

Research on How to Work Out Equipment Technical Data

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Abstract: Scientific and logical planning of technical data, which is the foundation to equip technical data efficiently, is an effective way to quickly transfer the equipment into combat effectiveness and support capability. With the transformation of war pattern and increase of equipment complexity, the critical role of equipment technical data in equipment support has become increasingly prominent. This paper focuses on the effective way to work out systematic planning method of equipment technical data. Beginning with equipment technical data concept and status, the paper studies the general idea of equipment technical data planning, makes deep analysis of specific planning process, and puts forward an instructive output model. It is expected to offer an instruction to scientific planning of equipment technical data, so as to accelerate transformation of new equipment into combat effectiveness, and improve equipment support capacity.

Introduction

Technical data, also known as the user technical data, is a general term for instructions, manuals, procedures, rules, lists, and engineering drawings etc. which are needed for equipment use and maintenance. As an important component of support resource, it usually covers equipment structure data, equipment operation data, equipment maintenance data, training data, support resources data, certification data and other data with paper version and electronic version[1-4]. The equipment technical data is one of the ILS elements. It plays an important role in effective equipment support. Scientific and systematic equipment technical data planning at the stage of equipment development can ensure that the technical data and new equipment be equipped to the army synchronously to accelerate transformation of new equipment into combat effectiveness and facilitate the whole system and whole life management of equipment.

General Idea

Equipment technical data planning is mainly conducted at equipment development stage, starting with the demonstration stage and ending with design determination stage. It is appropriate to prepare the equipment technical data according to life cycle stage by clarifying the specific work of each stage and figuring out the basic idea of technical data planning. The basic contents are shown in Table 1[2][5], and the general process of technical data planning is shown in Figure 1.

Table 1 . The Basic Contents in Each Phase of Equipment Technical Data Planning

Stage	Planning Content
demonstration stage	put forward overall requirements and constraints
scheme stage	confirm elements initially, propose the requirements for development, formulate writing plan, accumulate original design data and engineering data
engineering development stage	determine the composition, write and complete technical data, control the quality and progress, check and perfection
final stage	confirm the inspection and acceptance

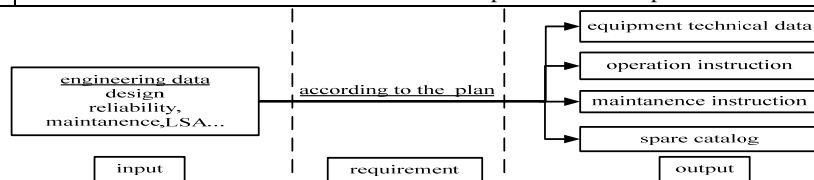


Figure 1. Equipment Technical Data Planning General Process

Specific Process

A. The General Requirements of Technical Data Planning

The equipment technical data planning process requires a clear and specific reference standard, in-depth analysis of actual support demands based on the specific equipment, scientific refining technical data constitutional elements, writing technical data with reasonable selection of work items in standard and avoiding reduplicated work while meeting the support demands. In the writing process, various data interfaces should be reserved to meet future equipment support developing demands and full consideration should be given to make up the lack of standard guidance. At the same time, it needs to strengthen the management and control of the process to make sure that the review comments in the transfer phase are fully carried out. And strict control of quality and progress is also needed to ensure equipment technical data planning synchronized with equipment design, and allocated with the equipment synchronously. In addition, with the development of information technology and the change of equipment support pattern, we need to gradually focus on the development of electronic technical data and emphasize the application of virtual technology, database technology and other technologies to promote the advancement of the integration, network and intelligence level of technical data.

B. The Proposal of Technical Data Support Requirements and Constraints [6]

Proposing reasonable requirements and constraints of technical data is a necessary prerequisite of scientific output of technical data planning and an important input of constraint equipment design. The equipment technical data requirements and constraints are raised based on a reference of similar technical data support system, considering different technical data requires different support strategy and making thorough analysis of current technical data background. The basic idea is shown in Figure 2, the specific content (reference) is shown in Table 2[7][8][9].

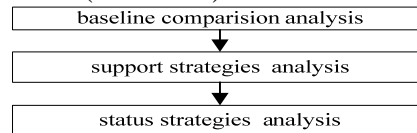


Figure 2. The Basic Idea of Equipment Technical Data Requirements and the Proposal of Constraints

Table II. Equipment Technical Data Requirements and Specific Content of Constraints (Reference)

Requirement	Specific Content	Constraint	Specific Content
content	accurate, concise, complete and interaction friendly	reading level	not beyond the level of *education
quantity	full	weight	single paper data does not exceed * g
delivery form	paper / electronic	cost	the single life cycle cost not exceed *
delivery progress	dispense the technical data with the equipment synchronously, allotment of other institutions in accordance with the requirements of the contract	technical level	electronic technical data not exceed *level; the paper technical data prepared in accordance with * standard requirements
interface	obligate upgrade and modify interface	error rate	error rate of one hundred less than *%
.....

