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STUDY REPORT
CAA-SR-88-14

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EQUIPMENT READINESS CODE RULE SYSTEM (ERC RULES)

JUNE 1988

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PREPARED BY
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19 ABSTRACT (Continue on reverse if necessary and identify by block number) The study was conducted to provide the US Army Training and Doctrine Command (TRADOC) with an automated means for assigning equipment readiness codes (ERC) to the equipment in Army units. The codes identify the essentiality of unit equipment to performance of the unit mission. The study employed expert system technology and developed a microcomputer-based, production rule, expert system for use by TRADOC combat development personnel. The tool facilitates the consistent application of policy and practice in the assignment of ERC and thereby contributes to the management of Army logistic readiness. The study approach provided for: (1) identification of equipment uses and their associated ERC, (2) structuring of this information into an expert system, and (3) field test of the system. The principal results of the study are: (1) an initial expert system of 275 rules, (2) test of the system at 20 sites, with correct ERC assignments 77.8 percent of the time, and (3) upgrade of the system, based on review of the test results, to 296 rules.					
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EQUIPMENT READINESS CODE RULE SYSTEM (ERCRULES)

June 1988



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REPLY TO
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15 DEC 1988

CSCA-FSL (5-5d)

MEMORANDUM FOR: Deputy Chief of Staff for Operations and Plans, ATTN:
DAMO-ODR, Headquarters, Department of the Army, Washington, D.C. 20310-0450

SUBJECT: Equipment Readiness Code Rule System

1. Reference memorandum, DAMO-ODR, 19 October 1987, SAB.
2. Subject memorandum directed the U.S. Army Concepts Analysis Agency to develop an expert system to advise on the assignment of equipment readiness codes (ERC).
3. An expert system for ERC assignment was developed and successfully tested. This final report describes the development effort. A copy of the working system, in diskette form, accompanies this report.
4. I wish to express my appreciation to the staff elements at TRADOC HQ, the Army Artificial Intelligence Training Cell at Ft. Gordon, and the TRADOC schools and integrating centers which contributed to the study.
5. Questions and/or inquiries should be directed to the Assistant Director, Force Systems Directorate, U.S. Army Concepts Analysis Agency, 8120 Woodmont Avenue, Bethesda, MD 20814-2797, AUTOVON 295-1607.

E. B. VANDIVER III
Director



**EQUIPMENT READINESS CODE RULE
SYSTEM (ERCRULES) STUDY**

**STUDY
SUMMARY
CAA-SR-88-14**

THE REASON FOR PERFORMING THE STUDY is to provide the US Army Training and Doctrine Command (TRADOC) with an improved means for assigning equipment readiness codes (ERC) to the equipment in Army units using expert system technology.

THE PRINCIPAL FINDINGS of the work are:

(1) The concept of user-as-developer was successfully employed. Potential users of the system were provided with knowledge engineering training and facilities for development of individual expert systems. These individual systems were then integrated by the US Army Concepts Analysis Agency (CAA) into a single expert system.

(2) A field test of the system was conducted by potential users of the system at 20 sites. The test involved a representative selection of unit tables of organization and equipment (TOE) and a representative selection of equipments within these TOE. Correct ERC were assigned 77.8 percent of the time the rule system was used. As part of a review of the test results, the incorrect ERC responses associated with these representative equipments were identified and corrected. The upgraded rule system is expected to provide reliable ERC assignments under similarly representative field use conditions.

THE MAIN ASSUMPTION is that users of the system will be knowledgeable about the unit and the individual unit equipment in question, when the system asks for information about the uses of the equipment needed to assign the ERC.

THE PRINCIPAL LIMITATION is the dependence of the coding process on information about equipment uses in units which may not be available in the TOE documentation but is known to the user on an informal basis.

THE SCOPE OF THE STUDY was the equipment in the current L-series TOE or the most current TOE documentation available.

THE STUDY OBJECTIVE was to develop the existing set of prototype expert system rules into an operational rule system for use by TRADOC.

THE BASIC APPROACH included:

(1) The identification, collection, and integration of the factors associated with equipment use within Army units into a system of rules for the assignment of ERC.

(2) The test of the rule system to establish the level of performance achieved by the system under representative field use conditions.

(3) The upgrade of the system, based on the field test experience.

THE STUDY SPONSOR was the Deputy Chief of Staff for Operations and Plans, Headquarters, Department of the Army, who established the study objective and monitored the study activity.

THE STUDY EFFORT was directed by Mr. James J. Connelly, Force Systems Directorate.

COMMENTS AND SUGGESTIONS may be directed to the Director, US Army Concepts Analysis Agency, ATTN: CSCA-FS, 8120 Woodmont Avenue, Bethesda, MD 20814-2797.

Tear-out copies of this synopsis are at back cover.

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EQUIPMENT READINESS CODE RULE SYSTEM

CHAPTER 1

EXECUTIVE SUMMARY

1-1. **PROBLEM.** Logistic readiness requires that a unit have the equipment and resources necessary to carry out its mission. The variety of equipment in a unit makes it critical to distinguish among those equipments which make an essential contribution to the mission and those which make an auxiliary or administrative contribution. The applicable readiness regulation, Unit Status Reporting (AR 220-1), does not provide sufficient guidance to allow the necessary differentiation to be made on a uniform and consistent basis by the activities assigning these classifications in the form of equipment readiness codes (ERC). There is a need to bring increased systemization to the classification process and, considering the volume and diversity of equipment involved, to implement such a system on an automated basis.

1-2. **BACKGROUND.** It was demonstrated in a prior prototype effort (Reference 1) that it is possible to meet the needs for systemization and automation using the emerging technology of expert systems. These systems provide expert advice by drawing upon an extensive set of rules dealing with factors which influence selection among alternatives such as equipment classification.

1-3. **SCOPE AND LIMITATIONS**

a. The scope (domain) of the rule system is the unique equipment use situations in the existing, L-series, company-size level, tables of organization and equipment (TOE). Where L-series TOE were not available, the most recent series of TOE documentation was used.

b. Use of the rule system anticipates a user who is knowledgeable about the type unit and the unit equipment in question. The information available to such a user may exceed that available in the TOE documentation. As such, the operation of the system relies on information not currently available in existing TOE data systems.

c. Changes in technology, doctrine, or force structure subsequent to the development of the system may generate new coding situations. These will have to be detected, and the rule system updated, by a system management process established for this purpose.

1-4. **TIMEFRAME.** Current (1988).

1-5. **KEY ASSUMPTION.** The users of the system will be sufficiently knowledgeable about the type unit and its equipment to respond appropriately to system queries about the uses of the equipment.

1-6. **APPROACH AND METHODOLOGY.** The study involved two basic areas of work:

- **Rule System Development.** The identification, collection, and integration of the factors associated with equipment use within units into a system of rules for the assignment of ERC.
- **Rule System Validation.** Testing of the rule system to establish the level of performance achieved by the system in the assignment of ERC under representative field use conditions.

The principal activities in each area and the relationships among the activities, are shown in Figure 1-1. Activities where the Training and Doctrine Command (TRADOC) personnel provided a major contribution in the form of equipment readiness coding experience and expertise are shown as shaded blocks.

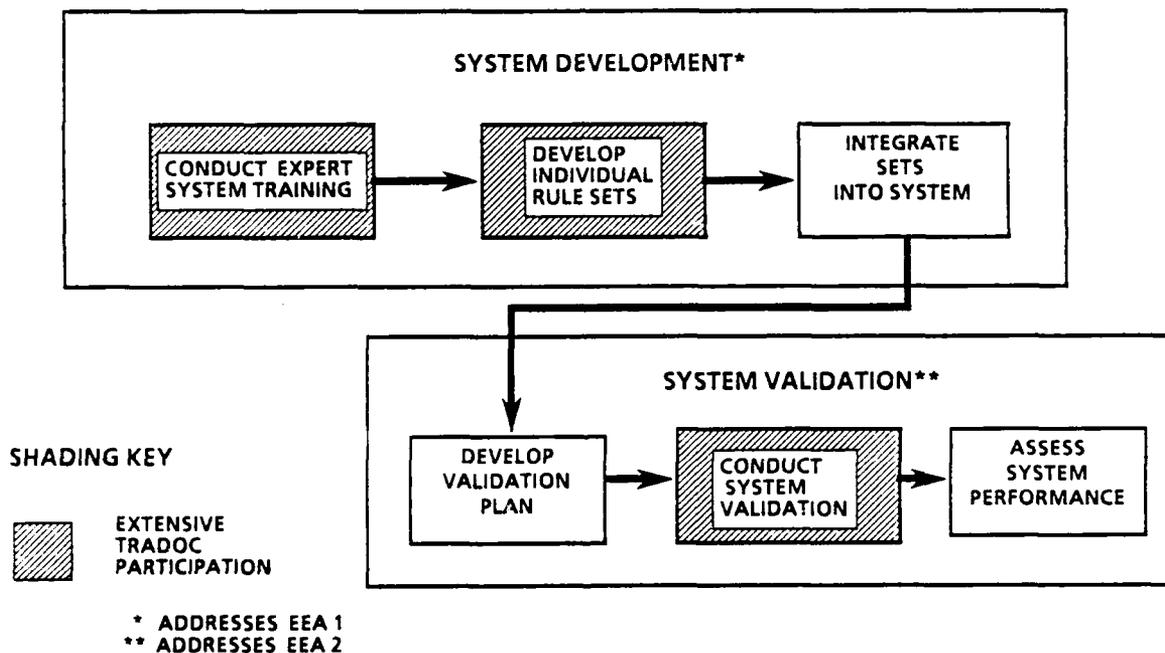


Figure 1-1. Study Areas and Activities

1-7. **ESSENTIAL ELEMENTS OF ANALYSIS (EEA)**

a. **EEA 1:** Given that the ERC assignment expertise resides in a community of experts and not a single expert, how effectively can the expertise be combined into a single system? The concept of user-as-developer was employed. Potential users of the system were provided with knowledge engineering training and facilities for development of individual expert systems. These were then integrated by CAA into an expert system of 275 rules.

b. EEA 2: Can ERC be reliably assigned using the rules in the rule system?

(1) A field test of the system was conducted by potential users at 20 sites. The test involved a representative selection of unit TOE and a representative selection of equipments within these TOE. Correct ERC were assigned 77.8 percent of the time the rule system was used.

(2) Given the innovative nature of the system development, no quantitative criteria for satisfactory rule system performance were established before the conduct of the test. The basic purpose of the validation was to establish a benchmark level of performance achieved by the rule system. The benchmark will provide a reference, against which subsequent measurements of system performance can be compared, as the system matures with use.

(3) As part of the review of the test result, the sources of the incorrect responses were identified and corrected. On the basis of the initial test results and the upgrade effort, it is anticipated that future measurement of the rule system performance may be expected to provide reliable ERC (i.e., exceed 95 percent correct ERC response).

1-8. OTHER KEY FINDINGS

a. Use of the rule system to identify the mission-essential equipment in a unit (i.e., pacing items/core equipment) was included on a sample basis in the rule system to demonstrate the manner in which the expert system could retrieve these facts from a fact table. The resulting size of the system including this sample of equipment facts is large. When extrapolated to the size of file with the full complement of equipment facts for all types of units, the system size will be impracticably large for the memory capacity of the field microcomputers hosting the system. The manner of storage of this mission-essential information must be reevaluated as part of the ongoing system management and maintenance activity.

b. The current development of mission essential tasks lists (METL) and their associated equipments is appropriate for inclusion in the system. The METL concept largely parallels the pacing item/core equipment concept demonstrated in the rule system, however, several implementation issues centered on the definition, organization, and scale of the information must be addressed to accommodate the METL concept.*

*METL concept has not been implemented in the present study.

CHAPTER 2

PROBLEM OVERVIEW

2-1. INTRODUCTION. This chapter describes the logistic readiness problem associated with the assignment of equipment readiness codes. It summarizes the current practice in the assignment of the codes. It describes the manner in which an automated system of coding, using the emerging technology of expert systems, addresses the problem in a new and more effective way. It includes a reference to contemporary developments considering ERC assignments.

2-2. CODES DEFINED. The ERC designate the essentiality of the equipment to the unit mission. The codes, as defined in AR 220-1 (Reference 2), are assigned at one of three levels shown in Table 2-1.

Table 2-1. Equipment Readiness Codes (ERC)

Code	Definition
ERC-A*	Equipment <u>essential</u> to and employed directly in the accomplishment of assigned operational missions and tasks.
ERC-B	Equipment which <u>supplements</u> primary equipment or takes the place of primary equipment should it become inoperative
ERC-C	Equipment <u>supportive</u> to the performance of assigned operational missions and tasks.

*A subset of ERC-A equipment, considered especially essential, is designated as "pacing items" and coded ERC-P.

The codes are assigned by TRADOC TOE documentation specialists to items of equipment in company-size units.

2-3. PROBLEM

a. Problem Areas. Problems with incorrect ERC code assignments surface in two distinct but related areas.

(1) **Operational Area.** Units in the field must report readiness on a monthly basis. Under the status reporting regulation (AR 220-1), all equipment designated ERC-A (i.e., equipment most essential to the unit) must be accounted for by indicating the quantity onhand, available, and ready to immediately perform the mission of the unit. The readiness is measured as the percentage of the ERC-A equipment available and ready, as measured against the required quantity as it appears in the unit TOE. It must be at least 90 percent for a C-1 readiness status (highest readiness) and 80 percent for a C-2 status. For items of equipment in short supply or deadlined for maintenance, the issue of the ERC-A coding of an item of

equipment may be questioned. Field commanders may elect to dispute the coding by questioning the rationale for the ERC-A designation. The commanders, in fact, have direct access to the criteria for the assignment of the ERC. The criteria appear as an appendix to the regulation which provides the guidance for reporting the unit status (AR 220-1, Appendix B).

(2) **Equipment Distribution Area.** The shortages of equipment in the field, in part, originate with the allocation of equipment to units. This allocation is carried out semiannually by the Total Army Equipment Distribution Program (TAEDP) and affects Army units worldwide. The TAEDP computer program considers both the priority of the unit, as reflected in the Department of the Army Master Priority List (DAMPL) and the ERC of the equipment in the unit in making the allocation. Incorrect ERC assignments can cause some units to receive equipment more appropriately distributed to others.

b. **Logistics Readiness Impact.** The collective impact of inappropriate ERC assignments in generating shortfalls in these areas has consequences for logistics readiness, that is, "the state of preparedness of a unit or activity to carry out its mission with respect to the availability and operability of materiel and resources required to maintain an operational capability" (AR 11-14). It is this larger context of the consequences of the inappropriate codes, rather than the mechanics of their assignment, that have prompted the rule system development effort.

2-4. CURRENT PRACTICE

a. School Activity

(1) The ERC are assigned by the TRADOC service schools as a part of the TOE documentation process. The codes are assigned, based on the judgment of the individual combat developer documenting the individual TGE. This judgment is guided by the regulation applicable to the codes, cited earlier, namely AR 220-1, Appendix B. The judgmental factor is significant in that Appendix B does not define all the possible coding cases. The appendix provides:

- Definitions for the three code levels involved (ERC-A, ERC-B, ERC-C).
- Guidance by means of illustration for several cases of equipment utilization.
- An extensive table of coding examples organized by equipment categories.

(2) In spite of this detail, not all equipment types are covered. In those cases where an equipment supports several activities, the guidance provides for "variable coding." In addition to these shortcomings, there are also situations where understandings have developed over time at the school level, which result in specific codes being assigned for specific equipment usages not directly relatable to the guidance.

(3) As a control on the ERC assignment process, TRADOC HQ requires (Reference 3) that a school, along with the submittal of the completed TOE, certify that the ERC assignments conform to the regulation (AR 220-1).

b. Headquarters Activity. Current practice includes review of the completed TOE document, including the ERC assignments, by the TRADOC HQ TOE review board. This board can challenge and adjust the code assignments made at the school level.

2-5. EXPERT SYSTEM TECHNOLOGY

a. Rule-based System. Historically, expert systems were developed to capture the knowledge of a particularly well-informed person, so that others could have access to it, in the absence of the person. The challenge in such a system is to establish a way of representing the information in a manner compatible with machine (computer) technology. The problem may be solved for a number of applications by reducing the knowledge to a set of rules. A rule is two sets of statements, paired so that "if" the first set of statements is true, "then" the second set of statements is also considered true. Using this "if-then" approach, a set of rules are produced which collectively capture all the significant issues in the problem addressed. The rule set includes a working memory and control features to search through the rules, guided by queries to the system user for pertinent information. The search continues until a useful outcome is generated or the system exhausts its rule set with no useful outcome.

b. Other Systems. Other strategies for knowledge representation (reference 11) such as the use of semantic networks, frames, and logistical expressions are available for implementation of expert systems. They are particularly applicable where there is considerable knowledge depth (i.e., relationships-within-relationships) to be represented. In the case of ERC assignments, the emphasis was placed on a shallow or surface knowledge representation so that all parameters contributing to the ERC assignment could be represented in a single structure (i.e. a single production rule). This use of a one-to-one relationship between coding situations and code assignment provides the most straight forward manner of identifying the rationale of the ERC selection to both the system user and others with ERC review responsibility. Examination of the rule (in clear English text) provides all the pertinent information about the assignment).

c. Criteria for System Use

(1) Expert systems are basically used in decision support situations which have the following characteristics:

- Limited set of choices, selected on a judgmental, rather than algorithmic basis.
- Extended set of choice selection factors.
- Need for repeated, if not ongoing, decision activity.

Expert system technology can deal effectively with such decision situations. It provides the decisionmaker with an automated tool incorporating all the

appropriate knowledge about the decision situation and the means (a search process) for guiding the user to an appropriate choice. Considering this role of providing assistance to a decisionmaker, it is more appropriate to refer to such a system as an ADVISOR (what it does) rather than EXPERT SYSTEM (where it came from).

(2) It can be observed that the decision situation faced by the combat developer in the assignment of ERC meets the criteria for such a system, i.e.:

- There is a limited set of outcomes, namely selection of ERC-A, ERC-B, or ERC-C.
- A diversity of considerations is present in the selection of an ERC, namely the possible combinations of equipment types and their uses within units.
- The decision is faced a number of times for each TOE (but not necessarily for each equipment in the TOE), depending upon the experience level of the decisionmaker.

d. **Benefits.** The expert system is a well-documented collection of knowledge, albeit in rules form. It provides several benefits of institutional value, as well as providing support to the individual decisionmaker as follows:

(1) **Visibility.** The system as a collection of rules can inherently "explain" its choice by citing the rule(s) involved in the choice. This is a benefit, in that the rationale for the choice is public information and not a private thought process. This is not to say that it is intrinsically correct, but that there is now an objective basis for discussion and review for the selection.

(2) **Consistency.** The system is readily exportable and, as such, can be available throughout the TRADOC school community to produce consistent coded results.

(3) **Continuity.** Where there are instances of personnel transition, the system can provide a fixed reference for assignment expertise by providing both entry-level and experienced personnel with authoritative coding guidance.

