

Assessment of the Readiness of Search and Rescue Structures to Eliminate the Consequences of Emergency Situations

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Abstract: The article presents the scientific basis for assessing the readiness of search and rescue structures to eliminate their consequences in the event of an emergency. In addition, during the training exercises, the mechanisms of using the necessary tools for protection against natural and man-made emergency situations in the objects of the regions were mentioned.

Key words: accident, training exercise, emergency situation, material resources, continuous cooperation.

Introduction

Citizens act in emergency situations to do preparation according to events transfer issues, that is Conducting command-staff training exercises, leader in subsystems and in the process of eliminating the consequences of accidents in specialists, strength and tools management skills harvest to do methodology, population and protection of territories from natural and man-made emergency situations to do according to events transfer seeing the stages Let's go out.

Education exercises to be held, population and the territories natural and man-made emergency from situations protection to do according to events take to go regarding planning of documents allows to verify the authenticity, as well as of these activities whole complexes, economy of objects territorial location to oneself characteristic sides, work to release and other characteristics to account received in case practical work exit the opportunity identified.

An analysis of the studies carried out in this system may occur was natural and man-made situations from the consequences country population and of the economy security level, of the state stability provider the most important from factors one is considered. The most effective and efficient way to train the leadership and forces of this system is important from the forms one this command staff training exercises is considered.

Continuous mutual cooperation save standing - this emergency a leader in the process of eliminating situations and the important role of the operational headquarters from the tasks one being detected (Figure 1).

To carry out these activities leader and operational headquarters to their duties the following includes: first of all, combatant the task in execution of divisions mutual of their actions in sight caught order enough completeness and accuracy with to do increase;

secondly, to update this procedure in a timely manner, taking into account the changing situation to determine, additions input and development;

thirdly, mutual collaborative movements broken in case, him/her again restoration or repeatedly organization detected.

Emergency the situation to the surface of arrival randomness, cover the scale of the area to be captured, rapid decision-making, and citizen protection of forces high preparation demand being detected.



Figure 1. Interaction of the operational headquarters in the elimination of an emergency situation cooperation organization chart

Emergency situations under the circumstances planning and the main tasks of management, rational distribution of forces and means to find a way out, rapid response units and of personal content necessary number consists of determination (Fig. 2). To this end, increasing the efficiency of the operational units for the elimination of emergency situations, the resources of organizations a method of attracting forces and means that allows for a rational distribution application possible.

Method

Natural and man-made emergency situations elimination verb efficiency many in terms of material of resources existence with is determined. Material resources to eliminate emergency situations State reserves , emergency prevention and response of the system important structural part as It is being cleaned . Them creation prevention and control of emergency situations, their occurrence exit danger reduction and to the surface arrival possible was negative consequences reduction according to measures of the complex inseparable being part of expressed.

Victim population life security provision and citizen protection the effectiveness of work on the implementation of activities, departments it is mentioned that it depends on timely material and technical provision. Citizen protection of events material and technical supply issues successful to be implemented, exactly to be planned and correct organization to be achieved.



Figure 2. The force involved in the elimination of emergency situations and tools order of distribution

Fast high to increase the efficiency of operations of units priority owner was requirements in turn to put, known time inside divisions number change application possible.

In this case, emergency rescue divisions work efficiency assessment methods are as follows by parameters is carried out:

- emergency the situation elimination verb deadlines;
- rescued victims number (victims) general from the number in percentage);
- delivered damage quantity (possible) from harm interest-bearing in relation to, if emergency rescue units are not involved if);
- emergency the situation elimination to do spent resources;
- mutual together movable services (emergency the situation elimination verb forces and tools)

Uz in turn, emergency situations elimination verb for material resource reserves, the most important and is an integral component and prevention of emergency situations to reduce the risk of their occurrence, as well as possible negative consequences reduction according to events to the complex enters.

