



Structure and content of special psychological training programme for anti-aircraft missile forces personnel in the context of countering massive combined strikes by the Russian Federation

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◆ **Abstract.** The paper substantiated the structure and content of the programme of special psychological training of anti-aircraft missile forces specialists of the Air Forces of the Armed Forces of Ukraine in the conditions of countering massive combined enemy strikes. The relevance of the study is conditioned by the discrepancy between conventional approaches to psychological training and the destructive load of contemporary high-tech warfare: intensive use of unmanned aerial vehicles and various types of missile weapons by the enemy, continuous combat operations for 5-8 hours, lack of time for decision-making, and awareness of the consequence of error cause cognitive inhibition, physiological exhaustion and the risk of psychological disruption of operators of anti-aircraft missile systems. The transition to control systems with elements of artificial intelligence additionally requires digital stress tolerance and critical thinking from combat services. The purpose of the study was to substantiate the integral structure and content of the programme of special psychological training of anti-aircraft missile forces specialists, aimed at improving the combat capability of combat services of anti-aircraft missile systems and preserving the mental health of military personnel. The methods of analysis were theoretical analysis, systematisation, and generalisation of Ukrainian and international scientific sources of military psychology, analysis of the experience of combat operations of air defence units of Ukraine in 2022-2026, comparative analysis, structural and functional modelling. A five-stage model of specialised psychological training has been developed, based on the principles of dynamic adaptation and a person-centred approach. It covered: professional and psychological selection with input screening of psychophysiological and cognitive indicators; basic training that combines psycho-education on the neurobiology of combat stress, stress hardening by dosed modelling of loads within the optimal stimulus range and cognitive immersion by means of virtual reality; psychological coordination of combat services and the fostering of group resilience through a common mental model, vertical trust, and horizontal cohesion; mutual monitoring of performance on the principle of “peer-to-peer” based on somatic, sensory and visual, communicative and speech fatigue markers using Express micro-

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interventions; post-combat decompression with group debriefing, psychological recovery of personnel by means of virtual reality and output screening, which closes the feedback loop of the programme. The practical significance of the study consists in the possibility of introducing the proposed model into the combat training system of anti-aircraft missile forces units, which will ensure the development of stable psychological readiness of personnel, maintaining professional reliability of combat services, preventing post-traumatic stress disorders, and preserving the combat potential of air defence units

♦ **Keywords:** psychological readiness; combat stress; group resilience; stress hardening; cognitive stability; anti-aircraft complex service; virtual reality technologies

♦ Introduction

The full-scale aggression of the Russian Federation against Ukraine has created a qualitatively new type of combat environment for the air defence forces: massive combined strikes, which are aimed at overloading the air defence system with simultaneous, different types and different heights of air targets, and combine the layered use of unmanned aerial vehicles, cruise, ballistic and aeroballistic missiles against the backdrop of intense electronic warfare. During combat operations to repel such an attack, the operator of an anti-aircraft missile system operates in a state that combines high alert and extreme stress, lack of time for decision-making, and awareness of the extremely high cost of error, because the lives of the civilian population and the preservation of the state's critical infrastructure depend directly on the precision of their actions. The experience of contemporary wars shows that the effectiveness of air defence is determined not only by the tactical and technical characteristics of weapons, but also by the psychological readiness of personnel: the human factor becomes the most critical and sensitive component of the state's air defence system. An additional challenge is the transition of anti-aircraft missile systems to control systems with elements of artificial intelligence, which generates a new type of professional stress – algorithmic alarm of combat personnel.

The analysis of recent studies and publications indicates an increase in scientific interest in the problem of psychological training of military personnel in high-tech warfare. Methodological bases for ensuring the psychological stability of military personnel directly in the conditions of combat operations were substantiated in the study by O. Kokun *et al.* (2022). Current challenges of psychological support of personnel in combat conditions, considering the transformation of the nature of armed conflict, were systematised by V. Aleshchenko & O. Kokun (2025). The mental stability of a soldier as an integral characteristic that acts as an indispensable guarantee of combat activity was revealed in the study by O. Khmiliar (2023). Social and individual determinants of activity, determination and resilience of Ukrainian servicemen in wartime conditions have been empirically investigated by I. Diachenko *et al.* (2024). The methodology for assessing the moral and psychological state of military personnel, including indicators of group cohesion and trust, in accordance with the practice of the Armed Forces of the leading NATO member countries was streamlined by V. Dykun *et al.* (2023). The subject dimension of a serviceman's behaviour in war and

the psychological lessons of mass armed conflicts were analysed by V. Osodlo & T. Traverse (2022).

