

MULTIPLE PSYCHO-PHYSIOLOGICAL STUDIES OF APTITUDE
OF MILITARY CADETS USING A POLYGRAPH

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Created for the specifics of military aviation complex multiple psycho-physiological studies of individual biological characteristics of the military cadets of aptitude using a polygraph system military pilot–aircraft–environment were developed. Comprehensive psychological survey of using polygraph allows to evaluate the accuracy of the information on the adequacy of the non-specific physiological responses to verbal answers in the study and solution of problems of the human element in military aviation and prevention of dangerous flight psycho-physiological factors. Psychocorrection of functional disorders of the nervous system revealed using polygraph promotes post stress rehabilitation and maintenance of positive flight motivation of military cadets in the system of psychological security of the flight.

Keywords: psycho-physiological testing, computer polygraph, military cadets, aptitude, base of the personnel data.

The psychical irregularities, provoked by specific physiological and psychological stress, connected with flight on aircraft are one of the main etiologies of air accidents, based on the human factor (HF). The violation of the psychological adaptation in military pilots in professional stressogenic situation develops as successive 4 stages of psychological crisis: difficulty, slowness, incompleteness and stall adaptation of personality to rapidly changing of extremal situation, in the form of desadaptive behavior deviation are manifested. The flying team of military aircraft in educational, training and especially combat flight the influence of psycho-physiological dangerous factors (PPhDF) of flight are subjected, as the manifestation of limited opportunities or violation of the operation of individual psycho-physiological systems of organism, influencing on psychological ensure flight safety (PEFS) in general. When the action of PEFS reaches definite values, the military pilots react either by incorrect actions or a decrease in the efficiency that leads to aviation incidents. The prophylaxis of PEFS increases the professional reliability and reduces the possibility of negative manifestations of HF.

The positive flying motivation and normal psychological protective mechanisms, the negative impacts of emotional stress in flight are counterbalanced [1]. The assessment of flight motivation is qualification, the relation of pilot to possible dangers are balanced, his ability to cope with dangers, his psycho-physiological

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reaction of extremely exo- and endogenous stimuli is determined by the HF [2]. HF includes the physiological, psycho-physiological, psychological, psychophysical, social characteristics of organism define abilities, reserves, stable properties of personality in the process of military-flight activity [3]. How to believe the military expert of NATO in military conflicts, the victory in military conflicts of XXI century will be achieved not only due to the military-technical superiority, but thanks to the skilful use of psychological action and HF [4]. Professional selection with study of individually-psychological features (IPF) of cadets on aptitude in armed forces (AF) of RA, systematical multilateral psycho-physiological testing, training and psychological post stressful rehabilitation using multifunctional professional computer polygraph (CP) are necessary assurance that cadet will have all the necessary psycho-physiological and moral-psychological qualities of military pilot, ready to professional aircraft stress and combat dangerous situations. In November–December 2014 and in February–March 2015 years on the proposal of the Management of the Ministry of Defense (MD) RA in laboratory of psychophysiology of acad. L.A. Orbeli Institute of Physiology NAS RA on the program of Psychological Security and Rehabilitation (PPSR) AF RA has been conducted multilateral psycho-physiological study of individual biological features of cadets in two courses of Military Aviation Institute (MAI) MD RA on the aptitude AF RA using CP.

The study was carried out according to international standards adapted to military aviation specifics proved by psycho-physiological, psychological and polygraphic methods. The non experimental, experimental and expert methods of study were used. The psycho-physiological status (PPhS) of individual on correlation by revealed types of identity, character and temperament, psycho-informational and physiological components were defined. By systems of integral methodic of complex integrated psychological survey (IPS) using CP was estimated the accuracy of verbal responses of studied cadets on the nonspecific physiological, psycho-vegetative, mimic and psychomotor reactions of organism [5–7]. In PPSR AF RA includes the triad of directions with semantically complementary components of integrated psycho-physiological and psychological study of military cadets and prevention of PPhDF flights using CP for:

- 1) revealing of individual biological specifics of cadets on aptitude;
- 2) the study and solving of the problem HF in system PEFS;
- 3) psychocorrection of probable professional functional violations of nervous system and reactivation of immunity to extremely exo- and endogenous stimuli.

