

MULTIPLE PSYCHOPHYSIOLOGICAL AND PSYCHOLOGICAL STUDIES OF THE APTITUDE OF MILITARY CADETS WITH THE USE OF A POLYGRAPH

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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 stress-causing situation develops as successive 4 stages of psychological crisis – difficulty, slowness, incompleteness and stall adaptation of personality to rapidly changing of extremal situation in form of desadaptive behavior deviation are manifested. The flying team of military aircraft in educational, training and especially combat flights are subjected to influence of psychophysiological dangerous factors (PPhDF), as the manifestation of limited opportunities or violation of the operation of individual psycho-physiological systems of organism, influence on psychological ensuring of the 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 lead to aviation incidents. The prophylaxes of PEFS the professional reliability increases and reduces the possibility of negative manifestations of HF.

The positive flying motivation and normal psychological protective mechanisms counterbalance the negative impacts of emotional stress in flight [3]. The assessment of flight motivation – qualification, the relation of pilot to possible the dangers are balanced, his ability to cope with dangers, his psychophysiological reaction of extremal exo- and endogenic stimuli – is determined by the HF [1]. HF includes the physiological, psychophysiological, psychological, psychophysical, social characteristics of the organism, define abilities, re-

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serves, stable properties of personality in the process of military-flight activity [4]. As noted by the military expert of NATO, the victory in military conflicts of the 20th century will be achieved not only due to the military-technical superiority, but also thanks to the skillful use of psychological action and HF [12]. Professional selection of cadets based on study of individual-psychological features (IPF) and aptitude in armed forces of the Republic of Armenia (the RA AF), systematical multifaceted psychophysiological testing, training and psychological post-stress rehabilitation with use of multifunctional professional computer polygraph (CP) are necessary assurances that cadets will have all the necessary psychophysiological and moral-psychological qualities of a military pilot, ready to professional aircraft stress and combat in dangerous situations. In November – December, 2014 and February-March 2015, on the proposal of the leadership of the Ministry of Defense of the Republic of Armenia (the RA MD), and within the Programme of Psychological Security and Rehabilitation (PPSR) of the RA AF, the laboratory of psychophysiology of acad. L.A. Orbeli Institute of Physiology of the NAS RA conducted a multilateral psychophysiological aptitude study of individual biological features of two cadets of two courses of Military Aviation Institute of the RA MD (the RA MD MAI) with use of CP.

The study was conducted according to international standards adapted to military aviation specifics, proven psychophysiological, psychological and polygraph methods. The nonexperimental, experimental and expert methods of study were used. The correlation of psychophysiological status (PPhS) of the individual to uncovered types of identity, character and temperament, psycho-informational and physiological components are defined. The accuracy of verbal responses of the studied subjects was assessed by systems of integral methodology of complex integrated psychological survey (IPS) with use of CP, on the nonspecific physiological, psychovegetative, mimic and psychomotor reactions of organism [6 – 8]. The RA AF PPSR includes the triad of directions with semantically complementary components of integrated psychophysiological and psychological study of military cadets and prevention of PPhDF in flights with use of CP for: 1) finding out individual biological specifics of cadets on aptitude; 2) study and problem solving of HF in the PEFS

system; 3) psycho-correction of probable professional functional disorders of the nervous system and reactivation of immunity to extremely exo- and endogenous stimuli.

The purpose of the study included:

- Determination of individual continuous hereditary and acquired psychophysiological, psychological, psychophysical and psychosocial features of RA the AF MAI cadets with use of CP on professional suitability of 4 degrees by Klimov [2].
- Psychophysiological and psychological testing of biological components of organism with definition of PPhS of individual and psycho-training of positive military-flight motivation with use of CP.
- Preventive uncovering and psycho-correction of functional post-stress impact on cadets' nervous system (stresses, acute and chronic alarm state in the sky, nervousness of the different etiology) adapted to military-flight specifics and optimized for ethno-mentality by psychophysiological, psychological and polygraph methods.
- The integrated psychophysiological, psychological and polygraph studies and solution of HF problems in the RA AF on example of the RA MD MAI in system of PPSR. The establishment of the confidential personal databases (PD) of the RA AF MAI cadets in the performance of functional training responsibilities (FTR).

The tasks of study included:

- Maintenance of positive military-training flight motivation of cadets (military pilot-engineer) and post-stress psycho-emotional re-adaptation to action of specific stressful factors with use of CP.
- The formation of mobilization readiness to complex types of flights by technical, meteorological, educational – training character and increase of stress resistance under performing combat missions of military pilots.
- The study of intra- and interpersonal relations of cadets in staffing psychologically compatible military-flights crews in the system of PEFS.
- Prevention of negative HF manifestations in extremal situations and adaptation of immunity to extremal exo- and endogenic stimuli.

- Ensuring reliability of military-flight activities and flight safety in general, taking into account that absolute competence does not exist, because all people are unique and the same professional qualities are individualized by biological peculiarities of the personality.
- Professional orientation of the RA AF MAI command in selecting cadets based on aptitude of multifaceted definition of personal and intellectual competencies, required in a stress-inducing military-aviation operations of the RA AF.

The topicality of the study: currently the multifunctional possibilities of CP in applied psychophysiological study and psychological ensuring the security of the staffing strategy in strengthening defense capability of RA have not been fully implemented in the RA AF. The RA PSR scientific-practical program meets the requirements of the RA MD in solution of HF problems, implementation of HR and post-stress rehabilitation by operational methods of polygraph studies.