Despite a significant scientific background, there are still unresolved contradictions in the system of psychological training of specialists of the anti-aircraft missile forces. Firstly, conventional methods do not correspond to the real nature of the destructive load on combat personnel, which combines massive and high intensity of air attacks, physiological exhaustion due to prolonged combat operations, and ultra-high moral and psychological pressure due to awareness of the price of error. The existing approaches do not provide the development of the ability to effectively filter information and quickly make decisions in a matter of seconds, which in combat conditions leads to the suppression of rational thinking under the influence of acute stress response, loss of fine motor skills, and cognitive inhibition. Secondly, there are not enough scientifically based technologies for transforming individual psychological stability into collective combat capability directly when repelling a massive combined strike, in particular, a complete system of diagnostic and corrective actions that would allow personnel to quickly apply mutual support protocols based on objective fatigue markers to prevent critical decompensation among combat personnel (Kokun *et al.*, 2022; Dykun *et al.*, 2023). Thirdly, there is no clear algorithm for post-combat psychological support: conventional relaxation methods demonstrate only partial effectiveness after many hours of air attacks, and the potential of immersive virtual reality technologies and group debriefing in the recovery system of anti-aircraft missile forces specialists remains scientifically unexplored. These contradictions determine the relevance of developing an updated programme of special psychological training adapted to the conditions of countering massive combined blows.

The purpose of the study was to develop and scientifically substantiate a promising model of the programme of special psychological training for the anti-aircraft missile forces personnel of the Air Forces of the Armed Forces of Ukraine, capable of ensuring the sustained combat effectiveness of the combat crew of an air defence missile system during combat operations and their long-term professional reliability. Achieving the goal involved solving the following tasks: to analyse the specific factors of combat stress of anti-aircraft missile forces personnel in the conditions of repelling massive combined strikes; to substantiate the stage structure of the programme of special psychological

training, the content of each stage, and the tools for verifying its effectiveness; to determine the psychological mechanisms for the development of individual and group resilience of combat services. The scientific originality of the study was to substantiate the five-stage model of special psychological training programme for anti-aircraft missile forces personnel, which for the first time systematically integrated professional and psychological selection, stress hardening with the use of virtual reality technologies, psychological coordination of combat services, mutual monitoring of performance on the principle of “peer-to-peer”, post-combat decompression and psychological recovery into a single continuous cycle, adapted to the conditions of countering massive combined enemy strikes.

◆ Materials and Methods

The research was theoretical in nature and was aimed at the conceptual substantiation of the structure and content of the special psychological training programme for anti-aircraft missile forces personnel in the conditions of countering massive combined enemy strikes. In accordance with the tasks set, a complex of complementary general scientific and special methods of the theoretical level was applied, namely, the research was implemented in three consecutive stages: analytical (highlighting the factors of combat stress and analysing the degree of development of the problem), synthetic (systematisation of psychological mechanisms for the development of individual and group stability), and constructive (building the author's model of the training programme and determining the tools for verifying its effectiveness).

The study was based on three groups of sources. The first group consisted of scientific publications by Ukrainian researchers in 2021-2025 on the problems of psychological support for the activities of military personnel in the conditions of the Russian-Ukrainian war, in particular, on ensuring the psychological stability of personnel in combat conditions, the mental stability of a soldier, current challenges of psychological support (Kokun *et al.*, 2022; Khmiliar, 2023; Aleshchenko & Kokun, 2025). This group also included studies of psychoprophylactic work with military personnel of groups of enhanced psychological attention and methodology for assessing the moral and psychological state of troops (Kolesnichenko *et al.*, 2021; Dykun *et al.*, 2023). The second group consisted of international studies on the psychology of combat stress, team interaction, and stress-resistant training, including classical concepts of stress grafting and the neurobiology of acute stress response (Meichenbaum, 1985; Goleman, 2005; Grossman & Christensen, 2008). The concepts of joint mental models of the team and collective effectiveness also retain methodological significance for designing innovative training programmes (Cannon-Bowers *et al.*, 1993; Zaccaro *et al.*, 1995). A separate subgroup consisted of studies on the use of virtual reality technologies in stress-resistant training of military personnel (Rizzo *et al.*, 2012; Pallavicini *et al.*, 2016). The third group was formed by regulatory and

