METHODS FOR ENHANCING THE OPERATIONAL AND TACTICAL READINESS OF RESCUERS IN EMERGENCY SITUATIONS

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Abstract: The effectiveness of rescue operations depends not only on the availability of specialized equipment and emergency response resources but also on the operational and tactical readiness of the personnel responsible for performing rescue activities. During emergencies, rescuers frequently operate in environments characterized by physical hazards, limited visibility, unstable structures, time pressure, incomplete information, and significant psychological stress. These conditions require a combination of physical endurance, technical competence, rapid decision-making, coordinated teamwork, and the ability to recognize and control operational risks. This study examines the organizational, professional, psychological, physical, and technological factors influencing the readiness of rescue personnel. Particular attention is given to the limitations of training systems that assess individual competencies separately without adequately considering their combined effect during complex rescue operations. A five-component model for enhancing rescuers' operational and tactical readiness is developed. The model integrates physical preparedness, professional and technical competence, psychological stability, team coordination, and technological adaptability. In addition, a methodological framework is proposed for evaluating personnel readiness through weighted indicators and mandatory safety competency requirements. A six-stage training cycle is introduced to connect initial assessment, individualized preparation, scenario-based exercises, team coordination, performance evaluation, and corrective training. The proposed approach provides a methodological basis for improving the quality of rescue personnel preparation and developing more systematic emergency response training programmes.

Keywords: emergency situations, rescue personnel, operational readiness, tactical preparedness, rescue operations, physical endurance, psychological resilience, risk assessment, team coordination, emergency management

Introduction. Emergency response activities require personnel to operate under conditions in which the consequences of incorrect decisions can be severe. Fires, industrial explosions, structural collapses, chemical releases, transportation accidents, floods, and other hazardous events create operational environments that may change within minutes or even seconds. In such circumstances, the effectiveness of rescue operations is closely connected with the ability of personnel to recognize threats, interpret available information, select appropriate actions, and coordinate their efforts.

The readiness of rescuers is often associated with physical fitness, professional knowledge, and the ability to operate specialized equipment. However, these characteristics do not independently guarantee effective performance. A rescuer may possess considerable physical strength but lack the ability to maintain concentration under pressure. Another individual may understand technical procedures but experience difficulties when communication is interrupted or when the operational situation changes unexpectedly. Consequently, readiness should be considered as an integrated professional capability rather than a simple combination of individual skills.

An additional difficulty arises from the difference between training conditions and actual emergency environments. Routine exercises are generally conducted according to predetermined scenarios, whereas real incidents may involve unexpected obstacles, inaccurate initial information, equipment limitations, changing weather conditions, and the simultaneous occurrence of several

hazards. This difference creates a need for training methods that develop not only procedural knowledge but also adaptability and operational judgement.

International approaches to incident management emphasize the importance of clearly distributed responsibilities, coordinated command, information exchange, and effective resource management. ISO 22320:2018 provides guidance on incident management, including organizational structures, responsibilities, resource management, and cooperation between responding organizations [1]. These principles demonstrate that the effectiveness of rescue personnel is influenced by both individual competence and the organizational environment in which rescue operations are performed.

The International Labour Organization also emphasizes that emergency preparedness requires advance planning, appropriate infrastructure, trained personnel, and clearly established procedures [2]. However, the existence of an emergency response plan does not automatically ensure that personnel can implement it effectively. Practical readiness must be developed through systematic training and evaluated under conditions that reflect the actual responsibilities of rescue teams.

A particularly important issue is the relationship between operational speed and safety. Emergency situations require prompt action, but an attempt to complete a task as quickly as possible may increase exposure to secondary hazards. For instance, entering a structurally unstable building without an adequate assessment may place rescuers at additional risk. Similarly, an incorrect approach to a chemical release may expose personnel to hazardous substances. Therefore, readiness must include the ability to determine when intervention is appropriate, when additional technical support is required, and when withdrawal or an alternative protective action is necessary.