2-6. **CONTEMPORARY DEVELOPMENTS.** There are several current activities which bear upon the basic issue addressed by the study, namely the identification and categorization of the relation of a unit's equipment to its mission. They are identified in the following paragraphs as having a potential for interaction with the study results in the future.

a. **Mission Essential Task List (METL).** The Assistant Deputy Chief of Staff for Force Development (FD) is advocating an ERC assignment concept based on the generation of a mission essential task list for a unit. The list, as prepared for each unit, is based on the unit's missions as identified in the individual unit's Operations Plan. The equipment system(s) which directly implement the tasks are identified as the METL systems, and

include the equipment which support the METL systems. The METL systems and their support equipment are coded ERC-A, without reference to the TOE units in which they occur. It is possible, and even likely, that the METL system support equipments will not be in units in which the METL systems occur. To apply this concept, the support equipment train must be explicitly traced through the supporting TOE units, in order to properly code the support equipments as ERC-A. TRADOC HQ is currently responding to the METL systems concept with a concept of doctrinal mission-tasks which will provide comparable ERC assignments. The doctrinal mission-tasks are more generic in nature than the operationally derived mission-tasks, but should otherwise be in correspondence with the operational mission-tasks.

b. **Major Item System Map (MISM).** The significance of ERC assignments has surfaced in another context in work recently completed by CAA for the materiel development and acquisition community (Reference 6). The issue addressed was the problem associated with determining the mix of major materiel items and munitions for major item system requirements. The study was concerned, in part, with the role the ERC might play in the consideration of the mix. The principal study focus, however, was the MISM, prescribed by AR 5-23. The MISM provides for the linking together of the items which support a particular major item of equipment. While the system map provides equipment linkages, there is no further indication of the nature of the support provided. Each item in the system map has an ERC but most of the equipments in the MISM are, by consideration of their major item support role, coded ERC-A. This broad assignment of ERC-A does not provide a basis for selecting, or otherwise prioritizing, the desired support equipment mix. An additional consideration is that the ERC, per regulation, are coded with respect to their support role in the unit to which they are issued, which is not necessarily the unit in which the major item itself is located. There is thus a conceptual gap between the TOE-centered ERC and the system-centered MISM. Further consideration of this TOE-centered versus system-centered support perspective is needed.

c. **TOE Builder.** TRADOC HQ is presently developing a minicomputer-based system for the automation of the TOE unit documentation process. The TOE are to be constructed by the system from a user specification of the mission/mission-tasks to be performed by the TOE unit. The system references its logic and data sources to construct a TOE which has the personnel and equipment assets appropriate to the intended tasks. The system, within its own program design organization, embodies a counterpart of the METL concept to convert tasks to equipment and a counterpart of the MISM/ERCULES concept to identify the necessary support equipment train. Additional program features fill out the TOE with those items of equipment needed for unit and personnel survivability on the battlefield.

2-7. **SUMMARY.** This chapter identified the consequences for unit status reporting and equipment distribution associated with the incorrect identification of ERC. The current practice involving judgement in ERC assignment is described. The use of expert system technology and its relationship to the problem is discussed along with a review of related efforts in dealing with the identification of essential items of equipment.

CHAPTER 3

EXPERT SYSTEM TOOL

3-1. **INTRODUCTION.** This chapter describes the selection and operation of the expert system tool used to construct the rule system.

3-2. **TERMINOLOGY.** The following terms, associated with expert systems technology, are provided for reference.

- **Expert system** - a computer program that uses knowledge and inference procedures to solve problems that normally require human expertise for their solution.
- **Knowledge base** - the specific collection of knowledge, structured as a set of rules, within an expert system.
- **Domain** - the nature and extent of the subject matter captured in the knowledge base that is the area of expertise of the system.
- **Inference** - the process by which an expert system works through the set of rules in its knowledge base to a conclusion, using information accumulated during the process to select the next rule to be evaluated.
- **Shell** - the expert system, less a knowledge base, as purchased from a vendor for development purposes.

3-3. SELECTED TOOL.

a. The expert system tool selected for the development of the rule system was basically the same type as the one used in the development of the prototype system (Reference 5), namely, a commercially available, micro-computer hosted, rule-based expert system. Development on the microcomputer host would allow the system to be readily ported to the microcomputers available at the field sites where the rule system would be used. The rule-based (production system) approach to the knowledge representation continued to be preferred for the convenience and flexibility it provided in capturing the variety of individual equipments uses, without the involvement of formal structures such as frames and networks. Such structures require more elaborate coding techniques and involve a loss of the clear English text representation allowed by the production rule approach.

b. For system management and maintenance purposes, the specific production rule expert system shell used for the rule system development was changed from the one used for the prototype system development, (EXSYS System Development Package, EXSYS, Inc., Albuquerque, NM) to the M.1 Knowledge System, vended by Teknowledge, Inc., Palo Alto, CA (References 9 and 10). The M.1 shell was procured in a lot quantity under contract with Teknowledge by the US Army. It is used as the instructional vehicle for training in expert systems by the Army Artificial Intelligence Training Cell (AITC), Fort Gordon, GA. As part of the rule development process (see Chapter 4), it was determined that the AITC would provide training to CAA and TRADOC personnel and, as part of the training activity, would make copies of the M.1

shell available to CAA and the training participants. Use of the M.1 shell under these circumstances offered the following management and maintenance advantages. It provided the development effort with a sophisticated, microcomputer-based shell. It provided a common expert system focus for all those involved in the development effort. It provided copies of the shell for use at the field locations without additional procurement expense or software license complications. Finally, it provided TRADOC with a base of technical support at the AITC for the operation of the system into the future.

3-4. **DESCRIPTION OF SELECTED TOOL.** The expert system tool selected for use in the study is a "rule-based" expert system. That is, it is a collection of equipment coding rules organized into a "knowledge base." It includes an "inference engine" which operates to select and apply the rules. The expert system organization is illustrated in Figure 3-1. In addition to the knowledge base and inference engine, there is a user interface which provides for user interaction with the system, and a working memory which holds information on the status of the rule processing.

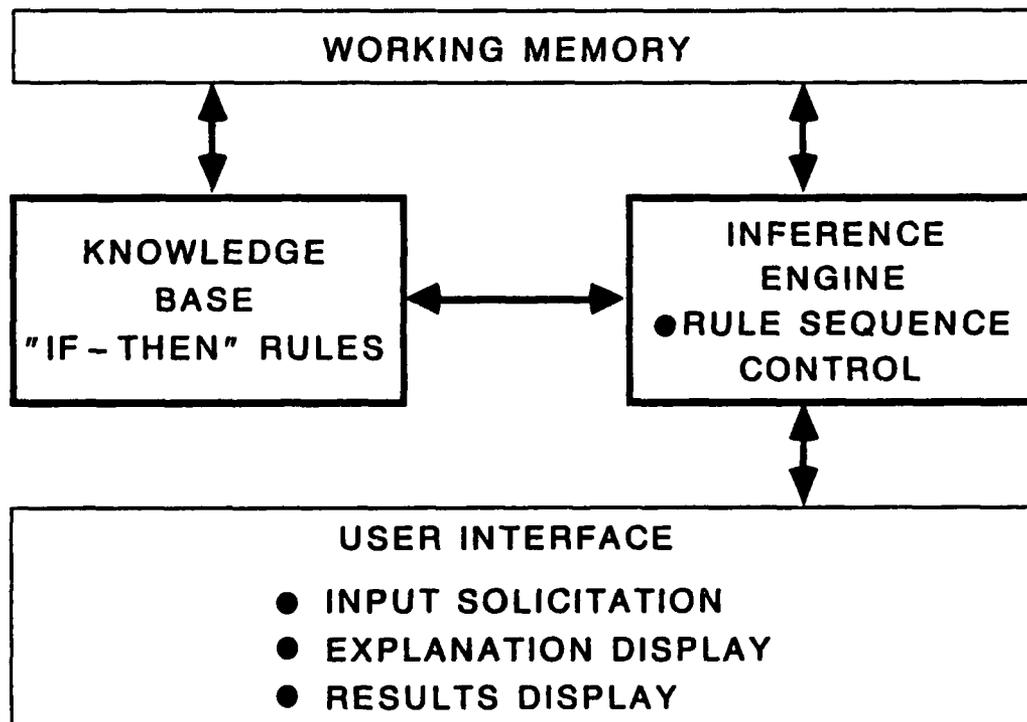


Figure 3-1. Organization of an Expert System

a. **Knowledge Base.** The knowledge base of a rule-based system shown in Figure 3-1 is essentially an unstructured area of computer storage into which the rules are loaded. The organization of the rules is provided by the system developer and is reflected in the sequence in which the rules are loaded into the system. The rule sequence may be varied to improve the efficiency (on average) with which the rules are searched by the "inference engine," but otherwise has no significance in the system operation. The rule organization, however, is significant to the system developer (also referred to as the knowledge engineer). The rule organization, as initially prepared by the developer in outline form, identifies the blocks of knowledge elements within the system and the preferred sequence of the blocks as loaded into the system. As the development continues, the focus shifts to the knowledge structure within the blocks, and the organization serves to identify gaps in the completeness of the knowledge and the consistency among the individual knowledge elements. Lacking this consistency and completeness, the system will fail catastrophically when an unanticipated condition is encountered during rule processing. Due to this precipitous failure behavior, expert systems are said to be "brittle" structures.

b. **Inference Engine.** The "inference engine" shown in Figure 3-1 is the computer term given to the logical processing carried out by the system, which allows it to work through the rules in the knowledge base. Unlike traditional programming, there is no strict sequential flow to the processing. Rather, a goal* for the system is established, namely, find an ERC. A search process, controlled by the inference engine, is then used to determine what is currently known about achieving the goal and what further information is needed. A path is traced back from the goal through the rules to establish what must be known in order for the goal to be satisfied. The search process used is referred to as "backward chaining" or "backtracking." As the backward path is traced, the system asks for input from the user. The user responses guide the selection of the next rule considered appropriate. Each item of equipment is thus processed by a particular path appropriate to the equipment's purposes in the unit as determined by the user responses to the system's queries. This path-following activity is not apparent to the user. All that is apparent to the user is a series of questions, culminating either in a goal selection (ERC assignment), or in an indication that no goal selection (no ERC assignment) is possible, based on the inputs provided.

c. **User Interface.** The user interface, as shown in Figure 3-1, supports three operations as follows.

(1) **Input Solicitation.** As the inference engine backward chains through the rules in the knowledge base to satisfy a particular goal, it reaches a point where no additional rule can provide the needed information. It then requests the user for an input corresponding to the first unknown item in the rule and follows this with additional requests for other unknown

*In the present system development, the goal is replaced by an M.1-unique "initialdata" statement which serves the same purpose.

items, with each item forming part of the logic of the goal selection. For the system in the present study, the request for input is in the form of a multiple choice. One of the presented choices is selected by the system user as a response. In many multiple choice situations, a null response ("none of above") is provided. If this selection is made, the system defaults to a message that no ERC can be advised. While this response is of no immediate value to the user, the user has, in effect, identified a shortcoming in the system knowledge base which should be corrected.

(2) **Explanation Display.*** At any point where the system poses a question, the user may ask why the input is needed, by entering the command "why". In response, the system will display the rule being processed. The rule will show how the input requested is embedded with other information in the rule. Additionally, the system can identify all the information accumulated to the present point of rule processing.

(3) **Results Display.** The output of the expert system is the selection of a particular value for the goal. For the present study, the goal is the selection of an ERC assignment for a particular unit equipment namely, ERC-A, ERC-B, or ERC-C.

d. **Working Memory.** The working memory maintains track of the particular backward chaining through the rules corresponding to the goal under evaluation. The working memory also accumulates the information input by the user, as well as the information concluded by the system as rule conditions are found to be true. It references this information to answer user queries about why inputs are needed and user queries about the current state of knowledge about a particular goal selection.

3-5. **SUMMARY.** This chapter described the basis for the selection of the expert system tool used in the development of the rule system. It discussed the organization of the system into a knowledge base containing the rules, and an inference engine which carries out the search of the rules. It also described the working memory which keeps track of the search process and accumulates the knowledge accumulated during the search process. Finally, it described the user interface which: solicits information from the user to guide the search, explains the need for information, and presents the results of the system operation.

*The explanation capability is of limited interest in the present system development because all coding of interest is carried out in a single rule (see Chapter 4, paragraph 4-4d) and the number identifying the rule is cited as part of the display of the coding result.

CHAPTER 4

RULE SYSTEM DEVELOPMENT

4-1. INTRODUCTION. This chapter describes the rule system development activity, that is, the activity associated with the collection and organization of the information on readiness coding into a system of rules for use within an expert system.

4-2. KNOWLEDGE ENGINEERING TRAINING

a. Training Needs. The development of an expert system requires a substantial contribution of information from the individual(s) expert in the subject matter under consideration. In the case of the ERCRULES development, this expertise is distributed across the TRADOC integrating centers and schools which have ERC assignment responsibility as part of their TOE documentation mission. It was recognized early in the development that the most effective use of the available expertise would be made if the individuals involved could be:

- Isolated from the demands of immediate work activities.
- Familiarized with the basic concepts of organizing knowledge.
- Familiarized with the use of a microcomputer and software as tools for use in expert system development.

The concept of familiarizing users with the expert system technology and then allowing them to proceed with the rule development (i.e., the user-as-developer) is one basic approach to the system development process. The other basic approach calls for the system development to be carried by our system design specialist (a knowledge engineer) involving the expert as an information resource. The approach used in the study is biased towards the user-as-developer approach with support from the system design specialist, particularly in the areas of system integration and user interface.

b. Training Program. The three training needs were met by utilizing the resources of the AITC at Fort Gordon, GA. The AITC is the designated Army facility for AI training and has staff, classrooms and individual computer workstations, all of which uniquely supported the needs of the system development. With the cooperation of the Director of the AITC, an 8-day training program, combining expert system training and development of ERC assignment rules, was developed. The program is a modification of the 2-week training program periodically offered at the facility in "Knowledge Engineering and Expert Systems" (References 7, 8). The modification was made to focus the training on the particular needs of the study, namely, harnessing the group expertise associated with the ERC assignment and doing this in the shortest possible time. The syllabus of the workshop sessions is shown in Exhibit 4-1. The program of training and rule development was designated the "ERC Workshop" and offered in two sessions one in October and the second in November 1987.

c. **Participants.** The TRADOC schools and integrating centers associated with TOE development were tasked by TRADOC HQ (see message in Appendix D) to send TOE documentation specialists to attend the sessions. The first session was attended by personnel associated with combat unit development. The second session was attended by personnel associated with combat support unit and combat service support unit development. The participants attending each ERC Workshop session are identified in Appendix A as part of the listing of contributors to the study.

4-3. RULE DEVELOPMENT

a. **First Workshop.** The first workshop (19-28 October 1987) was conducted per the syllabus (Exhibit 4-1). As shown in the syllabus, the knowledge engineering training was conducted during the first week. The second week of the workshop was basically allocated for the participants to apply their newly acquired knowledge engineering insights to the development of rules for ERC assignment. These individuals were well-informed about the specific instance of ERC assignment and were encouraged to express the specifics of these instances in rule form. In this, the first ERC workshop, the participants were informally guided through the process of structuring the rules. Help was provided on an as-needed basis. In retrospect, after the first workshop was completed, this approach was judged to produce uneven results. Some participants produced an extensive number of rules with clearly distinguished cases of equipment usage. Other participants, however, developed rules with extended narrative statements which, while valid, did not clearly differentiate between equipment use situations. Additionally, the terminology used in the narrative style rules, while appropriate to the description of the situation, was not sufficiently standardized to allow consolidation of the individually developed rules into a composite expert system. It was clear that additional guidance was needed to allow the participants to contribute rules at approximately the same level of detail and with the use of consistent terminology.

Exhibit 4-1. ERC WORKSHOP SYLLABUS

ARTIFICIAL INTELLIGENCE TRAINING CELL
FT GORDON, GEORGIA

DAY	TIME	ACTIVITY
1	Mon AM	Definition of artificial intelligence and expert systems Importance of AI to Army Applications of expert systems in Army Overview of life-cycle management of expert systems
	PM	Problem assessment (theoretical constraints) Problem assessment (practical constraints) Group practical exercises Individual practical exercises (HOMEWORK: Problem assessment)
2	Tue AM	Review individual practical exercises from Monday Design strategies for expert systems <ul style="list-style-type: none"> - case studies - top-down hierarchy Group top-down hierarchical design practical exercise
	PM	Individual top-down hierarchical design practical exercise Testing of expert systems <ul style="list-style-type: none"> - verification - validation (HOMEWORK: Individual design project)
3	Wed AM	Review of individual design projects Review of function of ERC advisor prototype Review of design of ERC advisor prototype Identify design issues remaining in prototype <ul style="list-style-type: none"> - user interface - rules
	PM	Discussion of design issues in prototype <ul style="list-style-type: none"> - user interface - rules

Exhibit 4-1. ERC WORKSHOP SYLLABUS (cont)

- 4 Thu AM Overview of microcomputer architecture
 Overview of microcomputer functions
 MS-DOS operation
 Screen editor (SIDEKICK) operation
 Practical exercise in using SIDEKICK
 to build files
- PM Tutorial on M.1
 - introduction
 - example expert system (wine selection)
 - example expert system (photo advisor)
- 5 Fri AM Tutorial on M.1 (cont'd)
 - photo advisor ((cont'd)
 - example expert system (advanced wine selection)
 - practical exercise in small
 rule base building
- (HOMEWORK: Write 20 functional area rules for
 implementation on Monday morning)
- 6 Mon AM Develop 20 (homework) rules into functional area
 rule base (on paper)
- PM Implement functional area rule base
 (in machine)
- 7 Tue AM Critique and further development of individual
 functional area rules (in machine)
- PM Discussion of integration of individual
 projects
 Group practical exercise - implementation of
 integration of individual projects
- (Rule integration completed overnight
 by CAA and AITF)
- 8 Wed AM Demonstration of integrated system
 Group discussion and critique of system design
 Group discussion and critique of system use
 in field
 Summary discussion
 Distribution of run-time system for field
 testing

b. **Second Workshop.** The second workshop (9-18 November 1987) again followed the syllabus, except that several short blocks of instruction were introduced in the first week to present formal procedures for rule formulation. A three-step procedure for rule formulation using "worksheets" to capture the results was devised and presented, as shown in Figure 4-1 and described in Exhibits 4-2 to 4-4. Using this three-step procedure, the workshop participants were more able to generate rules which were sufficiently consistent to be directly integrated into a composite system. With a little experience, most of the participants advanced from using the three-step procedure to direct preparation of the rules (STEP 3) without progressing through STEPS 1 and 2.