methodological documents and programme materials on the control of combat and operational stress, reflecting the practice of the armed forces of NATO member countries, in comparison with analytical materials on the experience of combat operations of air defence units of Ukraine in 2022-2026 (Department of the Army, 2006; Reivich *et al.*, 2011). The criteria for selecting sources were defined as: relevance of the subject of research, scientific verification, priority of publications of the last 3-5 years to reflect the current state of the problem and preserve classical works that make up the conceptual foundation of stress-resistant training.

Theoretical analysis and synthesis of scientific sources were used to solve the first task of the study – identifying specific factors of combat stress of specialists of the anti-aircraft missile forces. The analytical procedure provided for the decomposition of the professional activity of the combat crew of an anti-aircraft missile system when repelling a massive combined strike, followed by the correlation of its structural elements with the corresponding mental processes (perception, attention, thinking, decision-making) and types of load on them (Kokun *et al.*, 2022). The methods of systematisation and generalisation were used to organise the selected factors of destructive load into three categories: information (identification of false and real targets in the conditions of electronic warfare); psychophysiological (exhaustion due to prolonged continuous combat operations); and ethical and psychological (awareness of the price of error in protecting the population and critical infrastructure). This systematisation determined the targets of psychological influence that the content of each stage of the training programme should be directed at, and provided a meaningful correspondence between the structure of destructive factors and the structure of the model.

The comparative analysis is applied in two areas: firstly, to compare conventional approaches to the psychological training of personnel with the real nature of the loads that arise when repelling massive combined strikes, which allowed identifying areas of critical non-compliance of existing practice with current requirements; secondly, to correlate the Ukrainian experience of psychological support of combat activities with approaches implemented in the practice of the armed forces of NATO member countries, in particular, the doctrine of combat and Operational Stress Control and programmes for the development of military resilience (Department of the Army, 2006; Reivich *et al.*, 2011; Dykun *et al.*, 2023).

Structural and functional modelling has become the leading method for solving the second and third research tasks – constructing the model of the programme of special psychological training and determining the psychological mechanisms of individual and group resilience development. The construction of the model was carried out according to the logic of a full cycle of psychological support of a specialist: from professional and psychological selection through basic training and coordination of combat services to maintaining working capacity directly during combat operations and post-combat recovery. For each stage,

the goal, psychological mechanisms that it is aimed at activating, content, and expected results were determined. Functional connections between the stages were designed according to the principle of continuity of psychological support, in which the results of each previous stage were the initial conditions for the next, and the data of input and output screenings form a feedback loop for verifying the effectiveness of the programme as a whole, which completed the solution of the second research task.

The methodological basis of the study was primarily the subject-action approach developed by the Ukrainian school of psychology, according to which military personnel are regarded as active agents capable of self-regulating their own functional states under extreme operational conditions (Maksymenko, 2006). The second methodological basis was the concept of stress inoculation, which substantiated the development of resistance to critical loads through dosed modelling of stressful situations in controlled conditions, considering the natural relationship between the level of stimulus and performance (Yerkes & Dodson, 1908; Meichenbaum, 1985). The mechanisms of transformation of individual psychological stability into group combat capability are revealed based on the concepts of collective efficiency and joint mental models (Cannon-Bowers *et al.*, 1993; Zaccaro *et al.*, 1995). Ultimately, the human-centred approach to psychological support of personnel has defined the preservation of mental health of a serviceman as an independent value and a condition for long-term professional reliability (Aleshchenko & Kokun, 2025). The research was conducted in compliance with the principles of academic integrity; the sources used were cited in accordance

with the requirements of scientific ethics. A limitation of the study is its theoretical nature: the proposed model has not been experimentally tested at this stage, and its effectiveness is substantiated conceptually.