The scientific problem addressed in this study is the insufficient integration of physical, technical, psychological, organizational, and technological competencies within a unified framework for evaluating and developing rescue personnel readiness.

The purpose of the research is to develop a methodological approach to enhancing the operational and tactical readiness of rescuers through the integration of individual preparation, team-based exercises, risk-oriented decision-making, and systematic performance assessment.

The research addresses the following objectives:

- to identify the principal components determining rescuers' operational readiness;
- to examine the relationship between individual competencies and collective rescue performance;
- to develop an integrated model for improving personnel preparedness;
- to propose a structured methodology for organizing readiness-oriented training;
- to formulate an assessment framework for identifying deficiencies and planning corrective training.

The scientific contribution of the study consists of the proposed integration of five readiness components into a unified assessment framework, supplemented by mandatory safety competency requirements and a continuous training cycle.

Materials and Methods. The study applies a conceptual and analytical research approach based on the examination of emergency management principles, occupational safety requirements, human factors, and personnel training methods.

The methodological process consists of four interconnected analytical procedures.

First, a functional analysis is used to identify the main activities performed by rescuers during emergency response operations. These activities include hazard recognition, situation assessment, communication, protective action, rescue task execution, and operational withdrawal.

Second, a comparative analysis is applied to examine how physical, professional, psychological, organizational, and technological factors influence operational performance.

Third, systems analysis is used to establish relationships between individual preparedness and collective team effectiveness. This approach considers the rescue unit as an operational system in which the performance of one member may influence the actions of other members.

Finally, conceptual modelling is used to formulate an integrated readiness model and a corresponding assessment methodology.

The research is theoretical and methodological in nature. No controlled field experiment, personnel survey, or operational performance test was conducted. Therefore, the proposed model and assessment indicators are presented as methodological developments requiring subsequent empirical validation.

For the purpose of the study, operational and tactical readiness is divided into five components.

Physical preparedness (P). This component describes the physical capacity required to perform rescue tasks involving movement, lifting, carrying, climbing, maintaining balance, and working with protective equipment.

Professional and technical preparedness (T). This component represents the ability to apply professional knowledge, operate rescue equipment, follow established procedures, and perform assigned technical tasks.

Psychological preparedness (S). This component concerns the ability to maintain concentration, regulate emotional reactions, evaluate changing circumstances, and make appropriate decisions under pressure.

Team coordination (C). This component reflects the ability to communicate, distribute responsibilities, exchange information, cooperate with other personnel, and maintain operational consistency.

Digital and technological preparedness (D). This component represents the ability to use communication systems, monitoring devices, digital information, thermal imaging equipment, geographic information systems, and other technologies relevant to emergency response.

The selection of these components is based on the understanding that rescue operations involve both human performance and organizational coordination. None of the components should be considered independently sufficient for effective operational readiness.

These intervals represent proposed methodological categories rather than officially established certification thresholds. Their suitability must be evaluated through expert assessment and practical application.

The evaluation should be based on observable performance indicators rather than subjective impressions alone. For example, professional preparedness may be assessed through procedural accuracy and equipment operation, while team coordination may be evaluated through communication clarity, role distribution, and information exchange.

A separate assessment of mandatory safety competencies is also required. A high overall score must not compensate for an unacceptable result in a critical skill, such as the correct use of personal protective equipment or compliance with withdrawal procedures.

Results. The analytical findings provide the basis for developing a five-component model of operational and tactical readiness.

The model is designed around the relationship between individual capabilities, collective performance, and the operational environment.

The model demonstrates that readiness is formed through the interaction of several competencies. For example, physical preparedness supports the execution of a rescue task, but professional competence determines whether the task is performed correctly. Psychological stability

influences decision-making, while team coordination ensures that individual actions contribute to a common operational objective.

Technological preparedness strengthens the information available to personnel, although the final interpretation of information remains dependent on professional judgement and established procedures.