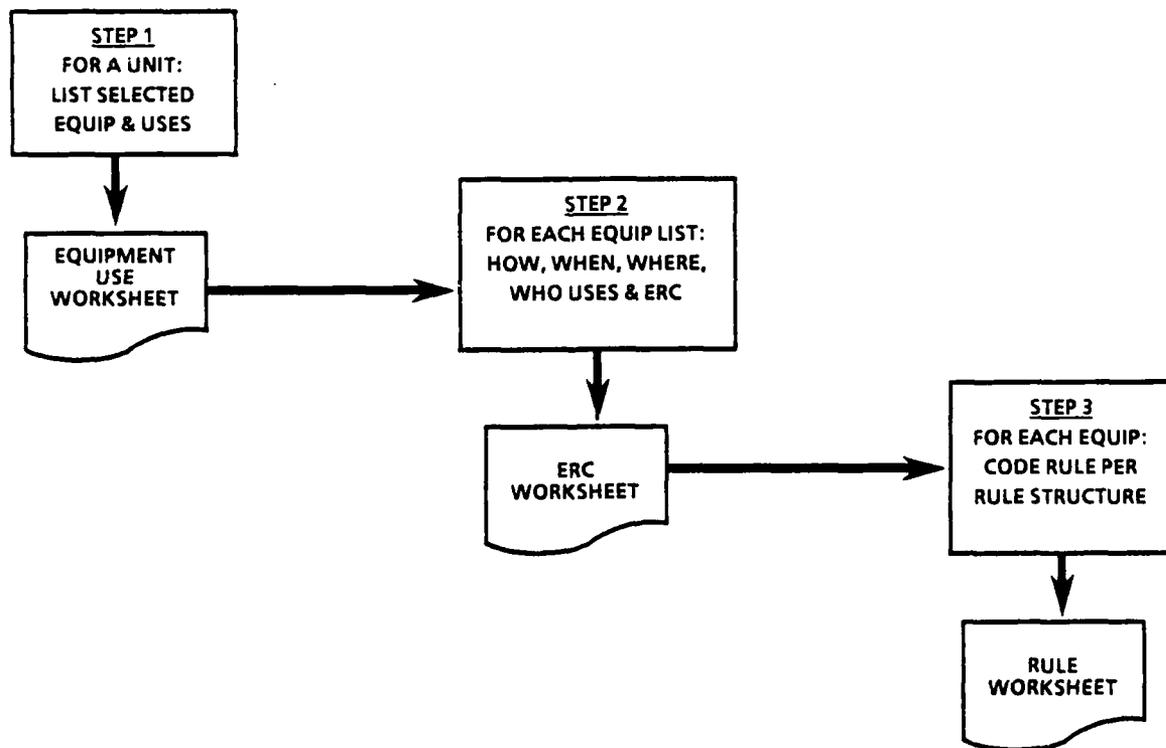


Figure 4-1. Rule Development Procedure

Exhibit 4-3. Rule Development Procedure - STEP 2

STEP 2 Procedure. Consider each item of equipment on the Equipment Use Worksheets in turn. For each item, prepare a "ERC Worksheet" (see below). Describe the use in narrative form. Then reduce the use to a set of specific use statements. Establish how, when, and where the equipment is used and who uses the equipment. Not all the specifics may be applicable to each equipment. Try to achieve a consistent level of detail and a standardized statement of use conditions from worksheet to worksheet.

ERC WORKSHEET	
BRANCH	
TOE	TOE NAME
LIN	LIN NAME
EQUIPMENT USE SITUATION (describe)	
EQUIPMENT USE SPECIFICS	
How Used	
When Used	
Where Used	
Who Uses	
ERC Assigned: <input type="checkbox"/> ERC-A <input type="checkbox"/> ERC-B <input type="checkbox"/> ERC-C	

ERC Worksheet

c. **Workshop Expert System.** Each participant used the computer workstation at his/her desk position to code the rules prepared into an individual expert system. It was possible for each participant to run the expert system to experience the operation of the system and check out any coding problems detected by the M.1 shell during the load of the system. As each system was completed it was edited and loaded into a single system. The system was edited to delete obvious duplications of rule and control features between the individual systems. The participants were then provided with a copy of the composite system and the M.1 shell on which it could be run before they returned to their duty stations. The composite system became the nucleus of the system later submitted for field validation.

d. **Workshop System Issues.** The composite character of the workshop-developed system, that is, the fact that the system was the simple inter-connection of independent systems, presented several problems which required attention to achieve a completely integrated system of rules. These issues were:

- **Issue 1** - The system lacked an overall organization in terms of the sequence of processing, grouping of rules, and the display of ERC assignment results.
- **Issue 2** - The equipment-type classification was organized around the needs of the individual systems and was not a broad-based system of classification.
- **Issue 3** - The users were concerned that the system operate with a minimum of questions, and that all queries be directly relevant to the equipment under consideration.
- **Issue 4** - The workshop activity was concerned with the development of rules for the assignment of ERC. In using the system to assign ERC, there is occasion to identify the especially critical equipment in the unit, designated as "core equipment" (see Appendix K). The core equipment identification was not considered an appropriate topic for the workshops and was added as part of the rule integration activity.
- **Issue 5** - In the workshop setting, the individual systems were "restarted" each time a consultation was needed. This is the standard procedure for use of the system. However, in the ERC assignment application, multiple consultations may be needed. Provision must be made to transition the user from one consultation to the next with a minimized restart procedure.

4-4. RULE INTEGRATION

a. **Rule System Organization (Issue 1).** The rule sets developed at the workshops were rearranged from a composite basis into an integrated system (Issue 1). Since the M.1 shell processes the knowledge base entries in input order, an order was selected which places the most likely needed elements early in the knowledge base, thereby speeding up the search time. The selected order is as follows:

- Rules controlling the overall operation of the system.

- Queries (meta-facts) for information from the user.
- Rules which assign ERC.
- Facts identifying core equipments.

The organization of the knowledge base into modules, reflecting this order is shown in Table 4-1.

Table 4-1. Rule System Modules

Module no	Module description	No of rules	No of facts	No of meta-facts ^a
1	Control and display of system operation	42	45	54
2	Queries for branch type and equipment type	--	25	54
3	Queries for equipment use	--	--	103
4	ERC assignments for items identified by type	47	--	--
5	ERC assignments for items identified by category	103	--	--
6	ERC assignments for items identified by use	83	--	--
7	Table of core equipments accessed via Module 1	--	57	56
	Total	275	127	326

^aSources for information incorporated in rules (e.g., the user).

As shown in Table 4-1, the rule system is organized into seven modules. Module 1 controls the operation of the overall system and provides for display of the system outputs under normal and contingency situations. Modules 2 and 3 support the system operation with queries for information from the user. Modules 4, 5, and 6 contain the rules which assign ERC, based on the user responses to the queries. Module 7 contains the "facts" about core equipments. Module 7 is the expert system equivalent of a table of core equipments. It is accessed by responses to queries for the identification of core equipments, generated by a pair of rules in Module 1. The code for each of the modules is provided in Appendix I.

b. Equipment-type Classification (Issue 2). A multidimensional approach to equipment classification has been adopted to reflect the variety of ways in which equipment is identified in the Army. In some instances, particular items are of interest. In other instances, the technology is used to characterize the equipment. In still other instances, the item used is employed to characterize the equipment. Thus, three approaches to equipment classification are employed as follows:

- **ITEM BY TYPE** - Items in this group are essentially identified by the item nomenclature, with some editorial license exercised to have the type apply to a series of functionally similar items. It is used in cases where the item does not readily fit into the broader groups of CATEGORY or FUNCTION, or where the item has historically received command attention. It is feasible to display up to 15 such items on the principal selection menu and an additional 45 items on a secondary selection menu.
- **ITEM BY CATEGORY** - Items in this group are organized into the broad technology areas employed by the Army (e.g., communications, vehicles, ADP). It is feasible to display up to 15 technology categories on the principal selection menu and, for each of these 15 categories, up to 45 specialized examples of the technology on a secondary menu.
- **ITEM BY FUNCTION** - Items in this group are organized into broad areas of use within the Army (e.g., system test/spt). It is feasible to display up to 15 use areas on the principal selection menu and, for each of these 15 areas, up to 45 specialized examples of usage on a secondary menu.

In general, the three approaches provide for equipment classifications that are independent of each other and will lead the user to select a classification from one approach. Where an equipment can be reasonably associated with more than one classification group, it is included in each classification where it is appropriate. This redundancy does not pose any difficulty in system operation, since the equipment name remains the same, regardless of the menu from which it is selected.

The items in each group, as presented to the user in the main equipment menu, are shown in Figure 4-2. In all, the equipment classification groups can provide up to 1,410 choices, based on selection from the main menu and associated secondary menus (see Appendix K, Module 2, "question(sub-eqp...)").

Which classification below, best identifies the item?

ITEM BY TYPE	ITEM BY CATEGORY	ITEM BY FUNCTION
1. Aircraft hel	10. Comm-electronics	18. NBC defense
2. Night vision dev	11. Vehicle/trailer	19. System test/spt
3. Generator	12. Weapon	20. POL/water hndg
4. Light set	13. ADP equip	21. Equip/matl hndg
5. Dupl/repro machine	14. Tool kit/set/outfit	22. Shelter/storage
6. Air conditioner	15. Audio/visual	23. Medical spt
7. Camouflage system	16. Photo/graphics	24. Personnel spt
8. Binocular	17. Band equip	25. Training spt
9. Wrist watch		26. EOD spt

27. Show me the extended list of ITEM BY TYPE.
28. None of above.

Enter the number corresponding to the best identification.

RESPONSE>

Figure 4-2. Main Equipment Menu

c. **User Interface (Issue 3).** The principal concern in system operation is the system interface with the user. To be effective, the system must query the user with relevant questions and present these questions in a logical order. The order of the questions is largely dependent upon the order of the rules and, within the rules, the order of the individual rule statements. As indicated by the module organization, rule organization is first by high-level rule control and then equipment classification. The individual rule structure follows a similar organization, proceeding from the general to the specific to the greatest extent possible. In particular, the rules dealing with ERC assignment have a hierarchy-of-detail structure, as shown in Figure 4-3. Each rule first asks about the branch of the unit whose equipment is under consideration followed by the equipment classification, the equipment use, and then the constraints on the use. As shown in Figure 4-3, only the equipment identification is mandatory in a rule. The branch information may be omitted if not relevant. The information about equipment use or the constraints on equipment use may be present or omitted, again dependent on relevancy. As shown in Figure 4-3, each rule concludes with an ERC and a generic classification of the equipment use (see Appendix K).

An illustration of an actual system rule, exhibiting this structure, is shown in Figure 4-4.

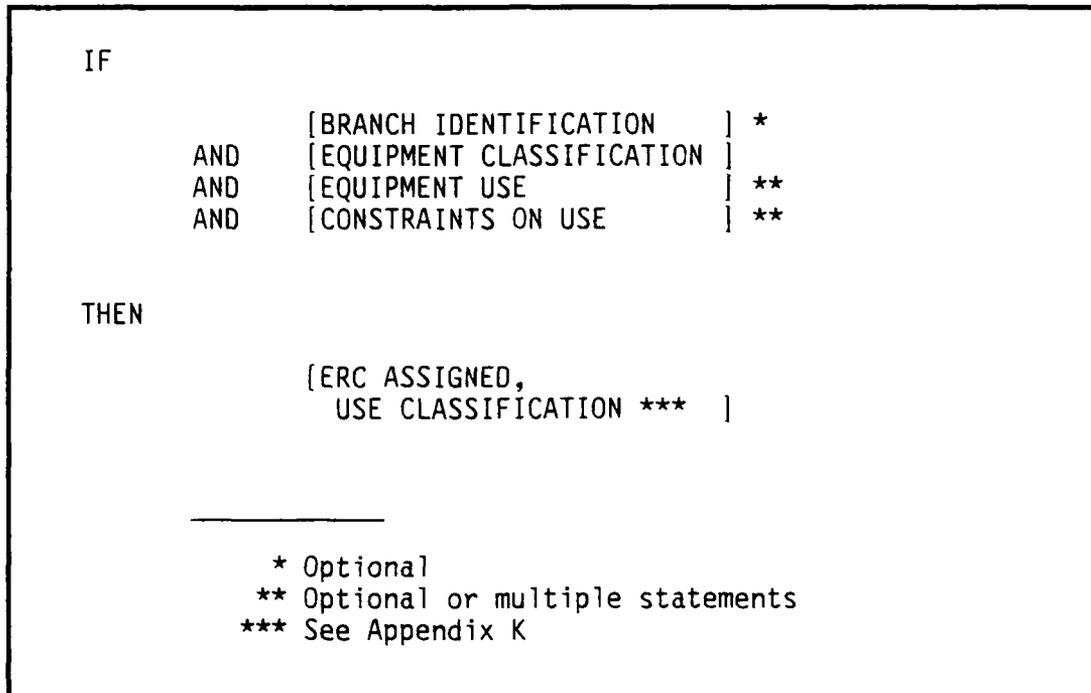


Figure 4-3. Rule Structure

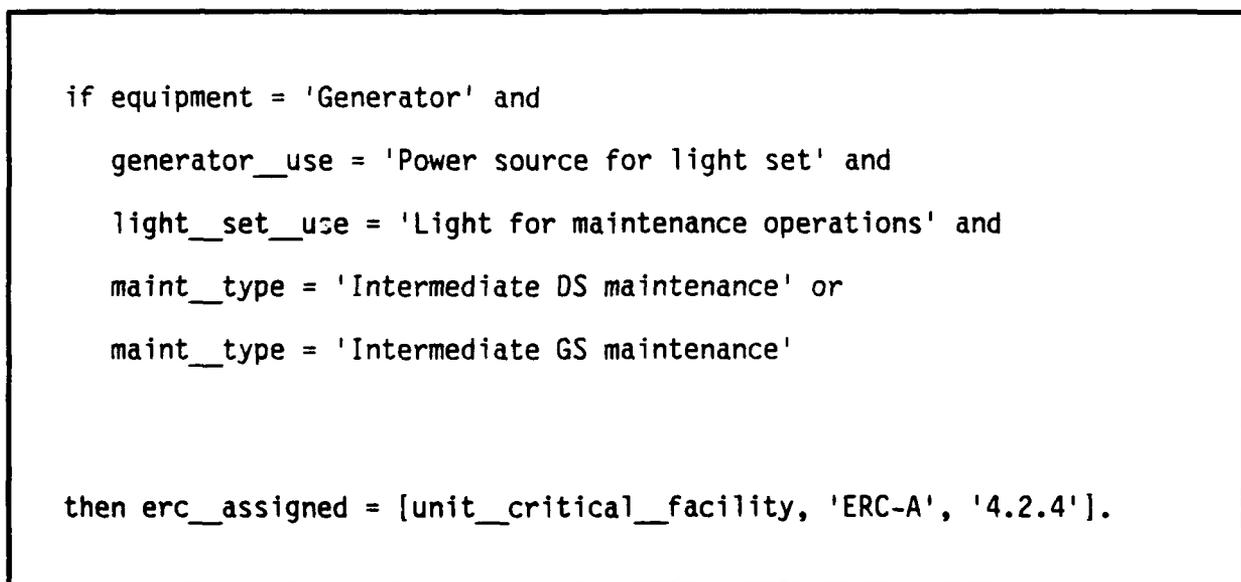


Figure 4-4. Actual Rule

d. **Core Equipment Identification (Issue 4).** In addition to the assignment of ERC, the system is also configured to advise on the core (essential) equipment for a unit.

(1) The user may explicitly want to know which equipments in the unit are, in fact, the core equipments. In this instance, the user identifies to the system the "mission" and "mission-task" of the unit. The system then retrieves the core equipment stored from a table indexed to the particular mission-task combination. An example of a core equipment display is shown in Figure 4-5.

```

*** CONSULTATION NOTICE - CORE EQUIPMENT ADVISED ***

      BRANCH: fas
        UNIT: Tgt Acq Bty
          TOE: 06307J400
    UNIT MISSION: Locate enemy for engagement
    MISSION TASK: Locate enemy artillery

The core equipment advised for this unit is/are:

      Artillery location radar          ERC P

```

Figure 4-5. Core Equipment Display

The manner in which the core equipment is stored in the system is shown in Figure 4-6. The quote (') symbols are included as part of the M.1 shell syntax requirements.

```

core_eq('Field artillery',
        'Locate enemy for engagement',
        'Locate enemy artillery') =

        'Artillery location radar ERC P'.

```

Figure 4-6. Core Equipment Storage

(2) In the other instance of dealing with core equipment, the user may be using the system to assign an ERC to an equipment unaware of its possible core equipment status. The system must differentiate between the use of the equipment which makes it a core equipment and the use of the equipment in a

less essential role. This differentiation is provided by the users' responses to queries. In the examples of an armored personnel carrier (APC) illustrated in Figure 4-7, CASE 1 involves the use of an APC in an infantry unit. This use of the APC codes to a core equipment, with an assignment of "ERC P". As shown in CASE 2, the same APC equipment used for unit maintenance (in a noninfantry unit) codes to "ERC B". Note that two separate rules are involved. One rule (CASE 1) codes for the core equipment case, and another rule (CASE 2) codes for the maintenance use case. In general, when an item of equipment can be used as either a core equipment or a support equipment, individual rules are provided to account for the different use situations.

```

CASE 1:

if  equipment = 'APC' and
    branch = inf
then erc_assigned = [core_equip,'ERC P','5.2.1'].

CASE 2:

if  (not branch = inf) and
    equipment = 'APC' and
    vehicle_use = 'Support unit maintenance operations'
then erc_assigned = [unit_equip_maintenance,'ERC B','5.2.3'].

```

Figure 4-7. Equipment Use Effect on ERC

(3) The identification of the core equipment, included on a sample basis, results in a system fact table which is (presently) approximately 25 percent of the overall rule system file size. The storage needed for the complete set of core equipment information is expected to exceed the file size of the rest of the rule system. The resulting system size will be impracticably large for the memory capacity of the field microcomputers hosting the system. Provision will have to be made to either partition the core equipment information on a proponent basis to fit within the present system or implement the information in a separate system.

e. **System Cycling (Issue 5).** Module 1 provides the user with a menu (Figure 4-8) to control the cycling of the system from one consultation to the next. The system stores the appropriate parameters, restarts the system, and reloads the stored parameters, thereby avoiding system queries for any information already known from prior consultations.

```

*** NEXT CONSULTATION MENU ***

Which type of consultation is desired next?

CORE CONSULTATION with

    2. Same Branch, Unit, Mission.
    3. Same Branch, Unit.
    4. Same Branch.
    5. Entirely new parameters.

ERC CONSULTATION with

    6. Same Branch, Unit, TOE Paragraph.
    7. Same Branch, Unit.
    8. Same Branch.
    9. Entirely new parameters.

OR 10. Quit Consultation system.

Enter number corresponding to your choice.'.

RESPONSE>

```

Figure 4-8. Next Consultation Menu

The purpose of the selections on this menu is to allow the user to minimize the amount of text information requested by the system as it cycles from consultation to the next. The menu is implemented for both the retrieval of core equipments (CORE CONSULTATION) and the assignment of ERC (ERC CONSULTATION). Without the choices provided, the user would have to reenter the information about "Branch", "Unit" (name and TOE) and "Mission" (CORE CONSULTATION) or "TOE paragraph" (ERC CONSULTATION) each time the system moves between consultations. With the choices provided, the user need only enter the information which actually changes from consultation to consultation. The fixed information is saved by the system in dynamic memory so that it is "known" the next time around.

4-5. DEVELOPMENT FINDINGS

a. The concept of user-as-developer was successfully employed. Potential users of the system were provided with knowledge engineering training and facilities for development of individual expert systems. These were then integrated by CAA into a single expert system of 275 rules.

b. The use of the rule system to identify unit mission-critical equipment (pacing items/core equipment) was included on a sample basis in the rule system. The resulting size of the stored sample is impracticably large when projected to the size of a full complement of these equipments.

4-6. DEVELOPMENT OBSERVATION. The mission critical equipments will have to be either partitioned by proponent within the present system or implemented in a separate system to accommodate the memory size limitation in the field host microcomputers.

4-7. SUMMARY. This chapter described the training provided in an ERC Workshop activity, conducted at Fort Gordon, GA, for TRADOC personnel participating in the rule system development activity. It identifies the three-step procedure used at the workshop to produce specific ERC assignment rules. It discussed the issues addressed by CAA, associated with combining the individually developed rules into an integrated system and the storage of information associated with identification of unit core equipment.

CHAPTER 5

RULE SYSTEM VALIDATION

5-1. CHAPTER SUMMARY. This chapter describes the activity to conduct the validation of the rule system, namely:

- Validation planning.
- Validation execution.
- System performance assessment.