◆ Results and Discussion

The analysis of the combat experience of the Ukrainian air defence units in 2022-2026 showed that during the repelling of massive combined strikes, the operator of the combat service of an anti-aircraft missile system experiences three types of destructive load: informational (identification of false and real targets against the background of electronic countermeasures), psychophysiological (exhaustion due to long-term, often overtime combat operations), and ethical and psychological (awareness of the cost of error in protecting the population and critical infrastructure). This load structure determined the targets of psychological impact and the logic of constructing the author's model.

The developed programme of special psychological training is based on two fundamental principles. The principle of dynamic compliance assumes that the content of training is promptly updated based on the results of an analysis of current trends in combat operations. The principle of human-centredness determines that the effectiveness of any type of weapons and military equipment is realised only through a professionally and psychologically trained operator, and the preservation of his mental health is an independent value and a condition for long-term professional reliability (Aleshchenko & Kokun, 2025). The model covers five consecutive stages united by the principle of continuity of psychological support (Table 1).

Table 1. Structure of the programme of special psychological training for the anti-aircraft missile forces personnel

Stage	Purpose	Leading psychological mechanisms	Main content
1. Professional and psychological selection	Recruitment of combat crews comprising personnel with the required level of professionally relevant qualities	Prognostic diagnosis of neuropsychiatric stability	Psychophysiological, cognitive and intellectual screening; study of individual psychological profile
2. Basic special psychological training	Development of individual psychological stability and readiness	Stress inoculation; cognitive reassessment of the threat	Psycho-education on the neurobiology of combat stress; dosed modelling of stress; cognitive immersion by means of virtual reality
3. Psychological coordination of combat services	Development of group resilience	Shared mental model; synchronisation of trust; collective efficiency	Trainings of team interaction; modelling of crisis situations; working out interchangeability
4. Monitoring of working capacity during combat operation	Maintaining stable performance during impact deflection	Mutual control of fatigue markers; inhibition of acute stress response	"Peer-to-peer" system; express micro-interference; code phrases as inhibitors
5. Decompression and recovery	Maintaining mental health and long-term professional reliability	Activation of parasympathetic regulation; collective understanding of experience	Group debriefing; virtual reality recovery; output screening

Source: compiled by the authors

Stage 1. Professional and psychological selection (input screening). The goal of the stage is not only to assess the candidate's health status, but also the individual psychological profile to identify people with high neuropsychic stability, rapid sensorimotor reaction, and the ability to concentrate for a long time under the conditions of a complex interference. Candidates prone to latent aggression, panic attacks, or depressive states are not eligible

for selection into combat crews; for working with service personnel who, according to the screening results, require additional attention, algorithms for psychoprophylactic work with groups requiring enhanced psychological attention – developed through Ukrainian practice – are employed (Kolesnichenko *et al.*, 2021). The content of the stage covers: psychophysiological screening (registration of heart rate variability due to a sharp change in the

operational environment, tremometry, assessment of sensorimotor reactions); cognitive screening (distribution and volume of attention, cognitive flexibility, noise immunity); screening of intellectual development. The results of incoming screening are recorded and then serve as a reference point for comparison to verify the effectiveness of the programme.

Stage 2. Basic special psychological training. The goal of the stage is to form psychological stability and readiness of a specialist to work as part of a combat crew through a combination of psycho-education on the neurobiology of combat stress with practical training using the stress inoculation method (Meichenbaum, 1985; Kokun *et al.*, 2022). The psycho-educational component involves the personnel's assimilation of the mechanism of acute stress response: activation of the amygdala as a "threat detector" triggers the "hit, run, or freeze" reaction, which is accompanied by the release of adrenaline and cortisol and manifests itself in narrowing of the field of vision and auditory perception, loss of fine motor skills, and cognitive inhibition (Grossman & Christensen, 2008). In the scientific literature, this condition is described as "amygdala abduction" – suppression of rational thinking under the influence of stress hormones (Goleman, 2005). The operator's awareness of the neurobiological nature of their own reactions is a prerequisite for the transition to their arbitrary regulation.