Regional lower systems material tools reserves further to predict and determine the economic model, create reserves and implementation of the mathematical modeling system of the placement process increase We provide the following information regarding : θ – planned of the era duration;

N – planned to the era need;

K – my master expenses;

S – time in unity material tools unity to keep value (price);

P – time in unity material tools shortage for fine;

λ – delivery to give speed, that is time in unity requested material tools quantity;

μ - need speed, that is, time in unity requested material tools quantity;

X – of reserves the most high level (save place volume);

T – leading to give period;

L – planned to the era correct visitor total expenses;

$L_{in.}$ – time to the unity corresponding average costs;

L- total costs for the delivery period. A priori in a way following inequalities is performed:

$$\mu < \lambda, (1)$$

$$S < P, (2)$$

Otherwise, there is no point in having a material support system. If condition (1) is false, then the system will not allocate resources. there is no way to accumulate, and (2) when the inequality is false, something It is wiser to pay a fine than to save, in this case to create a system was necessity disappears. Material supply the process in modeling, (1) and (2) inequalities correct because reception we will do.

If need continuous if, he/she in case speed μ permanent will be, that is,

It does not change during the entire working period. The fast delivery in the mathematical model giving, this delivery to give need speed (1) from quite a bit high indicates that. That is, at the beginning of its operation (1) system X based on inequality be in position and own almost immediately level X until the situation fills and T activity to show during will be busy providing material resources. T activity during at the end of the display, the amount of reserves tends to zero. This is it the system repeats the cycle. During the entire period of operation, the system, its tools reserves to keep spends.

Lt delivery to give during correct coming total expenses we will calculate. Total costs for the period of delivery , storage The total cost of the activity is the sum of the costs and overhead costs . The amount of reserves during the reporting period, linearly from the highest decreases (from a maximum) towards zero, then T during the time Average from X 50% is saved because reception will be done, this in case:

$$L = \frac{XST}{2} + K$$

$$t \quad 2$$

$$(3)$$

Average the cost finding for, delivery to give during correct coming money and T of value ratio determination need:

$$XST + K$$

$$L = \frac{2}{e \quad T}$$

$$e \quad T$$

If, T period during, system, delivery of giving the most high level to determine to your attention obtainable if we are, he/she in case need speed following ratio according to is determined:

This on the ground the following we find:

$$\mu = X$$

T

$$\mu = \frac{X}{T} \quad (5)$$

(5) putting the expression (4) we return the formula and the following to appear comes:

$$L = XS + K\mu$$

$$L = XS + K \frac{X}{T} \quad (6)$$

So acceptable X It is necessary to find that here is the average per unit of time Costs should be kept to a minimum. Also, X be a negative value inability factor into account to take necessary.

$$X > 0 \quad (7)$$

This problem in solution of the process stationarity to account to take necessary, this and L from Up to X was the harvest to zero to our equalization possibility gives, as a result we have following expression come it turns out:

$$S - K\mu = 0$$

$$2 \quad X^2$$

Him/her (7) of expression based on again to create, below cited expression

we get:

$$X = \sqrt{\frac{2K}{S}} \quad (8)$$

(8) expression (5) to if we put, following expression come it turns out:

$$2 K \mu$$

$$T = \frac{S}{\mu}$$

μ

(8) expression (6) put, this we find:

$$(9)$$

$$L = \sqrt{2K} \quad (10)$$

Expressions (8) - (10) are the model we are interested in parameters acceptable values gives.

Result and Discussion

Emergency situations under the circumstances fast planning and the main tasks of management, optimal distribution of personal content and fast divisions number from determining consists of. Such of the kind of issues exactly the solution of finding opportunity almost to the absence however, the use of official methods in this field is sufficient successful to be possible. This on purpose, fast of divisions has a high priority to improve operational efficiency selectively queuing requests within a specified time period divisions number change possibility It was revealed. In this case, accident- rescue divisions work efficiency assessment methods following parameters according to is carried out:

- emergency the situation elimination verb deadlines;
- rescued victims number (victims) general from the number in percentage);
- delivered damage quantity (possible) from harm interest-bearing in relation to, if emergency rescue units are not involved if);
- emergency the situation elimination to do spent resources;
- mutual together movable services (emergency the situation elimination verb forces and number of means).