The chapter concludes with a summary of the findings and observations associated with these activities.

5-2. VALIDATION PLANNING

a. Validation Concept. System validation, as distinct from system verification, is the process of testing to establish that a system produces outputs that are appropriate in terms of the real-world problem the system is devised to address. Verification, on the other hand, is the process of testing to establish that the system performs in accordance with its design, i.e., test that the system is essentially "bug-free."

b. Validation Objective. The objective of the validation is to establish the level of performance achieved by the rule system in the assignment of appropriate ERC when used in the field operating environment. The validation addresses equipment in a representative example of TOE units currently under development at the Army proponent schools and integrating centers. From each of these selected units, a representative sample of equipment is selected and assigned ERC using the system.

c. Validation Plan. A validation plan (Appendix G) was prepared to:

(1) Establish the nature and extent of the activities necessary to establish the effectiveness of the system when used in the field environment.

(2) Establish and coordinate the resources and procedures needed for the conduct of the system validation.

(3) Provide guidance for the management and execution of the effort necessary for the system validation.

d. Validation Sample. The validation plan calls for the system to be exercised on a representative sample of TOE, and within each TOE, a representative sample of unit equipments identified by their Line Item Numbers (LIN). The sample shown in Table 5-1 was used to validate the system. The derivation of this sample is described in the analysis of the validation sample size in Appendix A of the Validation Plan reproduced herein as Appendix G.

Table 5-1. Validation Sample

Sample factor	Level
Proponents involved	Each school/center
TOE examined by each proponent	Four TOE
TOE paragraphs examined per TOE	Each paragraph
LIN examined per paragraph	Every fourth LIN

e. **Validation Sites.** As identified in the Validation Plan, the schools and integrating centers participating in the validation were as follows:

Validation Sites

Academy of Health Sciences, Ft Sam Houston, TX
 Air Defense Artillery School, Ft Bliss, TX
 Armor School, Ft Knox, KY
 Aviation School, Ft Rucker, AL
 Aviation Logistics School, Ft Eustis, VA

Chemical School, Ft McClellan, AL
 Combined Arms Center, Ft Leavenworth, KS
 Engineer School, Ft Belvoir, VA
 Field Artillery School, Ft Sill, OK
 Infantry School, Ft Benning, GA

Information Systems Command, Ft Huachuca, AZ
 Intelligence School, Ft Huachuca, AZ
 Intelligence & Security Command, Arlington Hall, VA
 Logistics Center, Ft Lee, VA
 Military Police School, Ft McClellan, AL

Ordnance Missile & Munitions School,
 Redstone Arsenal, AL
 Ordnance School, Aberdeen Proving Ground, MD
 Quartermaster School, Ft Lee, VA
 Signal School, Ft Gordon, GA
 Soldier Support Center, Ft Benjamin Harrison, IN

JFK Special Warfare Center, FT Bragg, NC
 Transportation School, Ft Eustis, VA

f. **Validation Schedule.** The validation was scheduled to occur over a 7-week period, as shown in Table 5-2. Week 1 was 28 March 1988.

Table 5-2. Validation Schedule

Activity	Duration	Description (see Section)
Prevalidation a. TOE selection b. Validation tasking c. System distribution	Week 1	5-3a
Information to sites	Week 2	
Field Validation a. System use b. Site review	Week 3 and Week 4	5-3b
Information from sites	Week 5	
Postvalidation a. Results review b. Rule review c. Rule update d. System Performance	Week 6 and Week 7	5-3c

5-3. VALIDATION EXECUTION

a. Prevalidation Activity. Prior to the conduct of field validation, TRADOC HQ selected for each school/center four TOE considered representative of the TOE types prepared at the site each school/center for use in the validation. A message was passed (Appendix E) tasking each of the 22 TRADOC integrating centers and schools with the conduct of the validation. During this same time period, CAA produced 22 diskette copies of rule system, its associated run time files, and a listing of the rule system. In addition, CAA prepared a Validation Procedures Manual (Appendix H) to provide detailed guidance for the conduct of the validation. These test materials were mailed to each field location.

b. Field Validation Activity. The overall conduct of the validation is shown in Figure 5-1. The users at each site employed the transmitted test material to assign ERC to selected LIN from each of the four TOEs identified by TRADOC HQ. The LINs were selected following the sampling process prescribed in the Validation Procedures Manual.

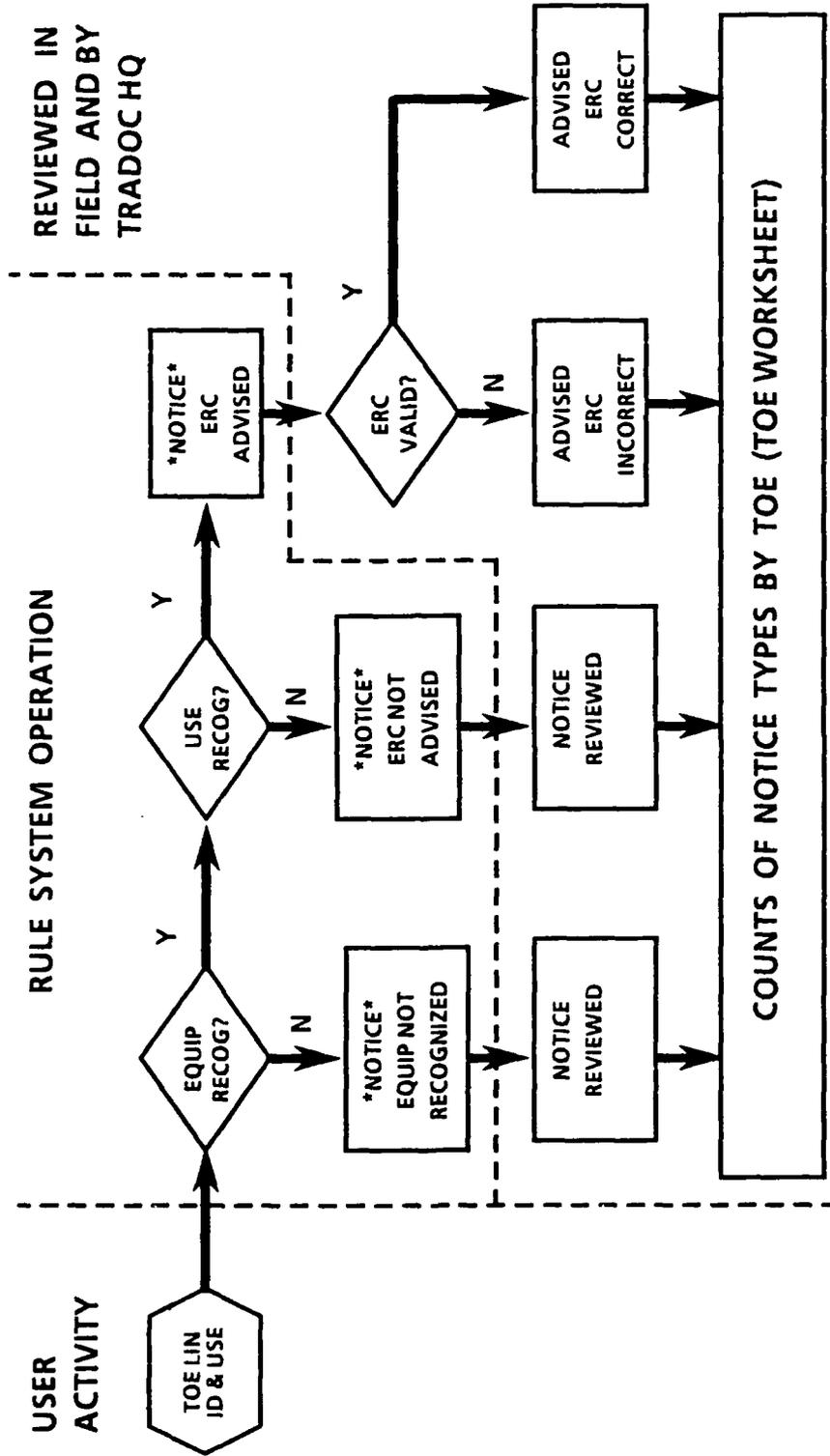


Figure 5-1. Conduct of System Validation

(1) **Generation of Notices.** As shown in Figure 5-1, each operation of the rule system resulted in the printout of one of the three following notices at the conclusion of each consultation:

- **ERC ADVISED** - The ERC ADVISED notice (top panel of Figure 5-2) is generated when the system succeeds in both identifying the equipment and the use of the equipment in the unit.
- **ERC NOT ADVISED** - The ERC NOT ADVISED notice (center panel of Figure 5-2) is generated when the system succeeds in identifying the equipment but fails to identify the use of the equipment in the unit.
- **EQUIPMENT NOT RECOGNIZED** - The EQUIPMENT NOT RECOGNIZED notice (bottom panel of Figure 5-2) is generated when the system fails to identify the equipment.

(2) **Review of Notices.** As shown in Figure 5-1, each notice was subsequently reviewed in the field by the TOE documentation supervisor (or supervisor's representative) following the review procedure described in the Validation Procedures Manual. As a part of the review procedure, the supervisor determined if the ERC assigned by the system was correct. If the ERC was incorrect, the supervisor annotated the notice with the correct ERC and where appropriate, adjusted the rule to provide the correct ERC assignment. The notices were further reviewed at TRADOC HQ and the correctness of the ERC assignments authenticated.

(3) **Count of Notices.** As also shown in Figure 5-1, the counts of the notice types, by TOE, were recorded on TOE Worksheets (see Figure 5-3). Each worksheet summarized the results of the ERC assignment attempts for each TOE. The individual worksheets, as prepared in the field, are reproduced in Appendix J.

***** CONSULTATION NOTICE - ERC ADVISED *****
Branch: qms
Unit Name: SUPPLY & SERVICE CO
TOE: 42007J400
LIN Para: 02
LIN: Y36844
Equipment: Water quality control set
The readiness code advised is:
ERC A (Rule 5.5.14)
The code is based on use of the equipment for support of an individual within unit with an item needed to apply skills to task.

- To PRINT notice: Form-feed paper, enter [Shift + Prtsc].
- To CONTINUE on: Type any alphanumeric key, then return key.

***** CONSULTATION NOTICE - ERC NOT ADVISED *****
Branch: qms
Unit Name: SUPPLY & SERVICE CO
TOE: 42007J400
LIN Para: 02
Equipment: GSE
An ERC cannot be advised based on the equipment use presented. You may wish to:

1. Reconsider the use and redo the consultation or
2. Consult with your supervisor about the need for an appropriate usage entry/rule change in system.

- To PRINT notice: Form-feed paper, enter [Shift + Prtsc].
- To CONTINUE on: Type any alphanumeric key, then return key.

***** CONSULTATION NOTICE - EQUIPMENT NOT RECOGNIZED *****
Branch: qms
Unit Name: SUPPLY & SERVICE CO
TOE: 42007J400
LIN: W99880
LIN Para: 02
An ERC cannot be advised based on the equipment identification presented. You may wish to:

1. Reconsider whether it may be possible to associate the equipment with an existing ITEM TYPE, CATEGORY or USE or
2. Consult with your supervisor about the need for an appropriate equipment entry/rule change in system.

- To PRINT notice: Form-feed paper, enter [Shift + Prtsc].
- To CONTINUE on: Type any alphanumeric key, then return key.

Figure 5-2. ERC Consultation Notices

TOE Worksheet		
Branch:		
TOE:		
Unit Name:		
Consultation Response	Mark slash (/) each time condition generated by consultation (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	/ / / / /	_____
B - Correct	/ / / / /	_____
C - Correct	/ / / / /	_____
A - Incorrect	/ / / / /	_____
B - Incorrect	/ / / / /	_____
C - Incorrect	/ / / / /	_____
ERC Not Advised	/ / / / /	_____
Equipment Not Recognized	/ / / / /	_____
Total of Above Responses		_____

Figure 5-3. TOE Worksheet

c. **Postvalidation Activity.** As shown in Figure 5-1, TRADOC HQ reviewed the validation results as transmitted from the field, including both the TOE Worksheets, the supervisor comments on the ERC assignments, and the recommendations for rule changes made directly on the consultation notices. The TOE Worksheets were passed to CAA for analysis of the system performance. In addition, recommended rule changes from the notices were coordinated with CAA and reflected in updates to the system (see Chapter 6).

5-4. **SYSTEM PERFORMANCE ASSESSMENT.** This paragraph describes the manner in which the level of performance of the rule system, in the ERC CONSULTATION MODE of operation, was assessed. The other mode of system operation, the CORE CONSULTATION MODEL, did not require a performance assessment since it is essentially a table lookup of core equipments, keyed to specific unit missions and mission-tasks. With the table lookup, there are no issues of

rule completeness, etc., which would require a performance analysis, as is the case in the ERC CONSULTATION MODE.

a. **Notice Data.** The data for assessment of the system performance is derived from the counts of the individual "notices" recorded on the TOE Worksheets. The data on the individual TOE Worksheets were summarized to facilitate the performance analysis. The summary of the validation results from the field test is shown in Table 5-3. The cells of the summary contain the quantities needed in the calculation of the system performance. For convenience, the standard cell position notation of "column/row" (e.g., A1, A2, A3) is used to identify the cells in the summary when cited in the following paragraphs.

Table 5-3. Notice Data Summary

Type of notice		Number of notices
Notice	Row	Column A
ERC Correct	1	2,782
ERC Incorrect	2	247
ERC Not Advised	3	383
Equipment Not Recognized	4	164
All notices	--	3,576

b. **Descriptive Statistics of Notice Data.** The count data for the notices shown in Table 5-3, converted to proportions (percentages of total), are diagrammed in the pie chart in Figure 5-4. These proportions clearly indicate the relatively high level of system correct responses (77.8 percent) and the distribution of the balance of the erroneous responses. As shown in the pie chart, the erroneous responses are composed of:

- Failure to recognize the equipment type (i.e., equipment not present on menus) 4.6 percent of the time.
- Failure to find an appropriate coding rule, for a recognized equipment, 10.7 percent of the time.
- Failure to assign a correct ERC, when an appropriate rule is found, 6.9 percent of the time.

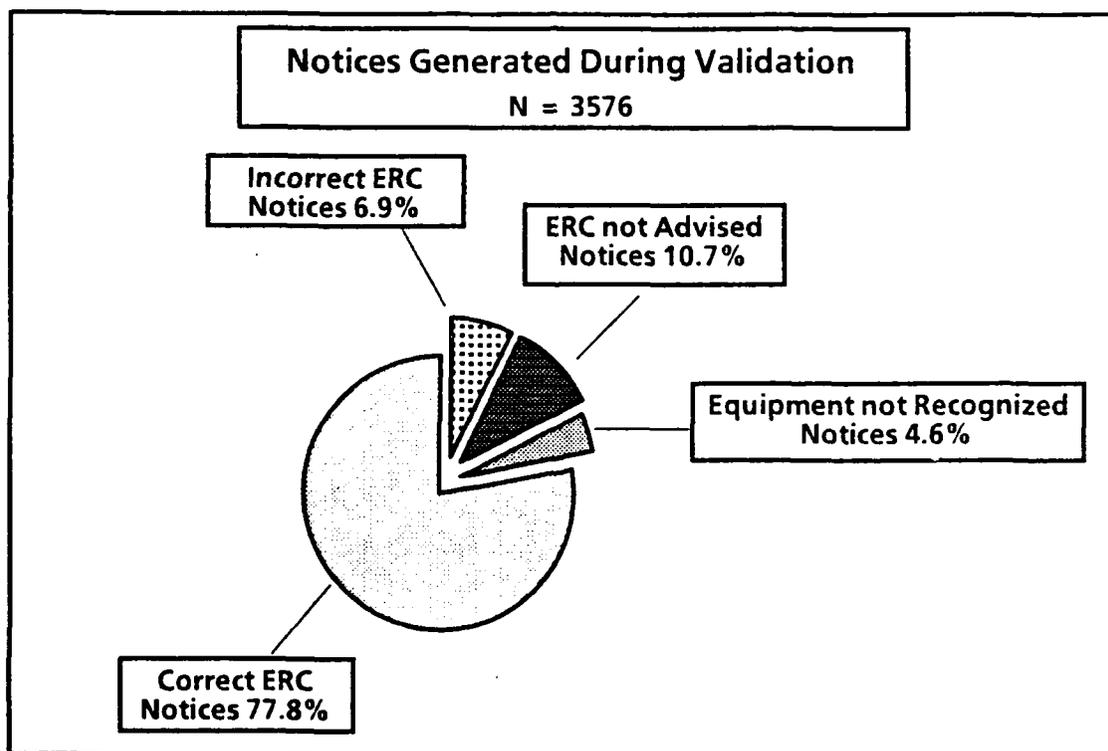


Figure 5-4. Notices Generated During Validation

c. **Measurement of Performance.** The measurement of the system performance, achieved during the validation trials, is basically one of comparing the number of correct responses of the system to the number of times an ERC was sought. There is only one interpretation of correct response, namely, did the system respond in a manner subsequent certified (by TRADOC HQ) as correct. However, the organization of the rules in the system permits several interpretations on the number of times an ERC was sought as follows:

- System completeness. The system is queried for an ERC. For what fraction of the queries under these conditions is a correct ERC advised?
- Rule completeness. The system is queried for an ERC, recognizes the equipment in question, and searches for (but may not find) an appropriate coding rule. For what fraction of the queries under these conditions is a correct ERC advised?
- Rule accuracy. The system is queried for an ERC, recognizes the equipment in question, searches and finds an appropriate coding rule. For what fraction of the queries under these conditions is a correct ERC advised.

Rather than selecting a particular interpretation, each of these interpretations is considered as a separate way of measuring the system performance. Exhibit 5-1 provides for each measure, its definition, and its computation, based on the notice data in Table 5-3.

Exhibit 5-1. Performance Measures

MEASURE: System Completeness

DEFINITION: Proportion of all responses where a correct classification is assigned.

COMPUTATION: The measure, referenced to the cells of the notice data summary is computed as follows:

$$\begin{aligned} \text{System Completeness} &= A1 / (A1+A2+A3+A4) \times 100 \\ &= 2781 / (2782+247+383+164) \times 100 \\ &= 77.8\% \end{aligned}$$

MEASURE: Rule Completeness

DEFINITION: Proportion of all responses where a correct classification is assigned--given the equipment is recognized.

COMPUTATION: The measure, referenced to the cells of the notice data summary, is computed as follows:

$$\begin{aligned} \text{Rule Completeness} &= A1 / (A1+A2+A3) \times 100 \\ &= 2782 / (2782+247+383) \times 100 \\ &= 81.5\% \end{aligned}$$

MEASURE: Rule Accuracy

DEFINITION: Proportion of all responses where a correct classification is assigned--given the equipment is recognized and a coding rule is found.

COMPUTATION: The measure, referenced to the cells of the notice data summary, is computed as follows:

$$\begin{aligned} \text{Rule Accuracy} &= A1 / (A1+A2) \times 100 \\ &= 2782 / (2782+247) \times 100 \\ &= 91.8\% \end{aligned}$$

f. **Performance Summary.** The system performance utilizing the measures of performance in Exhibit 5-1 is shown in Table 5-4. Confidence intervals for each of the measures, at the 5 percent level, are shown.