The practical component is implemented according to the method of stress grafting, which provides for three consecutive phases: conceptual (awareness of the impact of combat stress on the ability to perform functional duties as part of combat personnel), the phase of development and testing of skills (mastering specific techniques for maintaining combat capability), and the phase of applying skills in conditions as close as possible to combat (Meichenbaum, 1985). The effectiveness of this technique in reducing anxiety and improving performance has been confirmed meta-analytically (Saunders *et al.*, 1996). The leading technique is the dosed modelling of stress: a serviceman receives a controlled stress load of increasing intensity, which allows the psyche to develop programmes of cognitive and emotional protection. The regulatory guideline is the regularity according to which for the successful performance of the activity there is an optimal stimulus, and its excess reduces efficiency; dosed modelling forms the operator's ability to consciously maintain the functional state within this optimum with an increase in external pressure (Yerkes & Dodson, 1908). As a result, destructive stress (distress) is transformed into a functional state of mobilisation (eustress), and the role of the amygdala in the structure of emotional response changes: from the trigger of an uncontrolled reaction, it turns into a source of signal information about the threat, to which the operator responds professionally, according to established algorithms of combat operations. Since conventional simulators do not reproduce the level of information and psychological pressure of a massive combined strike, the key tool of the skills application phase is

defined as virtual reality technologies, the effectiveness of which in stress-resistant training of military personnel is confirmed, in particular, by the experience of the Stress Resilience In Virtual Environments (STRIVE) programme and systematic reviews of the use of virtual reality in stress management in the armed forces (Rizzo *et al.*, 2012; Pallavicini *et al.*, 2016). They provide cognitive immersion of a serviceman in simulated conditions of intensive combat operations, where automation of decisions is worked out in conditions of acute time constraints.

Stage 3. Psychological coordination of combat services and development of group resilience. The goal of the stage is to transform the individual psychological stability of military personnel into the collective combat capability of the unit. Psychological coordination is defined as the process of purposeful establishment of inter-individual connections, cognitive interaction and psychological compatibility of military personnel, which ensures the effectiveness of joint combat operations in extreme conditions. The conceptual basis of the stage is the provisions on collective efficiency and joint mental models of the team (Cannon-Bowers *et al.*, 1993; Zaccaro *et al.*, 1995). The development of group resiliency is implemented through four consecutive components. The first – development of a joint mental model that provides a synchronised understanding by each member of the combat crew of the current situation, interaction algorithms, and predicted actions of colleagues in conditions of time scarcity; the result is a reduction in team anxiety, optimisation of intra-group communication and proactive coordination of actions without additional discussions (Cannon-Bowers *et al.*, 1993). The second – synchronisation of trust in two vectors: institutional vertical trust in the "commander-subordinate" system, the significance of which is confirmed by data on the influence of the leader on the stability of subordinates under operational stress and horizontal cohesion between military personnel as a component of the moral and psychological state of the unit (Bartone, 2006; Dykun *et al.*, 2023). The third is psychological hardening by modelling intense combat situations: training of team interaction with the distribution of functional responsibilities, working out interchangeability scenarios, and synchronising the pace of combat operations, which strengthens the mental stability of each serviceman as a guarantee of combat activity (Khmiar, 2023). The fourth is the conversion of combat stress into collective purposeful activity: individual anxiety is transformed into structured joint combat operation, and the verified presence and confident actions of fellow soldiers in the confined space of combat operation are a factor that compensates for the deprivation effects of an isolated environment and prevents individual psychological breakdown.

Stage 4. Monitoring the performance of combat personnel based on "peer-to-peer" principle. The goal of the stage is to maintain a stable level of performance of personnel during the entire period of repelling a massive combined strike. The specifics of the activity of combat personnel during this period are characterised by a discrete

combination of vigilant waiting and hyper-loading lasting from 5 to 8 hours, which determines the rapid development of acute fatigue, somato-motor stress, and exhaustion of sensory systems; these factors threaten to reduce the reaction speed and errors with critical consequences (Kokun *et al.*, 2022). The horizontal control system is based on continuous mutual tracking by military personnel of 3 groups of objective fatigue markers directly at the workplace: somatic and sensorimotor (muscle numbness, forced change of posture, tremor of fingers during manipulations); sensory and visual (frequent blinking, squinting, slowing down the amplitude of eye movements); communicative and speech (slowing down the pace of reports, stuttering, skipping code words, atypical emotional destabilisation of intonations). The conceptual basis of distributed responsibility for the psychological state of the unit is the doctrine of control of combat and operational stress, which provides for the identification of signs of stress reactions and the provision of primary support by the unit itself before applying for specialised assistance (Department of the Army, 2006). Marker detection activates the algorithm of rapid micro-movements: initiation of short exercises of alternating muscle tension and relaxation, self-massage of toning points to activate capillary blood flow, verbal activation techniques, and controlled breathing to stabilise the heart rate (Kokun *et al.*, 2022). An additional tool is standardised code phrases – inhibitors that allow quickly interrupting the deployment of an acute stress response in a teammate and return the focus of attention to the algorithmic performance of a combat mission. Responsibility for the psychological state of the unit within this system is distributed among all members of the combat crew, and not just assigned to the commander or psychologist.