Based on this, forces and means to eliminate the emergency situation verb strategy, of forces productivity (efficiency), located place and from them use expenses to account received in case division methodology offer will be done. Emergency the situation elimination verb for necessary was strength and tools to be calculated generalized based on the following methodology It was determined:

$$Q = \sum_{i=1}^n \frac{W_r}{V_j \cdot T_r} \cdot q_{P_r} \cdot q_{C_r} , \quad (11)$$

this on the ground: W_r – r-type works volume;

r – emergency in the situation rescue works types;

- r-type in the works j–division one unity by to be carried out average of works volume; V_j

j – r-type to work attraction done rescue of the department type;

– r-type the works to perform time;

– r-type in the works weather conditions correction coefficient;

- r-type in the works day time correction coefficient.

Power and tools calculation in formulas works time, of rescuers rest they receive to account not received in case will be given. of rescuers work shift, works complexity and speed to account received in case 3-5 the clock organization does. Of the works general The duration of the work should not exceed 12 hours per day. In this case, The duration of the rest period is determined as follows: every 45 minutes of work later – 15 minute, work shift since it ended later – 3 hours.

$$T_{\text{coat}} = T_3 \cdot 0,25(\text{coat}),$$

(12)

here: T_3 - the time given to eliminate the emergency situation. Per day shift with you to take time as follows:

$$T_{\text{сутки}} = \frac{T_3 + \left(\frac{T_3 \cdot 3}{T_S}\right) + T_3 \cdot 0,25}{24} (\text{coat}),$$

(13)

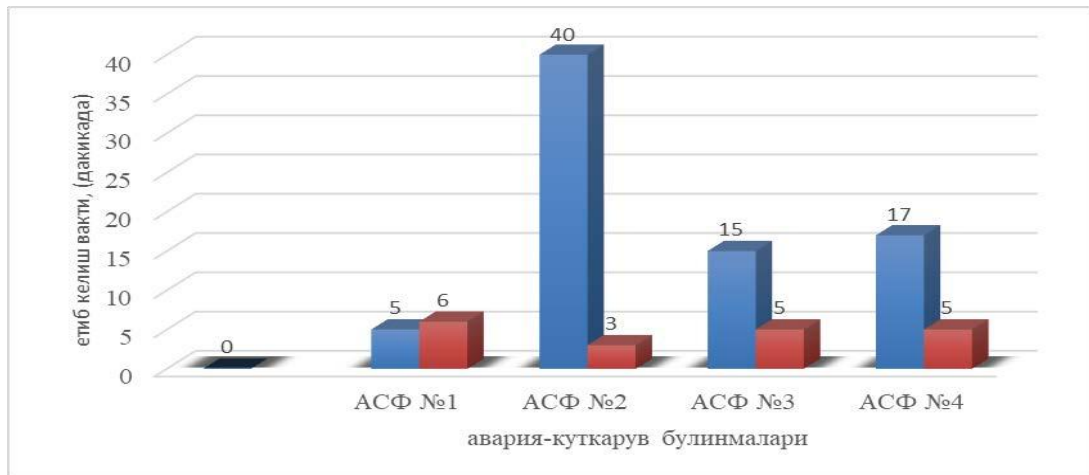
$$12 \quad (14) T_{\text{умум}} = T_3 + T_{\text{сменалар}} T_{\text{час}} + T_{\text{сутка}}$$

From that come came out in case, temporary dislocation in place waiting like time parameter finding offer was done:

$$3 \quad T_{\text{ф.в}} = T_1 + T_2 + T_3$$

$$T_{\text{ф.в}} = T_1 + T_2 + T_3 + T_{\text{кв}}$$

this on the ground, $T_{\text{ф.в}}$ – emergency the situation elimination verb time, T_1 – fast time to determine the situation, T_2 – time to make a management decision, T_3 – execution time of the adopted decision, $T_{\text{к.в}}$ – temporary dislocation in place waiting time.