An important result of the conceptual analysis is the identification of two interconnected levels of readiness.

The first level is individual readiness, which concerns the competencies of each rescuer. It includes physical capacity, technical knowledge, psychological stability, and the ability to use assigned equipment.

The second level is collective readiness, which concerns the ability of the rescue unit to perform coordinated activities. It depends on communication, role distribution, shared situational awareness, leadership, and resource management.

These levels are interdependent. A team consisting of individually competent rescuers may still demonstrate insufficient collective performance if responsibilities are unclear or communication procedures are ineffective.

For this reason, training programmes should include both individual assessments and collective operational exercises.

The weighting coefficients should be established according to the professional specialization of the rescue unit and the types of emergencies it is expected to address.

For example, a technical rescue team working in confined spaces may require a different distribution of assessment weights from a firefighting unit. Consequently, the model does not prescribe universal coefficients for all rescue organizations.

The readiness index provides an overall description of personnel preparedness, but it cannot independently establish whether a rescuer is authorized or competent to perform every high-risk activity.

For instance, strong physical performance cannot compensate for an inability to use the required respiratory protection correctly. Similarly, good technical knowledge cannot compensate for failure to follow communication or withdrawal procedures.

Based on the integrated model, a six-stage training methodology is proposed.

Stage 1. Initial assessment and competency identification

The first stage establishes the existing readiness level of personnel. The assessment covers physical preparedness, professional skills, psychological factors, communication abilities, and technological competence.

The purpose is not merely to assign a general score but to identify specific weaknesses that may affect operational performance.

The results are recorded in an individual competency profile. This profile becomes the basis for subsequent training activities.

Stage 2. Individualized professional preparation

The second stage involves the development of training activities according to identified competency deficiencies.

Personnel with insufficient physical endurance may require additional conditioning, while rescuers experiencing difficulties with equipment operation may need more practical instruction.

Individualized preparation also considers professional specialization. The training requirements of firefighters, technical rescue personnel, chemical incident response teams, and medical rescue specialists are not identical.

Stage 3. Scenario-based practical training

The third stage focuses on the application of individual competencies in simulated emergency environments.

Training scenarios may include:

- Fire incidents in industrial buildings;
- Structural instability and partial building collapse;
- Transportation accidents;
- Hazardous chemical releases;
- Flooding and other natural hazards;
- Emergencies involving electrical installations;
- Incidents with restricted access and limited visibility.

Scenarios should be designed according to the actual responsibilities of the rescue unit. They must be conducted under controlled conditions with appropriate supervision and safety arrangements.

Stage 4. Collective tactical exercises

The fourth stage evaluates the ability of personnel to operate as a coordinated unit.

The exercises should include task distribution, communication procedures, information exchange, resource allocation, and interaction with other emergency response organizations.

Particular attention should be given to situations in which the initial operational plan must be adjusted because of new information or changing hazards.

The objective is to develop the ability to maintain coordination without compromising established safety requirements.

Stage 5. Performance assessment and operational analysis

The fifth stage involves the systematic evaluation of training results.

The following indicators may be used:

1. Accuracy of hazard recognition;
2. Correct selection of protective equipment;
3. Compliance with established procedures;
4. Quality of operational communication;
5. Correct execution of assigned tasks;
6. Ability to adapt to changing conditions;
7. Compliance with safety and withdrawal requirements.

Assessment should distinguish between technical errors, organizational problems, communication failures, and individual competency deficiencies.

Stage 6. Corrective training and continuous improvement

The final stage converts assessment results into further training activities.

Identified deficiencies should be classified according to their operational significance. Critical weaknesses require priority attention, while less significant deficiencies may be addressed through routine professional development.

The training cycle then returns to the initial assessment stage, allowing the organization to evaluate whether corrective measures have improved personnel readiness.

This six-stage process establishes a continuous development mechanism rather than treating training as a series of unrelated exercises.

