based training than the "conditionally fit" cadets (6.18±0.45 and 5.5±0.41 respectively).

Results. The survey showed that the "fit" group, as compared to the "conditionally fit", are better adapted to the conditions of military service, have higher indicators of cognitive mental processes and sensorimotor abilities. They better master course content and simulator training. At the same time, in terms of their physiological and physical qualities the cadets of the two surveyed groups are indistinguishable and show good results, which is confirmed by their grades in physical education and shows their good physical development and fitness.

Conclusions. The obtained results suggest the following conclusions:

- the forecast of successful flight training made at the stage of professional psychological selection as a category of professional aptitude is confirmed at the initial stages of the cadets' training during professional psychological support activities;

- the forecast of successful flight training made at the initial stages of the cadets' training is confirmed by the results of their academic progress, psychological, psychophysiological inspection survey data, results of simulator training that can be used as components of the integral estimation. This integral estimation can be used in subsequent flight training as the input for individual professional training programs.

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[1] By five-point numerical grading scale

Specific quantitative criteria for the integral estimation with the inclusion of the results of their academic progress, psychological, psychophysiological inspection survey data, results of simulator training, that still ae not defined in aviation psychology, will be defined in subsequent studies with the use of statistical analysis methods and implemented in the professional psychological support for flight crew training. The reliability of forecast of successful flight training at the initial stages of the training was confirmed, however the applicability of the used PPS professional success forecasting methods to the training with the next generation aircrafts is in question.

To address these issues, PC-based integrated automated methods are planned to be developed for the purpose of diagnosing current flying PIQs, as well as methods of their improvement and development [4].

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