Stage 5. Decompression and psychological recovery. Output screening. The goal of the stage is to preserve the mental health of personnel and maintain the long-term reliability of combat personnel. Decompression is considered as a systemic process of reintegration of psychophysiological resources after the completion of intensive combat operation, aimed at minimising the cumulative effect of combat stress; according to the subject-action approach, it is interpreted as a conscious transition of a serviceman from a state of combat mobilisation to functional rest (Maksymenko, 2006). The content of the stage includes three components. The first – group psychological debriefing within the combat service, aimed at collective understanding of the combat work carried out, analysis of individual emotional reactions, and levelling the feeling of isolation in the experienced stress; conducting such activities by the unit's forces corresponds to the doctrinal provisions of combat and operational stress control (Department of the Army, 2006). The focus of debriefing is shifted from traumatic aspects to constructive analysis of professional interaction, which strengthens group cohesion as a component of the moral and psychological state of the unit (Dykun *et al.*, 2023). The second – targeted activation of the parasympathetic link of the autonomic nervous system

by means of virtual reality and directed audiovisual stimulation, which provides neurodynamic discharge, optimisation of central inhibition processes and prompt restoration of cognitive resource; the expediency of using virtual reality technologies in the system of psychological assistance to military personnel was confirmed, in particular, by the experience of their clinical use in military health care institutions (Reger *et al.*, 2011). This component acts as a preventive strategy for preventing maladaptive disorders, in particular post-traumatic stress disorder. The third – output screening for indicators identical to the input, closing the feedback loop of the programme: mathematical and statistical comparison of the results of input and output screenings allows objectively assessing the dynamics of individual and group resilience development and verifying the programme's ability to ensure professional reliability of anti-aircraft missile forces personnel.

The results obtained confirm and expand the provisions formulated in Ukrainian military psychology in recent years. The proposed model of the five-stage programme is consistent with the methodological principles for ensuring the psychological stability of military personnel in combat conditions developed by O. Kokun *et al.* (2022) and with conclusions of V. Aleshchenko & O. Kokun (2025) that the current nature of armed struggle requires the restructuring of the entire system of psychological support for personnel, and not just its individual elements. Common in the approaches is the understanding of psychological stability as a resource that requires purposeful development and maintenance. The difference lies in the fact that the works cited cover the psychological support of military personnel within a broad, cross-branch context, whilst the programme model developed here tailors the support cycle to the unique operational profile of anti-aircraft missile system crews – with their discrete standby and hyper-stress regimes, and where a single second's error can prove critical.

The provisions of O. Khmiliar (2023) on the mental resilience of military personnel as an indispensable guarantee of their combat effectiveness has been operationalised at the group level in the proposed programme model: the resilience of an individual operator is regarded as a necessary but insufficient condition for the combat effectiveness of a combat crew, which is complemented by mechanisms of coordination and mutual support. U. Huliak & V. Lisnevskyi (2024) also emphasised the decisive role of the value-based component of a serviceman's motivational sphere in combat operations: in the authors' model, the programme for raising awareness of the value and significance of combat operations aimed at protecting the population is integrated into the psycho-educational component of basic training. Methodology for assessing the moral and psychological state of personnel, compiled by V. Dykun *et al.* (2023) in accordance with the practice of the armies of NATO member countries, corresponds to the developed screening contour; the difference is that the named methodology focuses on periodic assessment of the state of units, while the proposed model complements it with

continuous mutual monitoring of fatigue markers directly during combat operations. The experience of combat operations of air defence units confirms the expediency of allocating a closed space of combat operations as an independent stress factor – an aspect that was not previously systematically considered in the training programmes of air defence specialists. Ultimately, the analysis by V. Osodlo & T. Traverse (2022) of the psychological lessons of mass wars supports the central thesis of this study regarding the inadequacy of purely technical superiority without the psychological readiness of the person wielding the weapon.