The proposed methodology requires training scenarios to reflect the specific characteristics of the hazards encountered by rescue personnel.

The table demonstrates that a single training scenario cannot adequately assess all aspects of readiness. Each emergency type creates different technical, physical, and organizational requirements.

Consequently, rescue personnel should participate in a combination of general and specialized exercises.

Technological development creates additional opportunities for improving the preparation of rescue personnel.

Thermal imaging systems can support the identification of heat sources and the assessment of certain fire-related conditions. Unmanned aerial vehicles may provide information about inaccessible locations, damaged structures, or the geographical distribution of hazards. Geographic information systems can support the interpretation of spatial information, while digital communication systems can improve information exchange between response units.

Simulation technologies can also contribute to personnel preparation. Virtual reality and computer-based scenarios allow rescuers to practise hazard recognition, decision-making, and procedural sequences in controlled environments.

However, the introduction of digital tools creates new training requirements. Personnel must understand the capabilities and limitations of the equipment, recognize unreliable information, and avoid excessive dependence on automated recommendations.

Technology should therefore be considered a supporting element of operational readiness rather than a substitute for professional competence.

Discussion. The proposed model provides a basis for reconsidering how rescuers' readiness is developed and evaluated. Its principal feature is the integration of individual and collective competencies within one methodological framework.

Traditional training programmes may emphasize physical standards, theoretical examinations, or the operation of specialized equipment. Although these activities remain necessary, they do not always demonstrate whether personnel can combine their competencies during complex operations.

A more comprehensive assessment should examine the complete sequence of operational activities: recognizing the hazard, understanding the situation, selecting a protective action, coordinating with other personnel, performing the assigned task, and maintaining safe operational conditions.

This approach is consistent with the incident management principles reflected in ISO 22320:2018, which emphasize responsibilities, information management, resources, and cooperation [1]. The National Incident Management System also highlights the importance of coordinated command, integrated communications, and resource management during incidents [3].

Physical preparedness and operational performance. Physical preparedness is essential because rescue activities may require considerable energy expenditure and sustained work under protective clothing. However, physical conditioning should be connected with the actual demands of professional tasks.

A training programme based exclusively on general physical exercises may not adequately prepare personnel for the movements and physical limitations associated with rescue equipment.

Therefore, functional training should reproduce relevant occupational movements under controlled conditions. Examples include carrying equipment, moving through confined training spaces, maintaining balance, and performing tasks while wearing appropriate protective clothing.

Fatigue management is equally important. Excessive fatigue may reduce attention, coordination, and decision-making capacity. Consequently, training programmes should include appropriate recovery periods and procedures for monitoring the physical condition of personnel.

Psychological stability and decision-making. Psychological preparedness is not equivalent to the absence of fear or emotional reactions. Rescue personnel may experience stress even when they possess considerable professional experience.

The relevant professional requirement is the ability to maintain effective behaviour despite psychological pressure.

Research on human error demonstrates that performance may be influenced by the interaction between individual characteristics, task demands, and organizational conditions [4]. This suggests that operational failures should not automatically be attributed to individual negligence.

Training should therefore address attention management, situational awareness, communication under pressure, and the ability to recognize personal performance limitations.

Structured post-exercise reviews may also help personnel identify difficulties and improve their responses during subsequent training.

Team coordination as an operational requirement. Rescue operations are rarely performed by isolated individuals. They generally require coordinated activities involving several personnel, specialized teams, and external organizations.

The quality of coordination depends on clearly assigned responsibilities, effective communication, and a shared understanding of operational objectives.

The work of Flin, O'Connor, and Crichton emphasizes the importance of non-technical skills, including communication, teamwork, leadership, and decision-making in safety-critical environments [5].

For rescue units, these competencies should be evaluated through practical exercises. The assessment should examine whether personnel understand their assigned roles, communicate important changes, and follow the established command structure.

An additional training objective should be the ability to identify communication failures before they develop into operational problems.

