

Research on RMS Data Analysis and System Construction of Digitized Forces

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Abstract. The collection of Reliability, maintenance and supportability (RMS) data is the important basis for preparing to construct and deploy equipment support system and its support resource. It has an important significance for the construction of digital troops. This paper begins with the analysis of the characteristics of digital military equipment, followed by the study of the RMS parameters of typical digital equipment and then the RMS data system of military equipment was constructed. The research of this paper may establish foundation for planning and designing equipment support system and its support resource, and have very important realistic meaning and significant military value for raising the equipment support ability of digitized forces and accelerating digitized equipment forming combat effectiveness.

1. Introduction

Digital force is a new type of troops, which plays an important role in the future war. AS an important part of the construction of digital troops, equipment support system and its security resources are important to maintain and restore the equipment performance, and play an important role in the combat effectiveness of weapons and equipment[1]. Equipment support system and its own security resource planning and design can not be separated from the data acquisition and analysis of the digital equipment reliability, maintainability and security (RMS). RMS data acquisition and analysis is an important basis for the establishment and configuration of equipment support system and its security resources.

Compared with the western developed countries, our army equipment in the delivery of troops, due to the lack of data acquisition and analysis of RMS and the corresponding support system. It is difficult to solve problems making for the maintenance of equipment of the new force, resulting in delays in the new equipment form a protective barrier ability and fighting capacity.

It is necessary to collect and analyze the RMS data of the whole element equipment of the digital troops in order to make the weapons and equipment of the digital troops in a timely and reasonable to carry out maintenance analysis and planning and then ensure weapons and equipment capable of playing their due combat effectiveness[2]. Therefore, this paper begins with the analysis of the characteristics of digital military equipment, followed by the study of the RMS parameters of typical digital equipment and then the RMS data system of military equipment was constructed. The research of this paper may establish foundation for planning and designing equipment support system and its support resource.

2. THE BASIC THEORY OF KNOWLEDGE

2.1 The Main Features of Digital Equipment

Along with tentacles of military information technology into every field of national defense military weaponry, weaponry development will continue to be a direction of systematization and modularization and will gradually achieve information digitalization, accurate and remote, armed

with a light-duty and stealth. Digital weapons will achieve the cross time jump, so that the equipment new stage from mechanization to the information, and presents some new characteristics[3].

- (1) The core performance of weapons and equipment has a new breakthrough.
- (2) The operational effectiveness of weapon equipment can be in greatly improved.
- (3) The informatization degree of weapon equipment is higher and higher.
- (4) Weapons and equipment has a dual function of combat and protection.
- (5) The integration trend of weapon equipment is becoming more and more obvious.

2.2 Requirement Analysis Process of RMS Parameters for Typical Digital Equipment

In view of the particularity of the digital equipment, the traditional RMS parameter description can not be fully applicable, so the build of the RMS data system for new digital equipment is necessary. In the construction, the RMS parameters is selected which can describe the characteristics of the digital equipment system. The selection of RMS parameters is according to the main factors of the impact forces equipment support resource allocation and optimization in order to determine RMS parameters directly related to the configuration and optimization of equipment support resources[4]. And then, the system data of RMS is determined according to the equation of RMS parameter. The detail procedure is shown in figure 1.

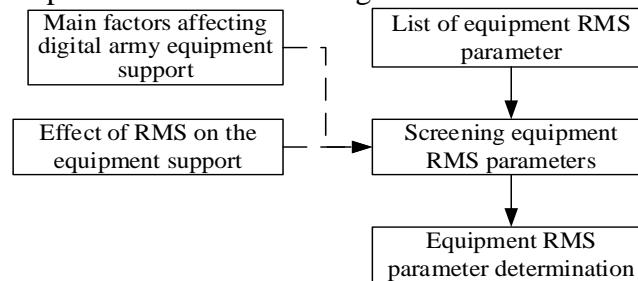


Figure 1 Analysis process of RMS parameter requirements

3. THE RMS PARAMETERS OF TYPICAL DIGITAL EQUIPMENT

The equipment digital RMS parameters can be divided into RMS comprehensive parameter, RMS single parameter and the guarantee system and its resource parameters according to the main factors of digitization army equipment support resource allocation and optimization and the influence of RMS on the equipment support resource allocation and optimization[5]. This paper focuses on the comprehensive RMS parameters. Different equipment can choose different comprehensive parameters. The commonly used comprehensive parameters can be divided into the combat readiness parameters, the success of the mission parameters and deployment parameters.

3.1 The Combat Readiness Parameters

- (1) Operational Availability(A_0)

Availability is one of the available parameters that can be related to the working time and can be expressed as the ration of the working time and total time. Its formula is shown in formula 1.

$$A_0 = \frac{T_U}{T_T} = \frac{T_U}{T_U + T_{DW}} = \frac{T_O + T_S}{T_O + T_S + T_{CM} + T_{PM} + T_{OS} + T_D} \quad (1)$$

In the formula, T_U indicates the time to work, T_T represents the total available time, T_{DW} represents inoperable time, T_O represents working time, T_S represents spare standby time, T_{CM} represents the total corrective maintenance time, T_{PM} represents the total time of preventive maintenance, T_{OS} represents the use of security time, T_D represents the delay time, A_0 is a parameter that is generally used in the initial stage of use or the subsequent use of the evaluation phase.