C. Contents Determination

1) Elements and Quantity Determination

With complex composing, a wide variety of equipment technical data are selectively equipped to support subjects with certain kinds and quantity primarily according to the actual needs of equipment support, meanwhile, the complexity of equipment has an effect on the planning of equipment technical data. Usually, the user has the same number of the technical data with his/her equipment, the number of technical data needed for the maintenance institutions and management institutions is corresponding with their institutions number. Some data can also be appropriately added according to the actual needs of the training, management and other conditions when funds acceptable, we do not discuss here. To determine the process for variety planning output refer to Figure 3[2] (this paper based on the two level maintenance structural model), the common data types refer to Table 3[2].

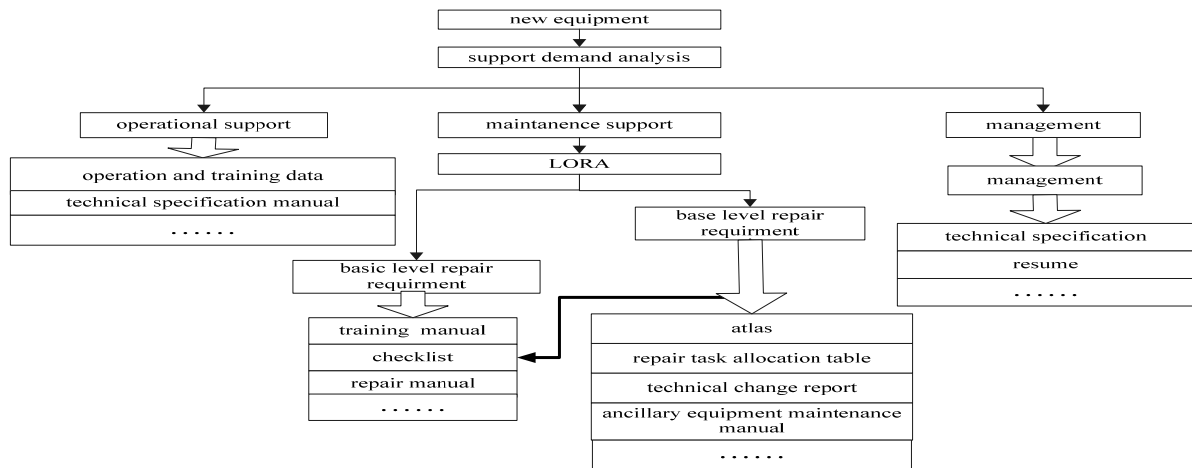


Figure 3. The Process Model to Determine the Type of Equipment Technical Data

Table III. Common Type of Technical Data in Equipment Support Work

User Object	Data Type	Data Use	Example
user	equipment data, operation data, training data	to provide guidance for the proper use and maintenance of equipment	equipment assembly diagrams, schematic work, technical manual, instruction manual, operating procedures, training materials
maintenance personnel	maintenance operation class data, all types of list / catalog	provide guidance for correct and effective maintenance	maintenance task allocation table, repair manual, rush-repair manual, spare parts and equipment catalog, wearing parts catalog, maintenance training materials
management personnel	PHS&T data, certification data, all types of list / catalog	provide guidance for scientific management	packaging level guide, resume, quality certification , corollary equipment catalog, technical data catalog

2) Contents Determination

The contents of each element refer to relevant requirements of Table 4. In the actual process, we can abstract appropriately according to the degree of complexity of the equipment, support requirements, the quality of support personnel, the support institution setting and other factors.

D. Output of Technical Data Planning

The output of equipment technical data planning is a recommendation list consisting of each element, making reasonable classification of technical data required by various support subjects, and determining equipment ways. The sample is as shown in Table 4[4-12] (in the actual process, the detailed contents of each element do not list).