Table 5-4. Performance Measure Summary

Performance measure	Value	Confidence interval
System completeness	77.8%	± 1.6%
Rule completeness	81.5%	± 1.7%
Rule accuracy	91.8%	± 1.8%

As presented in Table 5-4, the performance of the system may be stated as follows:

- When queried in general, the system responded 77.8 percent of the time with a correct ERC.
- When the system sought to assign an ERC, after recognizing the equipment involved, the system responded 81.5 percent of the time with a correct ERC.
- When the system succeeded in assigning an ERC, the system responded 91.8 percent of the time with a correct ERC.

5-5. **LESSONS LEARNED.** The validation of the system followed the recognized practice (Reference 11) of exercising the system on a series of test cases and comparing the results against authentic results (with TRADOC HQ as the authenticating agent). Based on the experience with the conduct of the validation, several points can be made to contribute to any future efforts to assess the system performance.

a. **Sample Selection.** The procedure of selecting of every fourth LIN as the basis for generating a representative selection of LIN within a TOE has more shortcomings than originally recognized, as follows:

- LIN Density - Some LIN occur throughout the TOE with the same identical use and thus may score correct or incorrect a multiple number of times.
- Paragraph Density - Some TOE have a small number of LIN per paragraph and compound the situation identified in above.
- Unit Density - Some proponents have a small number of unit types which similarly compounds the situations identified above.

An improved procedure for LIN selection is needed. The study method focused on a selection procedure easily made in the field by the participants. That is, check off every fourth LIN in the TOE listing and proceed with the ERC assignments. In retrospect, the LIN selection should have been made as part of the test design. A possible procedure would be to: (1) sample from the summary listing of all LIN in the TOE (i.e., the TOE recapitulation) and (2) identify the occurrence of the LIN in the individual TOE paragraphs. The sample procedure should take into account controls for the character of the TOE (see paragraph below).

b. Controls. The validation plan originally called for assessment of the performance as a function of the type of unit, where type was partitioned into "combat" units and "other" units. A preliminary analysis of the performance based on this single control did not provide any useful interpretation of the performance results. A more extensive number of controls could be put in place which would bear more directly on interpreting the performance. The controls should focus on the character of the TOE and the level of experience of the user along the following lines:

TOE Character Controls:

- Total LIN types per TOE
- Number of paragraphs per TOE
- LIN per TOE paragraph

User Experience Controls:

- User combat development experience
- User TOE documentation experience
- User relevant training experience

c. ERC Correctness Defined. The field and TRADOC HQ review of each LIN assignment, carried out during the validation, called for a determination as to whether the ERC assignment was correct. The reviewer was presumed to have knowledge of the correct ERC in each situation and was to compare this to the ERC assigned by the system. Where a difference was noted, the question arose as to how to code the erroneous response on the TOE Worksheet. Take the case where the system coded a situation as ERC-A and it should be coded ERC-B. Is this reported as "ERC-A incorrect" or "ERC-B incorrect"? If the reference is the system assigned code, then the ERC-A should be ERC-B and since it isn't, the ERC-A response is to be marked on the TOE Worksheet as "ERC-A Incorrect." However, if the reference is the reviewer's understanding of the code, then the ERC-B should be ERC-A and since it isn't, the ERC-A response is marked on the TOE Worksheet as "ERC-B Incorrect." Based on this field experience (unanticipated in preparation of the validation procedures manual), a convention must be selected and included in any future testing procedure to allow consistent reporting of coding results on the TOE Worksheet. Either system of reference is appropriate, but one system must be specified so that results can be analyzed down to the ERC-level, if desired. In the present study, where no convention was applied, it can only be said that they were "correct" and "incorrect" ERC responses, not which ERC-levels were correct and incorrect.

5-6. PERFORMANCE FINDINGS. A field test of the system was conducted by potential users at 20 sites. The test involved a representative selection of unit TOE and a representative selection of equipments within these TOE. Under these conditions, correct ERC were assigned 77.8 percent of the time the rule system was used. The balance of the unusable responses were: failure to recognize equipments (4.6 percent), failure to identify an appropriate ERC assignment rule once an equipment was recognized (10.7 percent), and failure of an identified rule to assign the correct ERC (6.9 percent).

5-7. PERFORMANCE OBSERVATION. Given the innovative nature of the system development, no quantitative criteria for satisfactory rule system performance was established before the conduct of the test. The basic purpose of the validation was to establish the level of performance achieved by the rule system as a benchmark against which subsequent measurements of system performance, as the system matures, could be compared. As part of the review of the test results, the sources of the errors were identified and corrected. On the basis of the benchmark results and the upgrade effort, it is anticipated that future measurement of the rule system performance may be expected to exceed 95 percent correct ERC response.

5-8. SUMMARY. This chapter described the planning and execution of the system validation, conducted at 20 TRADOC schools and integrating centers over a 7-week period. During this time, the rule system was exercised on a representative sample of equipment from a representative sample of TOE. The detailed procedure for conduct of the testing activity was described, including the generation of reports, which were reviewed on site and at TRADOC HQ for completeness and accuracy. The procedure for the quantitative assessment of the system performance was described and the numerical results from the testing presented. Lessons learned from the testing activity were reported.

CHAPTER 6

RULE SYSTEM STATUS

6-1. INTRODUCTION. This chapter summarizes the status of the rule system prepared as a study product to accompany the study report. It includes a description of the upgrades made to the system based on the results of the validation activity and the identification of issues that remain outstanding at the conclusion of the study.

6-2. RULE SYSTEM UPGRADE. As a part of the validation activity, the field personnel involved were requested to recommend changes when the system was observed to make inappropriate responses. The recommendations were informally annotated on the consultation notices and subsequently screened by TRADOC HQ and CAA for final disposition. In some cases, the recommendations were incorporated as presented. In other cases, consolidations were made. In rarer cases, the recommendations were considered to represent a particular school perspective and were treated in a more general, schoolwide form.

a. Rule Changes. In general terms, the changes included:

- Additional rules for uses of radios in nets.
- Additional choices in the equipment selection menus.
- Clarification of types of maintenance equipments.
- Reduction of the number of branch-specific rules.

b. User Interface Changes. In addition, features considered desirable by the users were incorporated to make the system more user-friendly, namely:

- Providing the user with the capability to "return to main menu" from the subequipment menus. This allows the user to explore the menus for an appropriate choice before committing to the selection, which then drives the remainder of the consultation. It avoids having to recycle through a complete consultation before having the opportunity for another equipment choice.
- Providing the knowledge base in a specially prepared fast-loading format. This format should reduce the system loading time to less than 30 seconds, a saving of several minutes on a typical host computer in the field.
- Inclusion of a sign-on display identifying the system and including a brief description of its purpose and use and a point of contact for questions on system operation.

c. Module Content Changes. The organization of the rule system (see Table 4-1) was not changed as a result of the field recommendations of the user interface additions. However, the content of the individual modules were affected by both changes and additions to existing rules, meta-facts,

and facts. These modifications are included in Table 6-1, which is a revised version of Table 4-1.

Table 6-1. Upgraded Rule System Modules

Module no	Module description	No of rules	No of facts	No of meta-facts ^a
1	Control and display of system operation	44	31	8
2	Queries for branch type and equipment type	--	28	56
3	Queries for equipment use	--	--	123
4	ERC assignments for items identified by type	53	--	--
5	ERC assignments for items identified by category	121	--	--
6	ERC assignments for items identified by use	76	--	--
7	Table of core equipments accessed via Module 1	--	57	156
	Total	296	116	343

^aSources for information incorporated in rules (e.g., the user).

A comparison of the rule, meta-fact, and fact totals in Table 6-1 and the earlier Table 4-1 is provided in Table 6-2. For clarity, the term "system-as-tested" is used to refer to the system as initially developed and the term "system-as-delivered" is used to refer to the upgraded system. The differences shown in Table 6-2 are due to: (1) the rule changes arising from the field testing experience and (2) the implementation of the user interface features.

6-3. RULE SYSTEM DOCUMENTATION

a. Knowledge Base. The knowledge base for the upgraded rule system is in Appendix I. It contains the working code for the rule system, organized into the seven modules described earlier in paragraph 4-4a. The code makes extensive use of clear English text for rule formulation and associated system constructs and is considered to be self-documenting. It is formatted as a separate, distributable, reference document, for individual workstation use.

Table 6-2. Rule System Comparison

Rule system	Number of		
	Rules	Facts	Meta-facts
System-as-tested	275	127	326
System-as-delivered	296	116	343
Differences	+21	-11	+17

b. **User Manual.** The user manual for operation of the rule system is in Appendix L. It contains general system reference information and instructions for loading and operating the system. It is formatted as a separate, distributable reference document for individual workstation use.

6-4. OUTSTANDING SYSTEM ISSUES. With the completion of the upgrade and delivery of the system, the following areas will require attention.

a. **Full Complement of Core Equipment.*** The core equipment presently identified in the system-as-delivered is representative of the core equipments associated with the missions and mission-task of Army units. It is included to demonstrate the manner in which the expert system could accommodate what is essentially a data retrieval task. An effort to collect this information from the integrating centers and schools (see message in Appendix D) was partially successful. Useful information was obtained, but the level of detail varied considerably from respondent to respondent. The information generated was, in part, included in the core equipment sample now in the system. Based on the response to this first effort, however, more detailed instructions will have to be provided to ensure that all respondents work to the same criteria for both the mission and mission-task definition and selection of associated essential equipments. The system itself can be expanded to include the new information, but the microcomputers hosting the system in the field have memory and processing speed limitations which will require accommodation. The full complement of core equipment, by itself, is estimated to exceed the size of the present system. Provision will have to be made to either partition the core equipment information on a proponent basis or implement the core equipment information in a separate system to accommodate the memory size of the field host microcomputers.

*Presently being replaced by the concept of the mission-essential task list (METL) and associated equipment (see paragraph 2-6a).

b. **Accumulated Memory Loss.** The validation activity called for the system to be recycled from equipment to equipment without leaving the consultation session. A provision was made to clear and reset the "cache" memory between cycles using the appropriate M.1 shell commands. This provided the desired system operation. However, users reported during the course of the validation activity that the system aborted after an extended series of cycles, reporting "Error 100 - Out of dynamic memory". Investigation revealed that while the M.1 cache memory was being appropriately cleared from run to run, the M.1 "working stack" memory which held associated conditions, was not being cleared. As a result, the working stack accumulated memory locations to a point that prevented overall system operation and the abnormal termination occurred. The matter was referred to the AITC faculty at Fort Gordon and they, in turn, contacted the vendor, Teknowledge, Inc. The vendor advised that the memory accumulation is a consequence of repeated recycling and that the matter is under consideration for a possible fix. For the present, the only advice offered was to keep the system size as small as possible to stretch out the time to termination. Reducing the system size, however, can only be done by contracting the statements used in the rules, which will partially defeat the idea of the rules as clear statements of the coding conditions associated with the ERC assignment. The most likely accommodation is the fact that the intense use of the system during the testing is not representative of operational use. In the course of normal use, the system would be cycled several times to address unusual coding conditions. At some point in the future, the vendor anticipates development of a fix and will provide an upgrade of the M.1 shell to the Army, as part of the existing software maintenance contract.

c. **System Support.** The rule system developed in this study shares with other computer program systems a need for ongoing support throughout its operational life. This is particularly the case for the rule-based expert system in that the system is developed on a largely empirical basis. That is, the system is developed by identifying equipment and equipment-use situations and their associated readiness codes as they present themselves to the recall of experienced practitioners of the coding process. Beyond the basic coding cases, identified in the applicable regulation and those recognized during the course of the development, it can be anticipated that new situations will be encountered from time to time which must be incorporated into the rule system. This will especially be the case in the period following the initial release of the system for operational use. The nature of the support is described in Appendix F.

6-5. **SUMMARY.** This chapter described the corrections and improvements to the system suggested by the testing results. It includes a summary description of the upgrade to the rules system, the changes made in the user interface, identification of the system documentation provided for field use, identification of the system documentation provided for field use, and the issues which need to be addressed as the system is put into initial operational use.

APPENDIX A
STUDY CONTRIBUTORS

1. STUDY TEAM

a. Study Director

Mr. James J. Connelly, Force Systems Directorate

b. Team Member

Ms. Kathleen M. Jackson

c. Other Contributors

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Mr. Carl B. Bates

Dr. Yuan-Yan Chen

Dr. Diego R. Roque

2. PRODUCT REVIEW BOARD

Ms. Louise L. Cox, Chair

Mr. Robert D. Orlov

Mr. Mark S. Adams

Ms. Belinda L. Brown

3. EXTERNAL CONTRIBUTORS

a. Study Advisory Group

MAJ Charles E. Larouche, Office of the Deputy Chief of Staff for Operations and Plans (Study Sponsor POC)

LTC Connie Brown, Office of the Deputy Chief of Staff for Operations and Plans (Study Sponsor POC)

Mr Donald Feeney, Office of the Deputy Chief of Staff for Logistics

Mr Isaac Greene, Office of the Deputy Chief of Staff for Logistics

LTC John Mc Garrahan, Army Artificial Intelligence Center

MAJ Charles Snow, Office of the Deputy Chief of Staff for Force Development

Mr. Dom Vittorini, TRADOC HQ

b. Other Contributors (US Army Training and Doctrine Command)

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CPT Richard Routh, Artificial Intelligence Training Cell

CPT Paul Rossbach, Artificial Intelligence Training Cell

ERC Workshop I

Mr. Alexander Archuletta, Signal Center & School
Mr. Melvin G Banner, Chemical School
Mr. Wes Barfoot, Combined Arms Center
Mr. Tomas Bezentes, Field Artillery School
Mr. Doyle M Bradshaw, Engineer School
Mr. Fredrick W. Gronaur, Air Defense Artillery School
Ms. Fay L. Kainz, Military Police School
Mr. Kevin H. O'Leary, Aviation Command
Mr. Merton D. Pepper, Air Defense Artillery School
Mr. William Reynolds, Armor School
Mr. Paul R. Sutcliff, Infantry School

ERC Workshop II

Mr. A. K. Autry, Aviation Logistics School
Mr. Alphonse Beverly, Quartermaster School
MSG Hedrick J. Bos, Information System Command
Mr. Steven E. Cook, JFK Special Warfare Center & School
Mr. Edward Hatcher, Intelligence & Security Command
CW3 James Hollaway, Intelligence & Security Command
Ms. Sandra Mugler, TRADOC HQ
SFC Donald Pfeil, Ordnance Center & School
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CPT Robert K. Smith, Academy of Health Sciences
Mr. William Stuart, Quartermaster School
Mr. James Violette, Aviation Logistics School
Ms. Pamila Walker, Soldier Support Center
Mr. Emmett A. Welch, Logistics Center
Mr. Walter Wiggins, Missile and Munitions Center & School

APPENDIX B
STUDY DIRECTIVEREPLY TO
ATTENTION OFDEPARTMENT OF THE ARMY
OFFICE OF THE DEPUTY CHIEF OF STAFF FOR OPERATIONS AND PLANS
WASHINGTON, DC 20310 - 04

19 OCT 1987



PUIC: DAMO-OO-I-03

DAMO-ODR

MEMORANDUM FOR: Director, US Army Concepts Analysis Agency, 8120
Woodmont Avenue, Bethesda, Maryland 20814-2797

SUBJECT: Equipment Readiness Code Rule System (ERCRULES)

1. PURPOSE: This directive provides tasking, direction and guidance for the conduct of the subject study.
2. BACKGROUND: Logistic readiness requires a unit to have the equipment and resources necessary to carry out its mission. The variety of equipment in a unit makes it critical to distinguish between items which make an essential contribution to the mission and those which make a supplemental or supportive contribution. The applicable readiness regulation (AR 220-1), does not provide sufficient guidance to allow the necessary differentiation to be made on a consistent basis by the Army proponent schools assigning these classifications. The classifications are in the form of Equipment Readiness Codes (ERC) incorporated into the unit table of organization and equipment (TOE).

A prior study conducted by the Concepts Analysis Agency for the DCSOPS (Ref 8.b(2)) examined the feasibility of applying the emerging technology of expert systems to the ERC assignment task. The study developed a prototype expert system with a rule system, using equipment coding situations, in a sample of company-size units in the heavy division. It successfully demonstrated the potential of an expert system to facilitate the equipment coding task. It remains to refine and expand the ERC rule system to include all equipment coding situations of interest.

3. STUDY SPONSOR AND SPONSOR'S STUDY DIRECTOR:

- a. Sponsor: ODCSOPS
- b. Sponsor Study director: LTC Connie A. Brown, DAMO-ODR, AUTOVON 227-5730.

DAMO-ODR

SUBJECT: Equipment Readiness Code Rule System (ERCRULES)

4. STUDY AGENCY: US Army Concepts Analysis Agency (CAA).

5. USER REPRESENTATIVE: US Army Training and Doctrine Command (TRADOC).

6. TERMS OF REFERENCE:

a. Terminology. The following terms associated with expert system technology and expert systems development, are provided for reference.

o Expert system - A computer program that uses knowledge and knowledge search (inference) procedures to solve problems that normally require human expertise for their solution.

o Knowledge - Information about a specific subject, arranged into statements which are to be confirmed or asserted as correct.

o Knowledge base - The specific collection of knowledge about an application, structured as a set of rules, for use in an expert system.

o Rule system - Term interchangeable with knowledge base.

b. Scope. The ERC rule system is to include all unique equipment coding situations in existing L-series, company-size level, TOE. Where L-series TOE are not available, the most recent series of documentation will be used.

c. Objective. Develop an ERC rule system for operational use by TRADOC.

d. Timeframe. Current

e. Essential Elements of Analysis.

(1) Given that the ERC assignment expertise resides in a community of experts and not a single expert, how effectively can the expertise be combined into a single system?

(2) Can ERC be reliably assigned using the rules in the rule system?

DAMO-ODR

SUBJECT: Equipment Readiness Code Rule System (ERCRULES)

f. Environmental Guidance.

(1) The rule system development process will be carried out with the participation of personnel from TRADOC HQ and the Army proponent schools experienced in ERC assignment.

(2) The Army proponent school personnel participating in the study will attend one of two training workshops to be conducted at the Signal Center School. After training in the fundamentals of artificial intelligence and expert systems technology and techniques, the participants will continue the study by assisting with the identification of equipment coding situations and statement of the appropriate coding rules.

(3) The rule system so developed will be evaluated by the TRADOC personnel against selected TOE. The evaluation will assess the appropriateness of the ERC assigned using the rule system.

g. Anticipated Benefits. Use of the rule system in an expert system is expected to improve ERC assignment as follows:

(1) ERC policy and coding procedure are available in an automated form, Army-wide.

(2) The systematized rules will readily convey the rationale for ERC assignment to higher authority.

(3) The rules are available as a mechanism for use in the refinement of ERC policy.

(4) The knowledge base developed in the effort may be adapted for use in more advanced computer systems using LISP programs.

h. Limitations:

(1) Changes in technology, doctrine or force structure subsequent to the development may introduce previously unidentified coding situations. These situations will have to be detected and included in the rule system by a rule revision/update management process established for this purpose. The requirements for the management process can be minimized by conversion from a widely distributed, microcomputer-based system to a centralized, advanced computing system.

DAMO-ODR

SUBJECT: Equipment Readiness Code Rule System (ERCRULES)

(2) The ERC assignment rules formulated will reflect the information available to users who are knowledgeable about the unit and unit equipment in question. Such information may or may not be expressly stated in references used in the TOE documentation. As such, the rules may use information/data not currently available from existing TOE data systems.

7. RESPONSIBILITIES:

a. Study Agency:

(1) With TRADOC assistance, organize and conduct the activities to identify and code the ERC assignment rules into an ERC rule system.