The purpose of the study is definition of individual continuous hereditary and acquired psycho-physiological, psychological, psychophysical and psychosocial features of MAI AF RA cadets using CP on professional suitability of 4 degrees according to Klimov [8]. Psycho-physiological and psychological testing of biological components of organism with definition of PPhS of individual and psychotrening of positive military-flight motivation using CP. Preventive revealing and psychocorrection of functional post stressful violations of nervous system (stresses, acute and chronic alarming state of the sky, the nervous of the different etiology) cadets adapted to military-flight specifics and optimized under ethnomentality by psycho-physiological, psychological and polygraph methods. The integrated psycho-physiological, psychological, polygraph studies and solution tasks of HF in AS RA

on example of MAI MD RA in system of PPSR. The establishment of the confidential based on personal data (BPD) of MAI AF RA cadets in the performance of functional training responsibilities (FTR).

The tasks of study is maintenance of positive military-training flight motivation of cadets (military pilot-engineers) and post stressful psychoemotional readaptation to action of specific stressful factors using CP. The formation of mobilization readiness to complex types of flights by technical, meteorological, educational are training character and increase of stress resistance under performing combat missions of military pilots. The goal of study of intra- and interpersonal relations of cadets is completing psychologically compatible military-flight crews in system of PEFS, and also the warning of negative manifestation of HF in extremely situation and adaptation of immunity to extremely exo- and endogenous stimuli. The ensuring reliability of military-flight activities and flight safety in general; taking into account, that absolute competence does not happen, because all the people are unique and the same professional qualities are individualized by biological peculiarities of personality. Professional orientation of command MAI AF RA when selecting of cadets on aptitude of multilateral definition of personal and intellectual competencies, required in a stress-inducing military-aviation operations of AF RA.

The Actuality of Study. At present multifunctional possibilities of CP in applied psycho-physiological study and psychological ensuring the security of the staffing strategy strengthening the defense capability of RA have not been fully implemented in AF RA. The scientific-practical program PSR RA conforms to the requirements of MD RA in solving the tasks of HF, realization of HR and post stressful rehabilitation by operational methods of polygraphology.

Materials and Methods. Psycho-physiological study (PPS), psychological testing (PT) and CPO using CP the aptitude according to Klimov [8] came 25 cadets of two courses MAI AD RA at the age of 18–23. 14 of them were at the age 19–23 studying in the 3-th courses and 11 cadets at the age of 18–19 studying in the 1-th courses. As technical equipment in integrated study was used CP LX-3000SW licensed companies Lafayette Instrument (Indiana 47903, USA) with programmed software Polygraph LX Software V.8.1.1 and by calculation algorithm of results POLYSCORE®, which implements a quantitative analysis of physiological information on the bases of modern method of statistical comparisons OSS running operational systems Windows® [9]. According to Applied Physics Laboratory Johns Hopkins University (USA) this algorithm provides the reliability of the interpretation more then 99% and allows the polygraph examiners to achieve practically full consensus in the accuracy assessment psycho-physiological information (PPhI) [10]. Physiological signals from sensors and data collection unit (DCU) CP were digitized and stored on high density magnetic media. The system of digital data processing OSS represents the empiric foundation of results of quantitative analyses and confirms the accuracy of polygraph findings [11]. Also was recorded the modified integral nonspecific vegetative reaction of organism in borders “norm–accentuation–pathology” in response to random verbal (semantic) and involuntary non-verbal (prosodic) stimulation [12]. IPF is revealed by fluctuation of 5 channels of physiological indicators of integral reactivity of organism: volume and frequency of pulses (cardiovascular reaction), electrocutaneous resistance (cutaneous-galvanic reaction CGR), thoracal and diafragmal

breathing in the process of CPO cadets on aptitude. At the same time physiological data, displayed and registered in course of preliminary PPhS CP and was reproduced for quantitative analyses and interpretation of psycho-physiologist-polygraph examiner [13]. The tests of PPhS, PT and components of CPO were adapted to the specificities of the military aviation, individual psychological, psycho-physiological, psychophysical, psychosocial characteristic, ethnomentality, the presence of independent/total hours flown and intellectual-professional level of each cadet, future military pilot-engineer in AF RA.