Comparison with international studies showed that the methodological core of the second stage of the model corresponds to the classical three-phase scheme of stress inoculation by D. Meichenbaum (1985), the effectiveness of which in reducing anxiety and improving performance was confirmed in a meta-analysis by T. Saunders *et al.* (1996). The developed model concretises the application of the methodology to the activities of combat personnel: the phase of applying skills is implemented through cognitive immersion by means of virtual reality, which continues the line started by A. Rizzo *et al.* (2012) in the STRIVE programme, and generalised by F. Pallavicini *et al.* (2016) in reviews of military applications of virtual reality. Comparison with the US Army Master Resilience Training programme, developed by K. Reivich *et al.* (2011) for the formation of resilience through the training of leaders, the difference of the author's approach is emphasised: instead of the cascade model "from leader to subordinate", a horizontal model of distributed responsibility is proposed, in which the support carrier is each member of the service. However, data by P. Bartone (2006) warns against absolutisation of the horizontal vector about the significant influence of the leader on the stability of subordinates under operational stress – this is why the model retains the vertical trust component. The doctrinal principles for managing combat and operational stress set out by the Department of the Army (2006) and the systematisation of the clinical and operational applications of military psychology carried out by C. Kennedy & E. Zillmer (2006) provided the framework within which the proposed model occupies a niche as a specialised sector-specific solution for air defence.

The phenomenon of algorithmic operator alarm, which interacts with control systems based on artificial intelligence, highlighted in the study deserves a separate discussion. No systematic programmes for psychological preparation for such interaction in combat conditions have been proposed in the available literature; the empirical research by I. Diachenko *et al.* (2024) on the determinants of resilience among Ukrainian military personnel also does not cover this factor. The proposed model creates a structural framework for integrating such training, primarily within the second and third stages, but the content of operator critical thinking training under conflicting recommendations of automated systems requires a separate study. Another point of debate is whether the mechanisms of

interpersonal trust described by P. Bartone (2006) for the "commander-subordinate" relationship and comradeship also apply to interactions within the "human-algorithm" system: the answer to this question will determine the architecture of the next generation of training programmes. The importance of comparative analysis lies in the fact that the proposed model integrates individual (self-regulation), group (coordination and mutual support), and organisational (screening feedback loop) levels of psychological support into a single continuous cycle, whereas in the analysed approaches these levels were considered mainly in isolation or sequentially.

◆ Conclusions

The conducted research allowed solving the tasks set and achieving the goal – to substantiate the integral structure and content of the special psychological training programme for anti-aircraft missile forces personnel in the conditions of countering massive combined enemy strikes. According to the results of the solution of the first task, it was established that the destructive load on the operator of the combat service of an anti-aircraft missile system during the repelling of a massive combined strike has a three-dimensional structure: information measurement is associated with the identification of targets in the conditions of electronic counteraction; psychophysiological – with exhaustion for many hours of continuous combat operations; ethical and psychological – with awareness of the price of error. A specific factor that has not yet been systematically considered in the training programmes of air defence specialists is the deprivation effect of the closed space of combat operations, and a promising challenge is the algorithmic alarm of the operator during interaction with control systems based on artificial intelligence. Based on the results of solving the second task, the five-stage structure of the programme covering professional and psychological selection with input screening of psychophysiological, cognitive, and intellectual indicators was substantiated; basic training that combines psycho-education of neurobiological mechanisms of acute stress response with three-phase stress inoculation and dosed modelling of stress load within the optimum of stimulus; psychological coordination of combat services; mutual monitoring of performance directly during combat operations; post-combat decompression, and psychological recovery with initial screening. Virtual reality technologies are defined as a tool for reproducing the maximum information pressure that is unattainable for conventional simulators, which provide cognitive immersion at the stage of basic training, and neurodynamic discharge at the stage of psychological recovery.