3. Efficiency of emergency and rescue units, minimum and maximum the most many (maximum) arrived arrival time to account received in case assessment results

This in the case, emergency the situation elimination to do expendable time the following organization does:

$$T_{\text{ф.в}} = T_1 (T) \Delta T_1 + T_2 (T) \Delta T_2 + T_3 (T) \Delta T_3 + T_{\text{кв}} (T) \Delta T_{\text{кв}} \quad (15)$$

$$T_{\text{ф.в}} = \int_{T_0}^{T_1} T_1 (T) dT + \int_{T_0}^{T_2} T_2 (T) dT + \int_{T_0}^{T_3} T_3 (T) dT + \int_{T_0}^{T_{\text{к.в.}}} T_{\text{к.в.}} (T) dT \quad (16)$$

$$T_{\text{ф.в}} = (T_1 + T_{\text{к.в.}}) + (T_2 + T_{\text{к.в.}}) + (T_3 + T_{\text{к.в.}}) \quad (17)$$

Take visited analyses as a result, fast time, commander and to headquarters of the situation real in the conditions management according to of events whole volume (only training in practice completed not) to perform, to the divisions and – emergency rescue works and placed tasks to perform need was from time to time come came out in case determination detected.

On the practical creation of reserves of financial and material resources works, permanent nomenclature of reserves of material resources improvement (of resources) necessary in volume reserves, to districts with a very high probability of emergency situations in advance collection) direction take going need It will be determined . Resources to take sources determination and to account to take and this it is necessary to develop provision plans on the basis of Material resources it is necessary to find additional sources of acquisition. All needs one of time in itself satisfaction possible absence because of, material resources purchase to do slowly, sequence, exists financial resources and other to opportunities looking at them use identifiable plans are made.

Command-staff training exercises efficiency mainly, management decisions reception of being done speed, divisions strength and rational distribution of means and prevention of emergency situations

removal, elimination of actions of government bodies efficiency dependency cited. Efficiency in evaluation, All required work in the event of an emergency or crisis situation and to the developed strategy to eliminate its consequences suitable in a way is required.

Thus, the tasks set in conducting training exercises successful organization being and of divisions effective other cooperation provision for following recommendations offer done:

emergency situations elimination verb headquarters organization to do and management system again to create;

of material and technical resources spending scientific moderation and experience information based on of departments to them was reasonable need to determine;

of the regions transport system, geographical location, logistics of potential existence, security and various different emergency to situations relatively weakness to account received in case material supply logistics reasonable centers distribution.

Conclusion. The hunt exercises organization and to transfer improvement according to cited recommendations, emergency and crisis Making management decisions and responding quickly when situations arise return efficiency increase the opportunity gives, here, practice made it possible to organize the actions of the divisions effectively and on time .

1. Education to the exercises preparation to see and emergency situations elimination to do intended of divisions, emergency situations providing the necessary material resources to eliminate the consequences level increase possible giving strength and tools calculation precise input regarding ;
2. reserves of regional units are reasonable of distribution mathematician model work It's an emergency the amounts delivery to give for time and distance allows to optimize, which in turn material resources ensures the adequacy and rationality of distribution and human life immediately eliminates the immediate threat to health, emergency eliminate the consequences of the situation, minimize its scope and organization of priority life support. crisis and emergency in situations population.
3. headquarters training in training participating territorial organization of cooperative actions between departments according to, emergency and crisis situations to the surface when you arrive management decisions reception to do and fast answer return efficiency to increase enabling develop recommendations expense
4. Ways to improve the stages of training exercises This is without a trace in the field exists problematic of foreign countries to improve and resolve issues developed a set of proposals and recommendations based on the application of international experience I need to go out .

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