Results and Discussion. Processing, comparative analyses and summarizing the synthesis of received reliable experimental data on more than 30 components of CPO, PT and PPhI using CP 25 cadets of two courses MAI MD RA showed significant results, differentiated on 4 degrees of professional “unsuitability”, “suitability”, “compliance” or “vocation” according to [8]. Summarizing analyses detected qualitative-quantitative correlations of individual biological and intellectually-professional data of MAI MD RA cadets justifies the conclusion of psycho-physiologist-polygraph examiner about his professional fitness to military-flights service in AF RA.

Individual cadet requested for psychological help about episodic interpersonal relations and situational neurotic psychosomatic violations. Against the background of control BPD these cadets by methods of biological feedback (BFB), with registration of CP physiological reaction of organism, was carried out cognitive-behavioral and “in sensu” psycho-physiological correction of acute anxiety by verbal modeling of different psychoemotional significance of interpersonal and educational-practical situations [14]. This contributed to the gradual conditionally-reflex adequacy of the excitatory-inhibitory balance and timeliness of physiological reactions on the arbitrary verbal exogenous stimuli, and as a result, psychological regulation of nervous system and restoration of positive flight motivation. Individual psychological training of flight mobilization, readiness and prophylaxes of verifiability and overcoming PPhDF of flight has been conducted with a view to PEFS on the whole. All the cadets have passed training preventive methods of respiratory and somatrespiratory autoregulation in prophylaxes of professional stress of different etiology.

The scientific objective results of PPSR AF RA allow teachers, instructors and authorities MAI MD RA on the base of control multi-purpose information of BPD to approach each cadet individually and effectively in professional formation of military pilots-engineers in AF RA.

The results of multilateral psycho-physiological and psychological study of individual features of cadets MAI MD RA on aptitude using CP showed flight mobilization readiness and the need to use the program PEFS AF RA in:

- 1) selection of cadets on the stage of entrance examinations in MAI MD RA;
- 2) maintenance of positive military-flight motivation;
- 3) individual/course scientific-practical preventive training of flight mobilization readiness;
- 4) replacement psychocorrection of professional post stressful states in system of PEFS;
- 5) the study and solution of tasks of HF in military aviation and prophylaxes of PDF of fights;

6) identifying conflict zones and strengthening of interpersonal relation in solution of tasks of conflictology;

7) determining the inherent to cadets strong/weak qualities of the identity, which promote/hinder the execution of FTR;

8) the psychomonitoring of dynamic of educational-practical and sportive lessons.

Preserving secrecy of confidential information BPD MAI MD RA, scientific-experimental data individual psycho-physiological and psychological characteristics, specialized interpretation of reliable results of testing and scientific objective, conclusions of multilateral study of military cadets on aptitude using CP is presented only the Leadership of MD RA, the command of MAI MD RA and in the article are not reflected. Training of professional competence, social-psychological and personal growth using CP minimizes psychogenesis of PPhDF of flights and reduces reliability and interoperability of cadets with military-aviation technique in system "military pilot–aircraft–environment". The specialized control of BPD cadets MAI MD RA is maximizing productivity of workshops in formation of military pilots-engineers. The systematical scientific-practical multilateral psycho-physiological and psychological study of biological features and timely regulation of nervous system of military cadets using CP on program of PSR AF RA with high reliability, provides predictability changes of the functional state of organism, positive influence on HF, maintenance of positive military-flight motivation in the performance of FTR of future military pilots-engineering MD RA.