Based on the results of solving the third problem, psychological mechanisms of resiliency development at the individual and group levels were determined. At the individual level, the leading mechanism is the transformation of destructive stress into functional mobilisation through cognitive reassessment of the threat, as a result of which

the emotional response to the threat is replaced by professional action according to the established algorithm. At the group level, resilience is formed through four inter-related components: a joint mental model of the combat situation, synchronisation of vertical trust and horizontal cohesion, psychological hardening by means of modelling crisis situations, and the conversion of individual anxiety into a structured collective professional activity. Maintenance of working capacity in the course of combat operations is provided by the “peer-to-peer” system, which is based on mutual tracking of somatic, sensory and visual, communicative and speech markers of fatigue and the use of express micro-interventions; the authors’ element of the system is standardised code phrases-inhibitors for rapid interruption of acute stress response in a team member. As part of the solution of the second problem, the tools for verifying the effectiveness of the programme were also outlined: a feedback loop formed by input and output screenings for identical indicators, the data of which are subject to mathematical and statistical comparison. Such a circuit transforms a programme from

a set of measures to a managed system with a measurable result. Prospects for further research cover three areas: empirical testing of the programme with mathematical and statistical verification of the dynamics of psychological and psychophysiological indicators of personnel; analysis of psychological determinants of maintaining professional reliability of combat personnel in conditions of high threat of impact on a combat position; investigation of the phenomenon of algorithmic anxiety and trust mechanisms in the human-algorithm system for designing programmes of preparation for interaction with weapons based on artificial intelligence.

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Структура та змістове наповнення програми спеціальної психологічної підготовки фахівців зенітних ракетних військ в умовах протидії масованим комбінованим ударам Російської Федерації

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♦ **Анотація.** У статті обґрунтовано структуру та змістове наповнення програми спеціальної психологічної підготовки фахівців зенітних ракетних військ Повітряних Сил Збройних Сил України в умовах протидії масованим комбінованим ударам противника. Актуальність дослідження зумовлена невідповідністю традиційних підходів психологічної підготовки деструктивним навантаженням сучасної високотехнологічної війни: інтенсивне застосування противником безпілотних літальних апаратів і різномірного ракетного озброєння, безперервна бойова робота впродовж 5-8 годин, дефіцит часу на ухвалення рішення, усвідомлення ціни помилки спричиняють когнітивне гальмування, фізіологічне виснаження та ризик психологічного зриву операторів зенітних ракетних комплексів. Перехід до систем управління з елементами штучного інтелекту додатково вимагає від бойових обслуг цифрової стресостійкості та критичного мислення. Метою дослідження стало обґрунтування цілісної структури та змістового наповнення програми спеціальної психологічної підготовки фахівців зенітних ракетних військ, спрямованої на підвищення боєздатності бойових обслуг зенітних ракетних комплексів і збереження ментального здоров'я військовослужбовців. Методами аналізу були теоретичний аналіз, систематизація та узагальнення українських і міжнародних наукових джерел військової психології, аналіз досвіду бойової роботи підрозділів протиповітряної оборони України 2022-2026 років, порівняльний аналіз, структурно-функціональне моделювання. Розроблено п'ятиетапну модель спеціальної психологічної підготовки, побудовану на принципах динамічної відповідності та людиноцентричності. Вона охопила: професійно-психологічний відбір із вхідним скринінгом психофізіологічних і когнітивних показників; базову підготовку, що поєднує психоедукацію щодо нейробіології бойового стресу, стресове загартування дозованим моделюванням навантажень у межах оптимуму збудження та когнітивну імєрсію засобами віртуальної реальності; психологічне злагодження бойових обслуг і формування групової резильєнтності через спільну ментальну модель, вертикальну довіру та горизонтальну згуртованість; взаємний моніторинг працездатності за принципом «рівний-рівному» на основі соматичних, сенсорно-зорових і комунікативно-мовленнєвих маркерів утоми із застосуванням експрес-мікротручань; післябойову декомпресію з груповим дебрифінгом, психологічне відновлення особового складу засобами віртуальної реальності та вихідний скринінг, що замикає контур зворотного зв'язку програми. Практичною цінністю дослідження є можливість впровадження запропонованої моделі в систему бойової підготовки підрозділів зенітних ракетних військ, що забезпечить формування стійкої психологічної готовності особового складу, підтримання професійної надійності бойових обслуг, профілактику посттравматичних стресових розладів та збереження бойового потенціалу підрозділів протиповітряної оборони

♦ **Ключові слова:** психологічна готовність; бойовий стрес; групової резильєнтність; стресове загартування; когнітивна стійкість; обслуга зенітного комплексу; технології віртуальної реальності