Risk-oriented decision-making. An important methodological consideration is that readiness should include the ability to distinguish between an urgent task and an acceptable operational risk.

The presence of injured persons or threatened infrastructure may create strong pressure to intervene immediately. Nevertheless, an intervention that exposes rescuers to uncontrolled hazards may increase the number of casualties.

The principles of risk management described in ISO 31000:2018 provide a general framework for identifying, analysing, evaluating, and treating risks [6].

In rescue training, these principles can be applied through a simplified decision sequence:

1. Identify the hazard and available information.
2. Determine who may be exposed.
3. Evaluate the severity and likelihood of possible consequences.
4. Select an appropriate protective or operational action.
5. Confirm that personnel and equipment are suitable for the task.
6. Monitor changing conditions and reassess the situation.

This sequence should not be interpreted as a replacement for emergency service procedures or specialized technical protocols. It is a training framework intended to strengthen risk awareness and structured decision-making.

Digital technologies and the limits of automation. Digital monitoring and communication systems can improve the availability of operational information. However, the quality of decisions depends on whether personnel can interpret that information correctly.

For example, a thermal imaging device may identify temperature differences, but the interpretation of an image requires appropriate technical knowledge. Similarly, information from an unmanned aerial vehicle may reveal visible structural damage without providing a complete assessment of internal structural stability.

The use of artificial intelligence in emergency management may support information processing, prediction, and resource planning. Nevertheless, automated outputs should be verified against reliable information and professional assessment.

This limitation is particularly important when systems are used in environments with unstable communications, incomplete data, or rapidly changing hazards.

Practical implications and research limitations. The proposed framework may be useful for designing training programmes, developing personnel assessment criteria, and identifying weaknesses in rescue unit preparedness.

Its practical implementation should begin with a pilot assessment involving a limited number of personnel. The assessment instruments should be reviewed by experienced specialists, and the results should be compared with performance observed during supervised exercises.

Several limitations must be acknowledged.

First, the readiness model is conceptual and has not yet been validated through field experiments.

Second, the weighting coefficients of the mathematical index may vary depending on the professional specialization and operational responsibilities of rescue personnel.

Third, psychological preparedness is difficult to measure through a single numerical indicator. Its evaluation should therefore combine structured observation, scenario-based performance, and appropriate professional assessment.

Future research should focus on testing the proposed model in different rescue units, developing reliable assessment instruments, and examining the relationship between training outcomes and operational performance.

Conclusion. The operational and tactical readiness of rescuers is a complex professional characteristic formed through the interaction of physical capacity, technical competence, psychological stability, team coordination, and technological adaptability.

The study identifies the limitations of evaluating these competencies separately and proposes an integrated five-component model for developing and assessing rescue personnel readiness.

A six-stage training methodology has also been developed. It includes initial assessment, individualized preparation, scenario-based practical training, collective tactical exercises, performance evaluation, and corrective improvement.

The proposed mathematical index provides a conceptual instrument for comparing readiness components and identifying areas requiring additional training. The introduction of mandatory safety competency requirements is particularly important because it prevents deficiencies in critical skills from being concealed by high scores in other assessment areas.

The analysis also establishes that effective readiness development requires a balance between rapid response and operational safety. Speed alone should not be considered an indicator of professional competence. A well-prepared rescuer must be capable of selecting an appropriate action, coordinating with other personnel, using equipment correctly, and recognizing when operational conditions require reassessment or withdrawal.

The practical value of the proposed approach lies in its potential application to the development of specialized training programmes, personnel evaluation systems, and continuous professional development activities within emergency response organizations.

Further empirical research is necessary to validate the model, determine appropriate assessment weights, and establish the relationship between training indicators and the effectiveness of actual rescue operations.

Ultimately, the improvement of rescuers' readiness should be regarded as a continuous organizational process in which professional training, operational coordination, risk management, and technological development are treated as interconnected elements of emergency preparedness.

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