- (2) Utilization ratio (R_U)

The utilization ratio is one of the parameters that are required to be used in operation[6]. It is the ratio of the actual working hours in the calendar time. R_U is a parameter related to the readiness of equipment and the use of policy relevant. Its formula is shown in formula 2.

$$R_U = \frac{T_0}{T_T} \quad (2)$$

(3) Rate of tasks can be performed (R_{MC})

Rate of tasks can be performed represents the equipment can carry out a task within the specified time which has a ratio of the total time period. It is the use of parameters, general assessment in service stage. Its formula is shown in formula 3.

$$R_{MC} = \frac{T_{MC}}{T_T} = \frac{T_{FMC} + T_{PMC}}{T_T} \quad (3)$$

In the formula, T_{MC} represents at least the time to perform a task, T_T represents the total available time, T_{FMC} represents it can perform all of the tasks, T_{PMC} represents it can perform some of the tasks.

(4) Preparation time before the task (T_{STM})

Preparation time before the task is the time to prepare the equipment into the state capable of performing the required tasks. In other word, it is time operational status of forces before the battle usually required by the state to combat readiness (Sometimes forces can also be in stages).

(5) Preparation time out again (T_{TA})

The mission of continuous equipment needs from the end of the last task to start out again required to perform a task preparation time which can be synthetic single index of finer. This parameter can be used as a parameter, also can make the contract parameters.

3.2 The Success of the Mission Parameters

There are many factors influencing the completion of a task, such as the battlefield environment condition and equipment features, etc. Common mission success parameters is the degree of mission success D . It takes into account the probability to finish the task from the perspective of reliability and maintainability design characteristics, represented by the following tasks reliability and degree of damage and repair tasks. D is a use of parameters, the conditions can be defined as a contract parameter. Its formula is shown in formula 4.

$$D = R_M + (1 - R_M)M_M \quad (4)$$

In the formula, R_M represents the reliability of the task, generally equipped with a complete mission profile indicates reliability. If the maintenance (repair) is not allowed in the case of the task $D = R_M$. M_M represents the maintenance task, generally used in the mission profile of maintenance in the maintenance level and the prescribed period of time (repair) damaged equipment so that it can continue to fight probability.

3.3 Deployment Parameters

Deployment parameters are generally used to deploy a combat unit to represent the traffic. It is equipped with a system including the deployment of combat units and support resources (including equipment) the transport volume. The parameters evaluated in using stage.

4. RMS data system of military equipment

According to the previous analysis, this paper analyzed the RMS parameters of the equipment and constructed the RMS data system, which mainly analyzed the comprehensive parameters. The RMS parameters system of typical digital equipment is constructed taking the comprehensive parameters as the main research content. The content of parameter system is shown in table 1. The

RMS parameters system of typical digital equipment mainly includes parameter types, parameter names, data names, verification and timing verification method.

Table 1 Military equipment RMS integrated data

Parameter type	Parameter name	Data name	Timing verification	Verification method
Combat Readiness Parameters	Operational Availability	Operating hours	Production seeting Use phase	Experimental Verification Use assessment
		Standby time		
		total corrective maintenance time		
		total preventive maintenance time		
		use of security time		
	Utilization ratio	delay time	Use phase	Use assessment
		Operation time		
	Rate of tasks can be performed	total available time	Use phase	Use assessment
		Time to perform all tasks		
		Time to perform some task		
	Preparation time before the task	total available time	Design stereotype Use phase	Demonstration experiment Use assessment
		Preparatory work before task		
		Manpower requirements and tools limits for each job		
	Preparation time out again	Timing of the work	Design stereotype Use phase	Experimental Verification Use assessment
		Preparatory work before task		
Manpower requirements and tools limits for each job				
Success of Mission Parameters	Task completion	Timing of the work	Design stereotype	Experimental Verification
		Task reliability		
Deployment parameter	Transport volume of operational units	Task maintenance degree	Using parameters	Use evaluation
		Types of transport		
		Number of transport vehicles		

5. Conclusion

Reliability, maintainability and supportability parameter index system is the basis for the security of force and combat effectiveness of the digital equipment, which reflects the requirement of military equipment to ensure combat tactics[7]. In this paper, the analysis process of RMS parameter of typical digital equipment is proposed on the basis of the characteristics of typical digital equipment. Taking the comprehensive guarantee parameter as an example, the RMS parameters of typical digital equipment are defined and the RMS parameter system is constructed, which is of guiding significance for the selection of RMS parameters of digital troops. The research has very important practical significance and military value to improve the capability of digital troops and speed up the formation of the digital equipment.

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