Material and Methods

Psychophysiological study (PPS), Psychological testing (PT), and CPO with use of CP the aptitude on Klimov [2] was implemented on 25 RA MD MAI cadets of two courses aged 18 – 23 years. Of them, 14 cadets were sophomores aged 19 – 23 years and 11 cadets were freshmen aged 18 – 19 years. As for technical equipment, the integrated study used CP LX-3000SW licensed companies Lafayette Instrument (Indiana 47903, USA) with programmed software Polygraph LX Software V.8.1.1 and POLYSCORE® results calculation algorithm which implements a quantitative analysis of physiological information based on the modern method of statistical comparisons OSS, run on Windows® operational system [14]. According to Applied Physics Laboratory (APL), Johns Hopkins University (USA), this algorithm provides over 99% reliability of the interpretation and allows the polygraph examiners to achieve practically full consensus in the accuracy assessment psychophysiological information (PPhI) [13]. Physiological signals from sensors and data collection unit (DCU) CP are digitized and stored on high density magnetic media. The OSS system of digital data processing repre-

sents the empiric foundation of the quantitative analyses results and confirms the accuracy of polygraph findings [9]. Also, the modified integral nonspecific vegetative reaction of organism in borders “norm – accentuation – pathology” in response of random verbal (semantic) and involuntary non-verbal (prosodic) stimulation was recorded [5]. IPF on fluctuation of 5 channels of physiological indicators of integral reactivity of organism was identified – the volume and frequency of pulses (cardiovascular reaction), electrocutaneous resistance (cutaneous-galvanic reaction CGR), thoracic and diaphragm breathing in process of CPO cadets. Physiological data, simultaneously displayed and registered in course of preliminary PPhS CP, were reproduced for quantitative analyses and interpretation of psycho-physiologist polygraph examiner [11]. The tests of PPhS, PT and components of CPO were adapted to the specificities of the military aviation, individual psychological, psychophysiological, psychophysical, psychosocial characteristic, ethno-mentality, independent/total hours flown and intellectual-professional level of each cadet – future RA AF military pilot- engineer.

Results and discussion

Processing, comparative analyses and summarizing the synthesis of received reliable experimental data on more 30 components of CPO, PT и PPhI with use CP 25 cadets of two courses MAI MD RA showed the significant results, differentiated on 4 degrees of professional “unsuitability”, “suitability”, “compliance” or “vocation” by Klimov. Summarizing the analyses of detected qualitative-quantitative correlations of individual biological and intellectual-professional data on cadets of the RA MD MAI justifies the conclusion of psycho-physiologist polygraph examiner about their professional fitness to military flights service in the RA AF.

An individual cadet requested psychological help for episodic interpersonal relations and situational neurotic psychosomatic disorders. Against the background of control PD of these cadets, cognitive-behavioral and “in sensu” psychophysiological correction of acute anxiety was carried out by verbal modeling of different on the psycho-emotional significance of interpersonal and educational-practical situations by methods of biological feedback (BFB), with registration of the organism’s CP physiological reaction [10]. This con-

tributed 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, the 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 have been conducted, with a view to PEFS on the whole. All the cadets had taken the training on preventive methods of respiratory and somatic-respiratory autoregulation in prophylaxes of professional stress of different etiology.

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

The results of multilateral psychophysiological and psychological study of individual features of the RA MD MAI cadets on aptitude with use of CP showed flight mobilization readiness and the need for action through the RA AF PEFS program in: 1) selection of cadets on stage of entrance examinations in the RA MD MAI; 2) maintenance of positive military-flight motivation; 3) individual/course scientific-practical preventive training of flight mobilization readiness; 4) replacement psycho-correction of professional post-stress states in the 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 problems in conflict studies; 7) determining the inherent to cadets strong/weak qualities of the identity, which promote/hinder the execution of FTR; 8) the psycho-monitoring of dynamic of educational-practical and sportive lessons.

To preserve secrecy of confidential information, the RA MD MAI cadets' PD, scientific-experimental data, individual psychophysiological and psychological characteristics, specialized interpretation of reliable results of testing and scientific objective the conclusions of the multilateral study of military cadets on aptitude with use of CP were presented only the Leadership of MD RA, the command of the RA MD MAI and not reflected in this article. Training of professional competence, social-psychological and personal

growth with use of CP minimizes psychogenesis of PPhDF of flights and reduced reliability and interoperability of cadets with military-aviation equipment in the “military pilot – aircraft – environment” system. The specialized control of the RA MD MAI cadets’ PD allows maximizing productivity of workshops in training of military pilots-engineers. The systematic nature of scientific-practical multilateral psychophysiological and psychological study of biological features and timely regulation of nervous system of military cadets with use of CP on program of the RA AF PSR with high reliability provides predictability for 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 pilot-engineers of the RA MD.

Conclusions

1. Computer polygraph is a multifunctional integral indicator with the measurability of bioenergetics of organism under integrated study of individual biological features of military cadets in the psychological support of the RA MD MAI.
2. The multilateralism of the psychophysiological and psychological study with use polygraph is the most reliable detection system correlation of individual biological features of military cadets on the aptitude and prophylaxes of psychophysiological dangerous factors of flights.
3. The registration by polygraph nonspecific physiological reactions of organism enables assessing 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 with use of polygraph of adequate flights motivation and emotional reactions on the flights allows quickly identifying psychovegetative manifestations and carrying out psycho-correction of stressful state of organism by the method of the biological feedback.
5. The integrated psychological questioning, with use of polygraph allows to correct the conduct of individual and group psychological training and monitoring of military cadets with a view to maintenance of positive flights

motivation, personal growth, definition of the psycho compatibility of the flight crew.

6. The cooperation of continual components of psychophysiological study, psychological testing and integrated psychological questioning with use of Polygraph allows promptly deciding the tasks of research and applied value with high reliability.

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