(2) Prepare a microcomputer-based expert system for use in rule development and as a vehicle for the evaluation of the rule system.

(3) Prepare a report documenting the rule development activity, the rule evaluation activity and the rule system.

b. Study Proponent:

(1) Provide coordination for the study with command and field activities.

(2) Establish and convene, as necessary, a Study Advisory Group (SAG).

(3) Review and approve the ERC rule system for operational use.

(4) Prepare an evaluation of the study results IAW AR 5-5.

c. User Representative:

(1) Authorize and coordinate participation of TRADOC personnel in support of the rule development activity.

(2) Direct and coordinate a TRADOC-wide school evaluation of the ERC rule system, using copies of the expert system evaluation vehicle developed by the Study Agency.

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SUBJECT: Equipment Readiness Code Rule System (ERCRULES)

(3) Review and approve the ERC rule system for operational use.

(4) Prepare an evaluation of the study results IAW AR 5-5.

d. Artificial Intelligence (AI) Training Center: Provide expert system training, rule development expertise and working facilities for TRADOC participants in the rule development activity.

e. Other Participants: Other participants, as represented on the SAG, will provide an ARSTAF/command perspective on the work in terms of its overall contribution to logistic readiness.

8. LITERATURE SEARCH: No other studies directly related to the assignment of equipment readiness codes were found in the literature, with the exception of the study conducted by CAA (Ref. 8.b(2)), which is the basis for this study.

9. REFERENCES:

a. Administrative:

(1) AR 5-5, Army Studies and Analysis.

(2) AR 10-38, Organization and Functions, US Army Concepts Agency, 18 December 1985.

b. Substantive:

(1) AR 220-1, Unit Status Reporting (under revision).

(2) US Army Concepts Analysis Agency, Expert System Initiative in Logistic Readiness, March 1987, CAA-SR-87-1.

10. ADMINISTRATION:

a. Funding: FY 88 funds required for TDY associated with the study are the responsibility of each participant organization.

DAMO-ODR

SUBJECT: Equipment Readiness Code Rule System (ERCRULES)

b. Development Facilities: Computers, program tools and workspace facilities associated with the rule development activity will be provided by the AI Training Center.

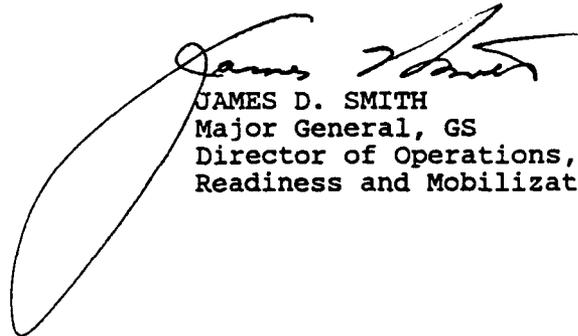
c. Milestone Schedule: Enclosure 1.

d. Coordination Procedure: Direct coordination is authorized between CAA, TRADOC and the Army AI Training Center.

e. Defense Technical Information Center (DTIC): The Study agency will prepare and send DD Form 1498 and final study documents to DTIC.

f. Study Tasking Procedure: This study directive complies with the mission, functions and procedures of the US Army Concepts Analysis Agency and has been coordinated in accordance with paragraph 6, AR 10-38.

FOR THE DEPUTY CHIEF OF STAFF FOR OPERATIONS AND PLANS:



JAMES D. SMITH
Major General, GS
Director of Operations,
Readiness and Mobilization

STUDY MILESTONES

ACTIVITY	COMPLETED BY
Develop rule system	30 November 1987
Evaluate rule system	31 January 1988
Operational rule system	29 February 1988
Draft study report	31 March 1988

APPENDIX C

REFERENCES

DEPARTMENT OF DEFENSE (DOD)

1. DOD Standard 7935.1, Automated Data Systems Documentation Standards

DEPARTMENT OF THE ARMY

Department of the Army (DA) Publications

2. AR 220-1, Unit Status Reporting

US Army Training and Doctrine Command (TRADOC)

3. TRADOC Regulation 310-4 (draft)
4. Handbook HDBK 700-1.1-83, System Support Equipment

US Army Concepts Analysis Agency (CAA)

5. Study Report, Expert System Initiative in Logistic Readiness, CAA-SR-87-1, March 1987
6. Study Report, Mix of Major Materiel and Munitions (4M) Study, CAA-SR-88-9, June 1988

US Army Signal Center and Fort Gordon

7. Student Handbook, Knowledge Engineering Methodology, October 1985
8. Advance Sheet, M.1 Training Materials, April 1986

MISCELLANEOUS

9. Teknowledge, Inc., M.1 Reference Manual, December 1986
10. Teknowledge, Inc., M.1 Sample Knowledge Systems, December 1986
11. O'Keefe, Robert M. et al, Validating Expert System Performance, IEEE Expert, Vol 2, No. 4, 1987

APPENDIX D

TRADOC MESSAGE - ERC WORKSHOP

ROUTINE

AD, FS
FSL / 2

CZCRHA023
RTTUZYUW RUCLAIAG915 2872208-UUUU--RUEBHRA.4 OCT 87 63 192
ZNR UUUUU
R 141700Z OCT 87
FM CDR TRADOC FT MONROE VA //ATCD-OP//
TO AIG 9843
INFO RUEADWD/HQ DA WASHDC //DAMO-ODR//
RUEBHRA/DIR CAA BETHESDA MD //CSCA-FSL//

- () A:RMI
- () CAA
- () CCFB
- () COMPT
- () DEEO
- () HSETC
- () MARLN
- () MAVHOSP
- () NMC MCB
- () RMDSC
- () RMRDC
- () RMRI
- () RMDC
- () RSHS
- () OUTPT
- () PSD
- () RAD SAFE
- () SUPPLY
- () USUHS

BT
UNCLAS
0000
SECTION 01 OF 02
SUBJ: EXPERT SYSTEM FOR DETERMINING EQUIPMENT READINESS CODES (ERC)
A. MSG, 172145Z AUG 87, ATCD-OP, SAB
B. EMAIL MSG, 1 OCT 87, ATCD-OP, SAB (NOTAL)
1. THIS MSG CONFIRMS AND REPEATS PERTINENT PARTS OF REF B TASKER ON SUBJECT. IT PROVIDES INSTRUCTIONS FOR YOUR PARTICIPATION IN DEVELOPING INPUT FOR SUBJECT SYSTEM, AS ANNOUNCED BY REFERENCE A. THIS PROJECT HAS HIGH COMMAND INTEREST AT THIS HQ, BOTH BY THE CG AND BY THE DCSCD, AND IS BEING ACCOMPLISHED AT CONSIDERABLE EXPENSE IN TIME AND FUNDS. IT IS ONE OF THE FIRST INITIATIVES TO TAP INTO ARTIFICIAL INTELLIGENCE (AI) PROCESSES FOR DOCUMENTING ORGANIZATIONS AND A PRECURSOR TO TOE BUILDER. IT IS ESPECIALLY CRITICAL THAT YOUR

PAGE 02 RUCLAIAG915 UNCLAS
BEST AND MOST EXPERIENCED SUBJECT MATTER EXPERT BE SCHEDULED TO PARTICIPATE.
2. COMPLETION OF SUBJECT SYSTEM WILL BE PHASED BETWEEN NOW AND 1 MARCH 1988.
A. PHASE I IS THE IDENTIFICATION OF ALL MISSIONS, MISSION TASKS, AND CORE EQUIPMENT APPLICABLE TO EACH PROPONENT TOE. THIS PHASE IS MORE FULLY EXPLAINED BELOW. REQUIRED COMPLETION DATE IS 19 OCTOBER 1987.
B. PHASE II CONSISTS OF A TRAINING WORKSHOP CONDUCTED BY THE SIGNAL CENTER AND SCHOOL. TWO SESSIONS WILL BE HELD, FROM 19-28 OCTOBER AND FROM 9-18 NOVEMBER 1987. ATTENDEES WILL RECEIVE TRAINING IN THE FUNDAMENTAL CONCEPTS OF AI AND EXPERT SYSTEMS AND WILL USE THIS KNOWLEDGE TO DRAFT KNOWLEDGE BASE RULES PERTAINING TO THE PROPONENT TOE MISSION TASKS IDENTIFIED IN PHASE I. RULES WILL ALSO BE DEVELOPED FOR OTHER TOE EQUIPMENT BASED ON ITS RELATIONSHIP TO CORE EQUIPMENT AND UNIT FUNCTIONS. EACH TOE PROPONENT IS REQUIRED TO SEND A REPRESENTATIVE TO ONE OF THESE SESSIONS AS SHOWN IN THE FOLLOWING SCHEDULE:
1ST SESSION (19-28 OCT) 2D SESSION (9-19 NOV)
HQ TRADOC (1) HQ TRADOC (3)

PAGE 03 RUCLAIAG915 UNCLAS
COMBINED ARMS CENTER LOGISTICS CENTER
AIR DEFENSE SCHOOL SOLDIER SUPPORT CENTER
ARMOR SCHOOL ACADEMY OF HEALTH SCIENCES
AVIATION SCHOOL AVIATION LOGISTICS SCHOOL
CHEMICAL SCHOOL MISSILE AND MUNITIONS SCHOOL
ENGINEER SCHOOL ORDNANCE SCHOOL
FIELD ARTILLERY SCHOOL QUARTERMASTER SCHOOL
INFANTRY SCHOOL TRANSPORTATION SCHOOL
INTELLIGENCE SCHOOL INFORMATION SYSTEMS COMMAND
JFK SPECIAL WARFARE CENTER(CHANGED TO NOV SESSION)
MILITARY POLICE SCHOOL
SIGNAL SCHOOL
INTELLIGENCE AND SECURITY CMD
SINCE EACH WORKSHOP IS LIMITED TO A MAXIMUM OF 15 ATTENDEES, THERE IS LITTLE SPACE FOR MORE THAN ONE REPRESENTATIVE PER PROPONENT. REQUESTS FOR ADDITIONAL QUOTAS WILL BE CONSIDERED ON A CASE-BY-CASE BASIS. CHANGES BETWEEN THE TWO SESSIONS WILL BE ENTERTAINED ONLY UNDER THE MOST EXIGENT CIRCUMSTANCES.
C. PHASES III, IV AND V WILL COMPLETE THE SYSTEM USING INPUTS DEVELOPED IN PHASES I AND II. PHASES III AND V WILL BE ACCOMPLISHED

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ENTIRELY BY CONCEPTS ANALYSIS AGENCY (CAA) AND THIS HEADQUARTERS. PHASE IV, EVALUATION, WILL REQUIRE PROPONENTS TO VALIDATE THE RULES AND PROVIDE COMMENTS TO HQ TRADOC AND CAA. THIS PHASE WILL BE ACCOMPLISHED BETWEEN 15 DECEMBER AND 31 JANUARY. DETAILS WILL BE PROVIDED SEPARATELY.

3. IT IS ESSENTIAL THAT ALL MISSIONS, MISSION TASKS, AND CORE EQUIPMENT BE IDENTIFIED AND CLEARLY UNDERSTOOD BY THE PROPONENTS REPRESENTATIVE PRIOR TO ATTENDANCE AT THE WORKSHOP. BRIEF AND CONCISE STATEMENTS OF MISSIONS AND MISSION TASKS WILL BE SUBMITTED TO HQ TRADOC, ATTN: ATCD-OP, NLT 19 OCTOBER 1987. A DESCRIPTION OF INFORMATION REQUIRED FOLLOWS.

A. UNIT MISSION

DEFINITION. THE DOCTRINALLY PRESCRIBED FUNCTIONAL ACTIVITY OF THE UNIT, EXPRESSED IN CONCISE TERMS.

SOURCE. THE MISSION STATEMENT IN SECTION I OF THE UNIT TDE WILL PROVIDE THE BASIS FOR THE STATEMENT. DOCTRINAL PUBLICATIONS, E.G., FM'S, AND RESIDENT DOCTRINAL SUBJECT MATTER EXPERTS (SME'S) SHOULD ALSO BE CONSULTED TO ENSURE ACCURATE STATEMENT OF ALL MISSIONS.

B. MISSION TASK

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DEFINITION. THE DOCTRINALLY REQUIRED ACTIVITIES WHICH ARE DISTINCT COMPONENTS OF THE UNIT MISSION, AND WHICH REQUIRE SPECIFICALLY ALLOCATED EQUIPMENT AND/OR PERSONNEL FOR TASK EXECUTION.

BT

#015

ROUTINE

NNNCZCFHA024
 RTTUZYUW RUCLAIAS916 2872208-UUUU--RUEBHRA.
 ZNR UUUUU
 R 141700Z OCT 87
 FM CDR TRADOC FT MONROE VA //ATCD-OP//
 TO AIG 9843
 INFO RUEADWD/HQ DA WASHDC //DAMD-ODR//
 RUEBHRA/DIR CAA BETHESDA MD //CSCA-FSL//
 BT
 UNCLAS

NHMC
 COMMOEN

140ct87 23 20z

FINAL SECTION OF 02

TASKS MAY BE SPECIFICALLY DEFINED IN, OR DERIVED FROM ANALYSIS OF THE MISSION STATEMENT. UNIT SUPPORT FUNCTIONS WILL NOT BE INCLUDED AS MISSION TASKS EXCEPT FOR CLASS III AND V RESUPPLY.

SOURCE. THE MISSION AND CAPABILITIES PARAGRAPHS OF SECTION I OF THE UNIT TOE WILL PROVIDE THE BASIS FOR THE MISSION TASK STATEMENTS. IT MAY BE NECESSARY TO INTERPRET THE MISSION STATEMENT IN SECTION I TO DISTINGUISH BETWEEN THE OVERALL MISSION AND THE COMPONENTS OF THE MISSION. AGAIN, DOCTRINAL PUBLICATIONS AND SME'S SHOULD BE CONSULTED TO ENSURE COMPLETENESS AND ACCURACY.

C. CORE EQUIPMENT

DEFINITION. THE EQUIPMENT ESSENTIAL TO ACCOMPLISH A SPECIFIC

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MISSION TASK. THIS INCLUDES ITEMS CODED ERC P AND SELECTED ERC A ITEMS. DEFINITIONS AND EXAMPLES PROVIDED IN AR 220-1 WILL GOVERN ERC ASSIGNMENT WHERE THE GUIDANCE IS SPECIFIC. NOTE THAT ERC CODING IN TOE WAS REVISED IN CTU 8710 TO INCLUDE CODING OF ERC P AND CHANGES TO ERC A, B, AND C IAW AR 220-1. PROPONENTS MUST USE THIS LATEST INFORMATION. USE OF CTU 8704 TOE FILES WILL RESULT IN INACCURATE ANALYSIS. QUESTIONS IN THIS REGARD SHOULD BE ADDRESSED TO THE TRADOC POC.

SOURCE. WHERE PACING ITEMS FOR THE UNIT ARE PRESCRIBED BY CTU 8710 BASED ON AR 220-1, THEY MUST BE ASSOCIATED WITH ONE OR MORE PARTICULAR MISSION TASKS. WHERE PACING ITEMS ARE NOT PRESCRIBED BY CTU 8710 OR AR 220-1, CORE EQUIPMENT TO SUPPORT EACH MISSION TASK MAY BE IDENTIFIED FROM EQUIPMENT CODED ERC A, AS APPROPRIATE. AT LEAST ONE ITEM OF CORE EQUIPMENT IS NORMALLY ASSOCIATED WITH EACH MISSION TASK.

D. THE FORMAT TO BE USED FOR SUBMITTING PHASE I INPUT TO HQ TRADOC, WITH SAMPLE ENTRIES AND NOTES, IS SHOWN BELOW.

----- FORMAT BEGINS -----

MISSION TASK SUMMARY

UNIT PROPONENT: ENGINEER SCHOOL

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MISSION: IMPEDE MOBILITY OF ENEMY FORCES. (NOTE THAT MANY UNITS HAVE MORE THAN ONE MISSION).

MISSION TASK: INSTALL MINEFIELDS. (CONCISE STATEMENT OF A SPECIFIC ACTIVITY REQUIRED TO ACCOMPLISH THE MISSION AND WHICH REQUIRES SPECIFICALLY ALLOCATED EQUIPMENT AND/OR PERSONNEL. ALSO NOTE THAT MOST MISSIONS WILL HAVE MORE THAN ONE MISSION TASK).

CORE EQUIPMENT:

LN	NOMENCLATURE	ERC IAW AR 220-1
D20629	DISPENSER, MINE; GROUND VEHICLE M 128	A
(ABOVE ITEM SHOWN AS SAMPLE; THERE MAY BE MORE THAN ONE CORE ITEM ASSOCIATED WITH THE MISSION TASK. INCLUDE ONLY PRIMARY EQUIPMENT ITEMS. LN AND NOMENCLATURE ARE SELF-EXPLANATORY. ERC WILL BE P OR A.)		

APPLICABLE TOE: 05143L0 ENGR CO, SEP HVT BDE
 (LIST OTHER TOE AS APPLICABLE.)

(7 CHARACTER SRC AND UNIT TITLE FOR ALL UNITS WHOSE MISSION INCLUDES THIS MISSION TASK AND CORE EQUIPMENT.)

REMARKS: (AS REQUIRED AND APPROPRIATE.)

IDENTIFICATION OF PREPARER: (NAME AND PHONE NUMBER (AV) OF PREPARER, AND DATE OF PREPARATION).

FS

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----- FORMAT ENDS -----

4. IT CANNOT BE OVEREMPHASIZED THAT PROPONENT REPRESENTATIVES MUST BE THE MOST HIGHLY OVERALL QUALIFIED SUBJECT MATTER EXPERTS AVAILABLE IN THE FIELD OF ORGANIZATION DOCUMENTATION, MISSIONS, MISSION TASKS, AND EQUIPMENT REQUIRED TO ACCOMPLISH THE MISSION TASKS. REPRESENTATIVES MUST BRING COPIES OF SECTIONS I FOR THE LATEST TO E EDITION (L, J, OR H) FOR EACH DIFFERENT TYPE UNIT, KEY DOCTRINAL PUBLICATIONS, TOE EQUIPMENT RECAPS, AND COPIES OF THE MISSION TASK SUMMARIES PREPARED DURING PHASE I. THESE REFERENCES WILL BE USED DURING THE APPLICATION PHASE OF THE WORKSHOP.

5. TELEPHONIC COORDINATION WITH ALL PROPONENTS SINCE DISPATCH OF REF B INDICATE THAT THIS EFFORT IS ON TRACK. YOUR RESPONSE AND SUPPORT IS APPRECIATED.