Conclusion.

1. Computer polygraph is multifunctional integral indicator the measurability of bioenergetics of organism under integrated study of individual biological features of military cadets in the psychological support of MAI MD RA.

2. The multilateralism of the psycho-physiological and psychological study using polygraph is the most reliable detection system correlation of individual biological features of military cadets on the aptitude and prophylaxes of psycho-physiological dangerous factors of flights

3. The registration by polygraph nonspecific physiological reactions of organism to assess the reliability of reported information, the significance of involuntary mimic, vegetative, psychomotor manifestations and accentuation of the nature of military cadets.

4. The multistage psychological testing using polygraph of adequate flights motivation and emotional reactions on the flights allows you quickly identify psychovegetative manifestations and carry out psychocorrection of stressful state of organism by the method of biological feedback.

5. The integrated psychological questioning; using polygraph allows you to correct the conduct of individual and group psychological training and monitoring of military cadets with a view to maintenance of positive flights motivation, of personal growth, definition of the psycho compatibility of flights equipage.

6. The cooperation of continual components of psycho-physiological study, psychological testing and integrated psychological questioning using polygraph allows with high reliability and promptly decide the tasks of research and applied value.

REFERENCES

1. **Levi L.** Physiological and Psychological Reactions. In book: Emotional Stress. Medical and Military Consequences of Stress. L.: Meditsina, 1970, p. 296–299 (in Russian).
2. **Gakhov A.** Psychological Aspects of Aviation in Modern Conditions. // Foreign Military Review, 2004, № 11, c. 34–43 (in Russian).
3. **Ovcharov V.Ye.** “Human Factor” in Aviation Accidents. M.: Poligraph, 2005 (in Russian).
4. **Streletskiy A.V.** Research in the Field of Improving the Professionalism of the US Armed Forces Personnel. // Foreign Military Review, 2006, № 5, p. 15–19 (in Russian)
5. **Panchulazyan K.A.** Psychological and Psycho-Physiological Research of Personnel in the Staff Strategy of Entrepreneurial Activity. // Reports of NAS RA, 2012, v. 112, № 3, p. 320–327 (in Russian).
6. **Panchulazyan K.A.** Psycho-Physiological Study of the Functional State of Organism with the Use of Polygraph in Providing Psychological Safety of Staff Strategy. // Reports of NAS RA, 2012, v. 114, № 3, p. 271–278 (in Russian).
7. **Panchulazyan K.A.** Psycho-physiological Study of the Staff Using the Polygraph. // 21 Century, 2015, v. 37, № 4, p. 95–104 (in Russian).
8. **Klimov Ye.A.** The Type of Professions: A “Human vs Nature”. M.: MSU Press, 2008, p. 7–12 (in Russian).
9. **Matte J.A.** Psychological Structure and Theoretical Concept of the Backster Zone Comparison Technique. // Polygraph, 2007, v. 36, № 2, p. 84–90.
10. **Harwell E.M.** A Comparison of 3- and 7-Position Scoring Scales with Field Examinations. // Polygraph, 2000, v. 29, № 2, p. 195–197.
11. **Pelenitsin A.B., Soshnikov A.P.** On the Scientific Validity of the Use of Polygraphs. // Jour. Expert-Criminalist, 2011, № 2, p. 12–15 (in Russian).
12. **Panchulazyan K.A.** Nonspecific Reactions of the Organism to Equivalent Levels of Acoustic Energy. // Vestnik MANEB, 2005, v. 10, № 5, p. 175–177 (in Russian).
13. **Soshnikov A.P.** Personnel Assessment. Psychological and Psycho-physiological Methods. M.: Eksmo, 2010, p. 27–33 (in Russian).
14. **Savchenko S.V.** Psycho-physiological Correction of Psychosomatic Disorders in Servicemen. St.Pb.: Piter Press, 2006, p. 241 (in Russian).