Table IV. List of Equipment Technical Data Suggestions (Sample Table/ Reference)

Object	Support task	Content of technical data	The way of allocation
operation personnel	equipment operation and maintenance	a.manual: summary, technical parameter, main equipment components, operating procedures, transportation and storage, etc.	allocate with equipment (contents can be included in d)
		b. technical specification: summary, main tactical and technical index, system operating principle, subsystem operating principle, analysis of key and important device, etc.	allocate with equipment (contents can be included in d)
		c. equipment use and maintenance support manual: basic way of operation, common faults and troubleshooting, etc.	allocate with equipment (contents can be included in d)
		d. training teaching material: equipment structure, analysis of techniques and tactics, teaching plan, etc.	allocate with equipment(contents can be included in a, b, c)
maintenance personnel	repair support of equipment	e. repair task allocation table: tasks of every level of repair organization.	allocate with equipment; every repair organization
		f. repair manual: manual overview; content and methods of preventive maintenance; repair standards and repair inspection standards; maintenance support information; technical data of the machine, modules(whole and parts); etc.	ascertain the specific content according to the task of each maintenance organization, every repair organization
		c and d are the same as mentioned above.	allocate with equipment
		g. technical change report: provide alteration or modification of the product design to users with technical data.	allocate with equipment
		h. battlefield damage assessment and repair manuals: battlefield damage assessment method, common repair method, battlefield damage method of the main function system or important parts, etc.	ascertain the specific content according to the task of each maintenance organization, every repair organization
		i. checklist: spare parts and equipment catalog; corollary data catalog; critical / pieces / special parts catalog, etc.	allocate with equipment
		j. training teaching material: equipment structure and working principle, teaching plan, etc.	every repair organization (content in reference with a, b, f, h)
		k. atlas: system block diagram; circuit diagram; structure diagram; installation process diagram; sub-systems, important module repair flowchart; mechanical transmission diagram; etc.	ascertain the specific content according to the task level of maintenance organization,two and three level of repair (contents together with m)
		l. technical file: disassembly, cleaning, PCB production and base level maintenance requirements, etc.	base level maintenance organization
		m. design drawings: circuit, fit diagrams, wiring diagrams, information processing chart and other drawings related to base level maintenance	base level maintenance organization (contents together with k)
management personnel	management of equipment	n.resume: factory data registration form, annual work time registration form, failure registration form, changing registration form, serious damage registration table, transfer registration form, etc.	allocate with equipment
		o. certification data: the equipment and ancillary equipment quality certification; transport, storage, periodic inspection and transfer records; important notepad, etc.	allocate with equipment
		p. PHS&T data: packaging level, storage custody guide, transportation and handling requirements, etc.	allocate with equipment
		q. PHS&T data: packaging level, storage custody guide, transportation and handling requirements etc.	allocate with equipment

Conclusion and Outlook

Equipment support issue is a hot topic in the field of military and researches on the planning of technical data are particularly important. Technical data planning is a complex systematic program. It involves a variety of theories and methods such as supportability analysis, tradeoff analysis, comparative analysis and so on. In the process of planning, we should first meet the support requirements, in line with the relevant standards, and then make in-depth technical methods research to simplify the planning process and reduce the cost of demand. In addition, with the development of science and technology, a fully electronic technical data will become an inevitable trend. Electronic technical data will be widely used in the field of equipment support, equipment

training etc. Combining the advanced and sophisticated information database, virtual technology and other technology with the current analysis technology has become a main direction of the technical data planning. Apparently, research area of technical data planning is still broad, and it is a long way to improve equipment support capability by raising the level of technical data planning.

References

- [1]Military Standard:Requirment of Tchnical Data Planning and Write , unpublished.
- [2]Shan Zhiwei,Equipment Integrated Engineering, 1st ed., Beijing:National Defense Industry Press, 2008, pp.161,197-199.
- [3]Ma Lin, Design,Analysis and Evaluation of Supportability,1st ed.,Beijing:National Defense Industry Press,2012,pp.172-173,200.
- [4]Zhu Xingdong.Weaponry and Equipment IETM, 1st ed., Beijing:National Defense Industry press, 2009, pp.15-19.
- [5]James and V.Jones, Integrated Logistics Support Handbook, 3rd Ed., Sole Logistics Press,2006.
- [6]Zhu Xuezheng, Nie Kunlin, Hao Hui, Li Yan. “Research on How to Work Out Support Resources Constraint of Newly-developed Equipment”, ICSEM2012.
- [7]Tang Wei. “Synopsis of Military Standard 5788”, Military Standardization, vol . 1, Feb 2010, pp.31.
- [8]Shang Yanli, “Requirment and Degin of Technical Data”, Military Standardization, vol . 2, May 2004, pp.29-33.
- [9]Li Fei, “Study on Maintenance Concept Programming of Chemical Defense Equipment, unpublished.
- [10]He Chengming,Liu Fusheng and Sheng Ying,“QRMS-67,” unpublished.
- [11]Yuan Yongmei, Tang Wei. “Synopsis of Military Standard 5788”, Military Standardization, vol . 1, Feb 2010, pp.31.
- [12]Office of Secretary of Defense. Designing and Assessing Supportability in DOD Weapon Systems: A Guide to Increased Reliability and Reduced Logistics Footprint. New York: U.S. Department of Defense,2003.