6. POC THIS HQ IS MR. RANDOLPH, ATCO-OP, AV 632-2234.

BT

#616

NNNN

APPENDIX E

TRADOC MESSAGE - ERCRULES VALIDATION

AD, FS - 17/6 -
FSL HED

ROUTINE

NNNNCZCRMA036
RTTUZYUW RUCLAIA7032 0922117-UUUU-RUEBHRA.
ZNR UUUUU
R 311930Z MAR 88
FM CDR TRADOC FT MONROE VA //ATCD-OP//
TO AIG 9843
INFO RUEADWD/HQ DA WASHDC //DAMO-ODR//
RUEDFUA/CDR USAFDSA FT BELVOIR VA //NOFD-A//
RUEBHRA/DIR USA CAA BETHESDA MD //CSCA-FSL//
BT
UNCLAS
0000

NMC NCR
COMMOCEN

1 Apr 88 23 49z

42

- () AFPMI
- () CAA
- () CCPO
- () COMPT
- () DEED
- () HSP/C
- () KALLN
- () NAVPROSP
- () NMC NCR
- () NLSO
- () NMIC
- () NNPI
- () NNCC
- () NSHS
- () OUTPT
- () PSD
- () RAD SAFE
- () SUPPLY
- () USURS
- ()
- ()
- ()

SECTION 01 OF 02
SUBJ: EQUIPMENT READINESS CODE RULE SYSTEM (ERCRULES) VALIDATION
1. THIS MESSAGE CONTAINS GUIDANCE FOR FIELD VALIDATION OF ERCRULES, THE ARTIFICIAL INTELLIGENCE (AI) PROGRAM FOR TOE ERC ASSIGNMENT. ERCRULES HAS BEEN DEVELOPED BASED ON INPUT FROM YOUR PARTICIPATION AT THE AI TRAINING WORKSHOPS AT FT GORDON IN OCT AND NOV 1987.
2. CONCEPTS ANALYSIS AGENCY HAS COMPLETED WORK AND WILL DISTRIBUTE COPIES OF ERCRULES SYSTEM DISKS, SYSTEM LOADING INSTRUCTIONS, THE SYSTEM LISTING INCLUDING ERC ASSIGNMENT RULES, AND SYSTEM VALIDATION PROCEDURE GUIDES TO ALL ADDRESSEES BY 8 APR 88. TOE PROPONENTS WILL REVIEW THEIR TOES SHOWN BELOW (PARA 5) IN ACCORDANCE WITH THE

PAGE 02 RUCLAIA7032 UNCLAS
VALIDATION PROCEDURES. REPORTS REQUIRED BY THE VALIDATION PROCEDURES WILL BE SUBMITTED TO THIS HEADQUARTERS, ATTN: ATCD-OP, NLT 22 APR 88.
3. THE VALIDATION IS ESTIMATED TO REQUIRE APPROXIMATELY 3 MAN DAYS OF EFFORT BY EACH PROPONENT. EQUIPMENT REQUIREMENTS ARE ONE MICROCOMPUTER (PC) WITH A MINIMUM OF 512K RAM AND A PRINTER CONNECTED DIRECTLY TO THE PC. TO REDUCE PAPER VOLUME LETTER SIZED COMPUTER PAPER SHOULD BE USED FOR THE PRINTED REPORTS. TOE LISTINGS (STEP 12) FOR EACH TOE USED WILL BE MARKED UP DURING THE VALIDATION AND SUBMITTED AS PART OF THE VALIDATION DOCUMENTATION. BASE TOE WILL BE USED FOR ALL VALIDATIONS.
4. VALIDATION SHOULD BE ACCOMPLISHED BY PERSONNEL WHO ARE SUBJECT MATTER EXPERTS ON THE TOE INVOLVED. IF THESE ARE DIFFERENT FROM THE REPRESENTATIVES WHO ATTENDED THE AI WORKSHOPS AT FORT GORDON, THE LATTER SHOULD BE CONSIDERED AS TECHNICAL ADVISORS ON USE OF THE SYSTEM.
5. TOES TO BE EVALUATED BY RESPECTIVE PROPONENTS ARE:
AHS AIR DEFENSE ARTY
08047L000 FWD SPT MED CO, LID 44166L200 HMB, ADA BN, HV DIV
08067L200 FWD SPT MED CO, ABN 44167L000 ADA BTRY, GUN/STGR

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08097L000 MED CO, MSB, MIZ DIV 44178L000 ADA BTRY, STINGER
08833L000 STATION HOSP, 300 BED 44637L000 ADA BTRY, PATRIOT AVIATION
ARMOR
17186L000 HHT, RECON SQDN, LID 01247L000 MED HEL CO (OH-47)
17376L000 HHC, TANK BN 01303L200 ASLT HEL CO (UH-60)
17377L000 TANK CO, TANK BN 01387L200 ATK HEL CO (AAH-64)
17387L100 CAV TROOP, CAV SQDN 01706L000 HHC ASLT HEL BN
AVIATION LOG
01933L200 AVN CO (AVIM) HV DIV 03157L200 CHEM CO, HV DIV
01947L500 AVN CO (AVIM) CORPS
01967L100 AVN CO (AVIM) EAC 03457L000 CHEM CO (SMOKE/DECON)
01977L200 AVN CO (AVIM) LID 03476L000 HHD CHEM BN
COMBINED ARMS CTR
ENGINEER
52413L000 CORPS SPT GP RAOC 05037H500 EN CBT CO, CORPS
67042L000 HHC AIR ASLT BDE 05147L000 EN CO, EN BN, HV DIV
77004L000 HHC LT INF DIV 05413L000 EN CO, CONST SPT
87042L100 HHC HV DIV BDE (ARMOR) 05493L100 EN CO, ASLT FLTBRG
FIELD ARTY
INFANTRY
06303L000 TGT ACQ BTRY, HV DIV 07247L000 RIFLE CO INF BN MECH
06366L200 HMB FA BN 155SP HV DIV 07248L000 ANTIARMOR CO INF BN
BT
#7032

178

NNNNCZCPHA033
RTTUZYUW RUCLAIA7033 0922117-UUUU--RUEADWD
ZNR UUUUU
R 311930Z MAR 83
FM CDR TRADOC FT MONROE VA //AICJ-OP//
TO AIG 9043
INFO RUEADWD/HQ DA WASHDC //DAMD-ODR//
RUEDFUA/CDR USAFUSA FT BELVOIR VA //MDFD-A//
RUEBHRA/DIR USA CAA BETHESDA MD //CSCA-FSL//
BT
UNCLAS
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ROUTE

NHC HQ
COMM GEN

1 Apr 88 23 49z

2/2

FINAL SECTION OF 02

06367L000	FA BTRY 155SP HV DIB	07316L000	MHC INF BN (MIN)
06369L000	SVC BTRY 155SP HV DIV	07317L000	RIFLE CO INF BN (MIN)
	INFO SYS COMMAND		INTEL SCHOOL
116225000	MHC STRAT SIG BDE	34207L000	OPS CO OPS BN MI BDE
11686L000	MHD SIG BN (SMA DCS OPS)	34227L000	CI-INTG CO IEB CORPS
11687L000	MAJOR NODE A CO	34277L000	CLJ CO MI BN AASLT D
11689L000	MINOR NODE CO	34288L000	I&S CO MI BN HV DIV
	INTEL & SCTY CMD		LOGISTICS CENTER
34614L000	EAC INTEL CTR	63002L000	MHC/MHC, DISCOM
34617L000	MI CO SIG INTEL EAC	63006L000	MHD FSB HV DIV

- () AFRI
- () CAA
- () CCPO
- () COMPT
- () DEED
- () HSEEC
- () MAJIN
- () NAVHOSP
- () POC MCR
- () TRTC
- () NMEDC
- () NLEI
- () NHTC
- () NSHS
- () OUTPT
- () PSD
- () RAD SAFE
- () SUPPLY
- () USUBS
- ()
- ()
- ()

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34627L000	MI CO INTG/EXPL EPW	63066L000	HHT SPT SQDN ACR
34657L000	MI CO CI	63126L000	HQ< MAINT CO, MTZ D
	MP SCHOOL		OPMCS
19172L000	MHC MP BDE	09007L000	ORD M&L SPT CO, DIV
19177L000	MP CO CBT SPT	09416L000	MHD ORD BN M&L DS/GS
19333L000	MP OP HV DIV	09433L000	ORD CO, CONV AMTD GS
19647L000	MP ESCORT GD CO	09520LA, LB, LC	EOO TEAMS
	ORDNANCE		QUARTERMASTER
43007L000	LT MAINT CO HV DIV	10463L000	WATER SUPPLY CO
43008L000	HV MAINT CO HV DIV	42004L100	SUP CO FSB HV DIV
43009L000	MAINT CO FSB HV DIV	42007L100	S&S CO M&S HV DIV
43209L000	MAINT CO NON DIV DS	42413L000	QM SUP CO GS
	SOLDIER SPT CTR		SIGNAL
12113L000	DIV AND ARMY BAND	11067L000	AREA SIG CO M&E
12423L100	GS POSTAL CO	11208L000	SIG SPT CO A ASLT
12457L100	PER SVC CO TYPE A	11417L200	AREA CO CORPS SIG BN
14403L000	FINANCE SPT UNIT	11603L100	SIG TACSATCOM CO
	JFKSWC		TRANSPORTATION
31701L000	MHC SPEC OPNS CMD	55178L000	TMT CO S&T BN LID
31303L000	SPT CO SF GP ABN	55603L000	TRANS MOV CON AGENCY

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31806L000	HQ SF BN	55719L100	TRANS LT-MDN TRK CO
31807L000	SF CO, ABN SF GP	55818L000	TRANS TERM SVC CO
6. POC THIS HQ IS MR. RANDOLPH, ATCD-OP, AV 630-2204.			
BT			
#7033			

APPENDIX F

SYSTEM SUPPORT

F-1. INTRODUCTION. The rule system developed on this study shares with other computer program systems a need for ongoing support throughout its operational life. Beyond the basic coding cases, identified in the applicable regulation and those recognized during the course of the development, it can be anticipated that new situations will be encountered from time to time which must be incorporated into the rule system. This will especially be the case in the period following the initial release of the system for operational use. The support will have to be resourced at two levels--system management and system maintenance.

F-2. SYSTEM MANAGER. Management of the system will require a TRADOC HQ-based individual broadly experienced in the policy and practice associated with the assignment of ERC. The individual's duties must be such that he/she is in touch with TOE documentation activities in the field on a regular basis. The regular contact will provide the opportunity to informally monitor the effectiveness of the system operation and be appraised of specific problems and proposed revisions. The individual will coordinate the approval of proposed system revisions with field and HQ personnel, pass detailed instructions for the approved revisions to the system maintainer, and distribute the approved and implemented changes to the field. As indicated, the duty should be carried out as an adjunct to other duties in the TOE documentation area.

F-3. SYSTEM MAINTAINER. Maintenance of the system will require an individual familiar with the disk operating system (DOS) of a microcomputer and the technical operation of the rule system implemented using the M.1 Knowledge System. While the clear English text character of the system code makes the code largely self-evident and self-documenting, familiarity with the M.1 shell reference materials (References 9 and 10) and general knowledge engineering principles (Reference 7) is required. The individual may also draw upon the faculty of the AITC, Fort Gordon, GA (the Army expert system trainer and Army agent for the M.1 shell), for assistance with system problems. In addition to carrying out the approved changes, the individual will also prepare the distribution copies of the revised system code and the associated hard copy listing of the ERC assignment rules for release by the system manager. The system maintainer will also maintain a log (preferably imbedded in the system code) of the code revisions and release dates. These duties should be tasked, as needed, as an adjunct to other programming support duties assigned to the individual.

APPENDIX G
VALIDATION PLAN

INTRODUCTION. The validation plan shown in this appendix is a facsimile of the plan developed to evaluate the performance of the ERCRULES expert system. The plan was approved by TRADOC HQ and served as the basis for the conduct of the field validation of the system. The plan is modeled on, and closely follows, the organization and editorial style of the documentation standard for the Test Plan in DOD 7935.1 - Automation Documentation Standards (Reference 1). Departures from the Test Plan standard have been made, as appropriate, to meet the specialized testing needs of the ERCRULES expert system, not provided for in the DOD Standard.

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EQUIPMENT READINESS CODE RULE SYSTEM
(ERCRULES)

VALIDATION PLAN

MARCH 1988

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VALIDATION PLAN
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SECTION 1. GENERAL

1.1 Purpose of the Validation* Plan.

This Validation Plan for the Equipment Readiness Code Rule System (ERCRULES) is prepared to:

- a. Establish the nature and extent of the activities necessary to establish the effectiveness of the system when used in the field environment.
- b. Establish and coordinate the resources and procedures needed for the conduct of the system validation.
- c. Provide guidance for the management and execution of the effort necessary for the system validation.

1.2 Project References.

- a. AR 220-1, Unit Status Reporting, 16 Sep 1986.
- b. TRADOC Regulation 310-4, Living Tables of Organization and Equipment.
- c. US Army Concepts Analysis Agency, Equipment Readiness Code Rule System, 22 Jan 1988 (draft).

1.3 Terms and Abbreviations. See Glossary.

*Validation, as distinct from verification, is the process of testing to establish that a system produces outputs that are appropriate in terms of the real world problem the system is devised to address. Verification, on the other hand, is the process of testing to establish that the system performs in accordance with its design, i.e., test that the system is essentially "bug-free."

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SECTION 2. VALIDATION PLAN

2.1 System Description.

a. ERCRULES is a microcomputer-based expert system (using the M.I expert system shell from Teknowledge, Inc.) and an associated knowledge base. The knowledge base contains rules for identifying the core equipment in a unit and rules for making ERC assignments to equipment in the unit.

NOTE: An Army unit, as the term is employed in the rule system, is a military element at the company-size level. It consists of a command element, and operating elements at the platoon, section, and team levels.

b. The system operates interactively with the user. The user provides the information which allows the system to search its knowledge base for the appropriate core equipment or ERC assignment rule and display the result. Each such session of user interaction with the system is referred to as a 'consultation' with the system.

c. In general, the user input is via selections from menus presented by the system. The knowledge base is ordered such that the menus ask for progressively more detail about the equipment until an appropriate outcome is presented, or until the system generates a notice that it is not possible to respond, based on the inputs provided. In addition, the user is provided with a menu to control the cycling of the system from one 'consultation' to the next.

d. The system provides a summary record (audit trail) for each consultation with the system. In addition to the system-generated information, additional reference information for this record is requested of the user via alphanumeric inputs. These inputs explicitly identify the unit and the equipment under consideration. They are not used in the logic of the system operation, but become part of the output display to provide a more complete record of the consultation for audit purposes. Control features have been added to the system to pass alphanumeric input from one consultation to the next, whenever possible.

e. The system, with its full complement of rules, takes an appreciable time (approximately 4 minutes) to load at the beginning of a session and takes a noticeable time (20 seconds) to respond to some inputs by the user. These times are based on system operation using first generation (8086/8088-based) microcomputers. Faster times (by a factor of four) are possible using second generation (80286-based) microcomputers.

2.2 Validation Objective. The objective of the validation is to establish the level of performance of the Equipment Readiness Code Rule System (ERCRULES) in the assignment of appropriate Equipment Readiness Codes (ERC) when used in the field operating environment.

2.3 Validation Scope.

a. The validation will address equipment in selected TOE units currently under development at the Army proponent schools and integration centers. From each of these selected units, a representative sample of equipments will be selected and will be assigned ERC using the system.

NOTE: The unit's table of organization and equipment (TOE) documents the minimum essential personnel and equipment requirements for sustained operations in wartime. The TOE is subdivided into paragraphs, which list the personnel and equipments within the platoons, sections and other components of the unit. Only the equipment requirements information in the TOE, in the form of the equipment line item number (LIN) and its nomenclature (equipment name), is used in conjunction with the system operation.

b. As summarized from the analysis of the validation sample size in Appendix A, the following sample will be used to validate the system.

Validation Sample

Sample Factor	Level
Proponents involved	Each school/center
TOE examined by each proponent	4 TOE
TOE paragraphs examined per TOE	Each paragraph
LIN examined per paragraph	Every fourth LIN

2.4 Validation Sites. The school and integration center sites at which the validation will be conducted are listed below.

Validation Sites

Academy of Health Sciences, Ft Sam Houston, TX
Air Defense Artillery School, Ft Bliss, TX
Armor school, Ft Knox, KY
Aviation School, Ft Rucker, AL
Aviation Logistics School, Ft Eustis, VA

Chemical School, Ft McClellan, AL
Combined Arms Center, Ft Leavenworth, KS
Engineer School, Ft Belvoir, VA
Field Artillery School, Ft Sill, OK
Infantry School, Ft Benning, GA

Information Systems Command, Ft Huachuca, AZ
Intelligence School, Ft Huachuca, AZ
Intelligence & Security Command, Arlington Hall, VA
Logistics Center, Ft Lee, VA
Military Police School, Ft McClellan, AL

Ordnance Missile & Munitions School,
Redstone Arsenal, AL
Ordnance School, Aberdeen Proving Ground, MD
Quartermaster School, Ft Lee, VA
Signal School, Ft Gordon, GA
Soldier Support Center, Ft Benjamin Harrison, IN

JFK Special Warfare Center, Ft Bragg, NC
Transportation, Ft Eustis, VA

2.5 Validation Schedule. The validation schedule will be conducted over a 7-week period, as shown in Table 2-1.

Table 2-1. Validation Schedule

Activity	Duration	Description (see Section)
Pre-Validation a. TOE selection b. Validation tasking c. System distribution	Week 1	3.2.1
Information to sites	Week 2	
Field Validation a. System use b. Site review	Week 3 and Week 4	3.2.2
Information from sites	Week 5	
Post-Validation a. Results review b. Rule review c. Rule update d. System Performance	Week 6 and Week 7	3.2.3

2.6 Site Requirements.

2.6.1 Site Equipment. The equipment, per site, required for the validation is as follows:

Site Equipment

Quantity	Item
1	Microcomputer, with 512K memory (minimum)
1	Printer, 80 col (minimum)
1	Workspace for TOE printouts

2.6.2 Site Software. The software, per site, required for the validation is as follows.

Site Software

Quantity	Item
1	M.1 System Shell *
1	M.1-Formatted knowledge base **
1	M.1 Configuration file **

* distributed at ERC Workshops October/November 1987.

** distributed by CAA per Validation Plan during Week 3.

2.6.3. Site Personnel.

a. Schools/Centers. The personnel, per school/center site, required for participation in the validation are TRADOC combat development personnel responsibility for TOE documentation as follows:

Participating School/Center Personnel

Number	Skill	Period Needed	Percent Time Per Day
1	TOE documentation *	4 days	50
1	TOE documentation supervisor	4 days	25

* person experienced with TOE selected for use in validation

b. TRADOC HQ. The personnel at TRADOC HQ, required for participation in the validation, are those with organizational responsibilities for policy, management and review of TOE documentation as follows:

Participating TRADOC HQ Personnel

Number	Skill	Period Needed	Percent Time Per Day
1	TOE program management	10 days	50
1	TOE review *	10 days	100

* TOE Review Board Member

2.6.4. Site Materiel. The materiel, per school/center required for the validation is as follows:

Site Materiel

Quantity	Item
1 each	TOE identified by TRADOC HQ for use at site in validation

2.7 ERC Certification. For the purposes of the system validation, the TOE Review Board, presently constituted at TRADOC HQ, or a representative thereof, will be the final authority for:

- a. Certifying the appropriateness of the ERC assignment rules in the system.
- b. Certifying ERC assignments of the equipments in the TOE used in the validation.

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SECTION 3. VALIDATION PROCEDURE

3.1 Functions Examined. The system functions in two modes of operation, a Core Consultation Mode and an ERC Consultation Mode. The Core Consultation Mode will be demonstrated and the ERC Consultation Mode will be validated.

a. Core Consultation Mode. In this mode, the user indicates the unit mission and mission-task. The system responds by identifying the core item(s) of equipment associated with the mission and mission-task, including the ERC of the core equipment. The ERC assigned may be either ERC-A (essential) or ERC-P (pacing), depending upon the type of equipment involved, as prescribed by AR 220-1.

b. ERC Consultation Mode. In this mode, the user indicates the type and the nature of use of an item of equipment in a unit. The system responds with:

- (1) ERC assignment (ERC-A, ERC-B, or ERC-C)
- (2) Number of rule used to make assignment
- (3) Category of equipment use in unit

The ERC assignment is the immediately desired item of information. The rule number is provided for reference and the category of use is a generic support equipment classification assigned by the system.

3.2 Pre-Validation Activity.

3.2.1 TOE Selection. TRADOC HQ will select the TOE to be used at each site from the TOE currently under development at the site.

3.2.2 Validation Tasking. TRADOC HQ will task the schools/centers with the conduct of the validation. The tasking will include the schedule, resources, activities and products required for the system validation.

3.2.3 System Distribution. The system materials, as approved by TRADOC HQ, will be distributed by CAA to each site as follows.

System Distribution Materials

Quantity	Item
1	Diskette with system files
1	System loading instructions
1	Listing of system
1	System Validation Procedure

3.3 Field Validation Activity.

3.3.1 System Use. The validation at each site will be carried out by exercising the system on each TOE identified for school use. The following procedures will be used.

a. Core Consultation Procedure

(1) The user will load and activate the ERCRULES program using the loading instructions provided.

(2) After selection of the CORE CONSULTATION mode of operation, the user will respond to the system prompts for unit mission and mission-task, with menu selections appropriate to the TOE under consideration.

(3) The system will respond with a 'CONSULTATION NOTICE - CORE EQUIPMENT ADVISED' for the TOE, and the ERC associated with each core equipment.

(4) The user will locate these core items in the appropriate TOE paragraphs and annotate the ERC on the TOE listing. The core equipment notice also includes a prompt to the user to proceed to the next coding activity.

(5) Before responding to the prompt, the user will print out the core equipment notice on the screen, as a record of the consultation, by following the instructions provided on the screen.

b. ERC Consultation Procedure.

(1) Before stating the ERC CONSULTATION mode of operation on the microcomputer, the user will mark or highlight every fourth item of equipment in each paragraph of the TOE under consideration. The user will start the LIN count from the first LIN of the first paragraph. The user will select every fourth LIN encountered, moving continuously from paragraph to paragraph, without regard to the start of new paragraphs. This process will yield approximately 80 LIN in each TOE so marked.

(2) If not already loaded, the user will load and activate the ERCRULES program using the loading instructions provided.

(3) Working from the marked TOE listing, the user will select each marked LIN in turn, for validation. The user will begin by identifying the LIN to the system using the selections from the system equipment menu(s).

(4) If, at this point in the procedure, the system displays a 'CONSULTATION NOTICE - EQUIPMENT NOT RECOGNIZED' (see Figure 3-1, bottom panel), the user will decide whether to repeat the session re-identifying the same LIN, or go on to the next LIN marked in the TOE. If the choice is to repeat the session, the user will respond to the prompt to proceed and will not make a copy of the screen. If the choice is to go on to the next marked LIN, the user will make a copy of the screen before proceeding.

(5) In the absence of a notice, the user will respond to the prompts for information about the use of the equipment in the unit.

(6) In course, the system will display a 'CONSULTATION NOTICE - ERC ADVISED' (see Figure 3-1, top panel). The notice includes the ERC of the item and the number of the rule used to arrive at the ERC assignment. Alternately, the system will display a 'CONSULTATION NOTICE - ERC NOT ADVISED' (see Figure 3-1, middle panel). The user will decide whether to repeat the session re-identifying the LIN usage, or go on to the next LIN marked in the TOE. If the choice is to repeat the session, the user will respond to the prompt to proceed and will not make a copy of the screen. If the choice is to go on to the next marked LIN, the user will make a copy of the screen before proceeding. The display also includes a prompt to the user to proceed to the next coding activity.

(7) The user will repeat the above steps (3 thru 6) for each marked LIN in the TOE, generating a printout for each LIN as a record of the consultation.

***** CONSULTATION NOTICE - ERC ADVISED *****
Branch: qms
Unit Name: SUPPLY & SERVICE CO
TOE: 42007J400
LIN Para: 02
LIN: Y36844
Equipment: Water quality control set
The readiness code advised is:
ERC A (Rule 5.5.14)
The code is based on use of the equipment for support of an individual within unit with an item needed to apply skills to task.
* To PRINT notice: Form-feed paper, enter [Shift + Prtsc].
* To CONTINUE on: Type any alphanumeric key, then return key.

***** CONSULTATION NOTICE - ERC NOT ADVISED *****
Branch: qms
Unit Name: SUPPLY & SERVICE CO
TOE: 42007J400
LIN Para: 02
Equipment: GSE
An ERC cannot be advised based on the equipment use presented. You may wish to:
1. Reconsider the use and redo the consultation or
2. Consult with your supervisor about the need for an appropriate usage entry/rule change in system.
* To PRINT notice: Form-feed paper, enter [Shift + Prtsc].
* To CONTINUE on: Type any alphanumeric key, then return key.

***** CONSULTATION NOTICE - EQUIPMENT NOT RECOGNIZED *****
Branch: qms
Unit Name: SUPPLY & SERVICE CO
TOE: 42007J400
LIN: W99880
LIN Para: 02
An ERC cannot be advised based on the equipment identification presented. You may wish to:
1. Reconsider whether it may be possible to associate the equipment with an existing ITEM TYPE, CATEGORY or USE or
2. Consult with your supervisor about the need for an appropriate equipment entry/rule change in system.
* To PRINT notice: Form-feed paper, enter [Shift + Prtsc].
* To CONTINUE on: Type any alphanumeric key, then return key.

Figure 3-1. ERC Consultation Notices

3.3.2 Site Review. The TOE documentation supervisor (or designated representative) at the site will:

- Review the individual ERC consultation printouts.
- Prepare a summary of the ERC consultation results.

a. ERC Consultation Review. The supervisor will review and annotate the consultation notices (printouts) as follows. The review activity will be conducted by the supervisor, even if the supervisor is the person who conducted the original consultations.

(1) ERC ADVISED NOTICES

- If in agreement with code assigned, place check mark to left of ERC.
- If in disagreement with code assigned, place X-mark to left of ERC, and annotate the more appropriate code, again at the left. Use lower half of printout to indicate the change needed in rule to correct situation or, alternatively, propose a new rule.

(2) ERC NOT ADVISED NOTICES

- Examine the queries leading to the failure to advise an ERC.
- As needed, rerun consultation to clarify query text.
- To the extent possible:
 - (a) cite an existing, relevant rule and recommend change needed in the rule to correct the coding situation.
 - (b) Alternatively, consider recommendation of a new rule to deal with the coding situation.
- Use the lower half of printout to record the recommendation.

(3) EQUIPMENT NOT RECOGNIZED NOTICES

- Examine the equipment types presented, leading to the inability to make an appropriate selection.
- As needed, rerun consultation to clarify equipment type text.
- To the extent possible, recommend change needed in existing equipment menus to correct the situation.
- Use the lower half of printout to record the recommendation.

b. Consultation Response Summary. The TOE documentation supervisor (or designated representative) will prepare a summary of the consultation activity by completing a TOE Worksheet (see Figure 3-2) for each TOE.

NOTE: The summary will be based on the initial results from use of the system. It will not include anticipated results from improvements in system operation, expected to result from incorporation of recommended changes.

Copies of the worksheet will be reproduced, as needed, on site from the worksheet copy included in the System Validation Procedure material distributed to the site.

c. Results Transmittal. Upon completion of the field validation activity (as described herein) the results will be forwarded to TRADOC HQ. The materials to be forwarded are as follows:

Validation Results Transmittal

Quantity	Item
Each	Marked-up TOE showing LIN selected for use in validation
Each	Consultation notice generated (with annotations)
Each	TOE Worksheet

 TOE Worksheet

Branch: _____

TOE: _____

Unit Name: _____

Consultation Response	Mark slash (/) each time condition generated by consultation (collect slashes in groups of 5, separated by commas)				Total Slashes
A - Correct	,	,	,	,	_____
B - Correct	,	,	,	,	_____
C - Correct	,	,	,	,	_____
A - Incorrect	,	,	,	,	_____
B - Incorrect	,	,	,	,	_____
C - Incorrect	,	,	,	,	_____
ERC Not Advised	,	,	,	,	_____
Equipment Not Recognized	,	,	,	,	_____
Total of Above Responses					_____

Figure 3-2. TOE Worksheet

3.4 Post-Validation Activity.

3.4.1 Results Review. TRADOC HQ will review the validation results as transmitted from the field.

(1) TOE Worksheets

- Inspect for relative number of ERC advised and relative number where ERC were not advised, to provide initial insight into system performance.
- Pass summaries to CAA for detailed analysis of the system performance, as described in Appendix B.

(2) Consultation Notices. Arrange notices into three categories and conduct review as follows:

- ERC ADVISED Notices - review field annotations and make final determination of correct ERC. If ERC satisfactory, place check thru printed ERC. If ERC unsatisfactory, place a slash thru printed ERC and indicate correct ERC in a circle next to printed ERC.
- ERC NOT ADVISED Notices - review field annotations and make final determination of rule changes and additions to correct failed coding situations.
- EQUIPMENT NOT RECOGNIZED Notices - review field annotations and make final determination of equipment menu changes and additions, to correct failed equipment selection situations.

3.4.2 Rule System Review. Guided by the results review, TRADOC HQ will identify rule changes needed and coordinate with CAA on the manner of their implementation.

3.4.3 Rule System Update. Based on rule system changes coordinated with TRADOC HQ, CAA will implement the changes and forward the revised rule system to TRADOC HQ. Rule changes identified in the test and review activity will be discussed in the study report.

3.4.4 System Performance Analysis. CAA will analyze the performance of the system in the assignment of ERC during the field trials. Appendix B describes the manner in which the system performance will be assessed.

GLOSSARY

AR	Army Regulation
audit trail	a record of the consultation with the rule system for general reference, and use by higher authority
core equipment	equipment essential to the performance of the unit mission
support equipment	equipment in unit other than the core equipment
ERC	Equipment Readiness Code, a three-level code (A (highest), B, or C) which is assigned to an equipment in a unit, to indicate its importance to the conduct of the unit mission.
ERC RULES	acronym for Equipment Readiness Code Rule System
expert system	a computer program that uses knowledge and logical inference procedures to solve problems that normally require human expertise for their solution
K	thousand
M.1	trade name for expert system shell marketed by Teknowledge, Inc.
knowledge base	collection of knowledge (facts, rules of thumb) structured as a set of rules, for use in an expert system
LIN	line item number, the basic Army reference number for an item of equipment
ODCSOPS	Office of the Deputy Chief of Staff for Operations
pacing equipment	equipment of the highest essentiality to a unit as defined in AR 220-1
TOE	table of organization and equipment

TRADOC HQ unit	Training and Doctrine Command Headquarters Army unit; as used by the rule system a company-size element
validation	process of demonstrating that a (expert) system produces useful results
verification	processing of demonstrating that a (expert) system is operating as designed

APPENDIX A
VALIDATION SAMPLE SIZE

A-1. Introduction. This appendix presents the rationale for the equipment sample size used in the validation of the ERC Assignment mode of operation of the system.

A-2. Sampling Objective: Establish quantitative factors for the selection of TOE and their constituent equipments, which provide a representative selection of the equipment in Army units.

A-3. Representative Selection. A representative selection is one that takes into account the principal sources of variability in unit equipment across all types of Army units. Variability across and within units arises from the following factors:

Across Units

- o Unit Class (i.e., Proponent)
- o Unit Type (i.e., TOE)

Within Unit

- o Equipment Allocation (i.e., TOE Function by Paragraph)
- o Equipment Type (i.e., LIN)

These factors are described in the following paragraphs.

A-3.1 Unit Class (Proponent).

a. Sampling Factor. The class of a unit is defined by the Army proponent (school or integrating center) which has responsibility for design of the unit. Each proponent develops units in a specialized area of military capability (e.g., infantry, armor, quartermaster).

b. Sampling Assumption. Across the classes of units there is a variability in equipment and equipment uses. More significantly, however, there is value in having each proponent participate in the validation process as a means of contributing to the system development. In addition, the validation activity demonstrates the capability of the system to assist with ERC assignments during the TOE documentation process.

c. Sample Fraction. The validation sample will include all (100%) of the unit classes (proponents).

A-3.2 Unit Type (TOE).

a. Sampling Factor. Each Army proponent develops unit types which are individually documented in a "table of organization and equipment" (TOE).

NOTE: A TOE is identified by a 9-character, alphanumeric designation, consisting of 5-digit 'base' TOE number, a TOE series letter, and a 3-digit variation number. This format makes it readily possible to identify the 'base' TOE of interest.

b. Sampling Assumption. Apart from specialized core equipments which are handled separately by the Core Equipment Mode of system operation, unit types (within a unit class) employ similar equipments and exhibit low variability across unit types.

c. Sample Fraction. The validation sample will use a 5% sample of the unit types (TOE) within each unit class (proponent).

A-3.3 Equipment Allocation (TOE paragraph).

a. Sampling Factor. Within each TOE, the unit equipment is grouped by component, where each component has a particular mission or capability and is allocated the equipment appropriate to such activity.

NOTE: A TOE is divided into numbered paragraphs, each of which itemizes the equipment in a particular component of the unit under description. Paragraph '01', for example, usually itemizes the equipment in the command component. Subsequent paragraphs follow through the unit organization, and list the equipments in the platoons, sections, teams and other components into which the unit is organized.

b. Sampling Assumption. Across the components of a unit (TOE paragraphs) there is a wide variability in equipment and equipment uses

c. Sample Fraction. The validation sample will include all (100%) unit components (LIN paragraphs) within a unit (TOE).

A-3.4 Equipment Type (LIN).

a. Sampling Factor. Each equipment type (LIN) within a unit component (LIN paragraph) represents an example of the application of the basic technology present in the unit. Similar equipments and uses can be found in other unit types (within the unit class).

NOTE: Individual items of equipment are identified by Line Item Number (LIN) in the TOE listing. The rule system menus, by design, list generic equipment types, which bring related LIN together into a group. A user selection of 'truck', for example, can refer to any one of several LIN, identifying trucks of varying capacity.

b. Sampling Assumption. The equipment types in unit components (LIN paragraphs) are similar to the unit components within other unit types (TOE) within the unit class (proponents).

c. Sample Fraction. The validation will include 25% of the equipment types (LIN) within the unit type (TOE) and unit class (proponent).

A-4 Estimated Sample Size. Table A-1 summarizes, by sample factor, the assigned sample fraction rates and the associated (estimated) sample size. As shown in the 'Total' row in Table A-1, an estimated 6600 ERC assignments will be in the sample generated by the 22 schools and integrating centers participating in validation.

Table A-1. Estimated Sample Size

Sample Factor	Value	Sample Size	
		Percent Sampled	Number Sampled
Number of proponents	22	100 %	22
TOE per proponent ('base' TOE)	40 *	10 %	4
TOE paragraphs per TOE	10 *	100 %	10
LIN per TOE paragraph	30 *	25 %	7.5
* average value estimated from selected TOE references			
Total (estimated)	--	--	6600

A-5 Validation Sample. As read directly from Table A-1, the following sample of equipment types will be used for validation.

Table A-2 Validation Sample

Sample Factor	Level
Proponents Involved	All
TOE examined per proponent	4
TOE paragraphs examined per TOE	All
LIN examined per paragraph	Every fourth LIN

APPENDIX B
SYSTEM PERFORMANCE ASSESSMENT

B-1. Introduction. This appendix describes the manner in which the level of performance of the rule system, in the ERC CONSULTATION MODE of operation, will be assessed.

NOTE: The other mode of system operation, the CORE CONSULTATION MODE, is essentially a table look-up of core equipments, keyed to specific unit missions and mission-tasks. With the table look-up, there are no issues of rule completeness which would require a performance analysis, as is the case in the ERC CONSULTATION MODE.

B-2. Performance Data. The data for assessment of the system performance will be the 'notices' generated by the system as a record of each consultation. There are three notices associated with the ERC CONSULTATION MODE as follows:

- ERC ADVISED - Displays the ERC assigned to the equipment, the assignment rule number.
- ERC NOT ADVISED - Displays a message that an ERC cannot be advised, based on the equipment use identified.
- EQUIPMENT NOT RECOGNIZED - Displays a message that an ERC cannot be advised, based on the equipment identification presented.

B-3. Control for Unit Type. It is anticipated that the system performance may be influenced by the type (branch) of unit involved. All units are not alike in the diversity of equipment types and equipment uses present. In general, combat units have less equipment diversity than units with either combat support missions or combat service support missions. For the scale of the system validation considered appropriate, it is not feasible to examine such diversity by branch. However, it is feasible to aggregate the unit types into two basic diversity-sensitive groups as follows:

- Combat Units - Infantry
Armor
Field Artillery
Special Forces
Air Defense
Aviation
- Support Units - balance of proponent schools

B-4. Performance Data Review. The 'notices' generated during the evaluation will be examined and annotated by the TOE documentation supervisors as part of the site review (see Section 3.3.2). The notice information for the TOEs will be summarized on TOE Worksheets (see Section 3.3.2.b and Figure 3-2). The worksheet values (one worksheet per TOE) will comprise the data used in the performance evaluation. The worksheet data includes the identification of the unit branch needed to control for unit type.

B-5. Performance Data Matrix. The data from the TOE Worksheets will be summarized, in turn, into a single matrix of performance data, to facilitate the performance analysis, as shown in Table B-1. The matrix organization is described in the following paragraphs.

Table B-1. Performance Data Matrix

		Consultation Response	Combat Units	Support Units	All Units
			Number	Number	Number
			Col A	Col B	Col C
Row 1	ERC Correct		—	—	—
Row 2	ERC Incorrect		—	—	—
Row 3	ERC Not Advised		—	—	—
Row 4	Equipment Not Recognized		—	—	—

B-5.1 Matrix Columns. The matrix columns correspond to the columns in the TOE Worksheets, namely:

- Combat Units
- Support Units
- Ali Units (the total of both groups)

B-5.2 Matrix Rows. The matrix rows correspond to the rows in the TOE Worksheets, with some of the worksheet rows summed into a single matrix entry:

- ERC Correct - Sum of worksheet responses for:

ERC A Correct,
ERC B Correct,
ERC C Correct.

- ERC Incorrect - Sum of worksheet responses for:

ERC A Incorrect,
ERC B Incorrect,
ERC C Incorrect.

- ERC Not Advised - Sum of corresponding worksheet responses.
- Equipment Not Recognized - Sum of corresponding worksheet responses.

B-5.3 Matrix Cells. The matrix cells contain the quantities needed in the calculation of the system performance. For convenience, the standard cell position notation of 'column/row' (e.g., A1, B2, C3) are used to represent the performance data values in the calculations described in the following paragraphs.

B-6. Performance Measures. A group of related measures, based on the performance data matrix, will be used to establish the system performance as follows:

- System Completeness - the extent to which the system recognizes the equipments presented for assessment.

- System Accuracy - the extent to which the system assigns the correct ERC to the equipment recognized.

- System effectiveness - the extent to which the system assigns the correct ERC to the equipment presented for assessment.

The following paragraphs describe both the significance and the measurement of each performance measure.

B-6.1 System Completeness.

a. Significance. System completeness assesses the success of equipment recognition by the system. Equipment recognition is a prerequisite to consideration of ERC assignment by the system. The success of the system in equipment recognition is indicated indirectly by the fact that the system has produced output associated with the assignment of an ERC. Thus, there is no express indication that equipment identification has occurred; it is inferred from the ERC-related outputs. On the other hand, the failure of the system to recognize an equipment is explicitly identified. Under this condition, the system displays a 'notice' advising 'Equipment Not Recognized'. System completeness is the comparison of ERC-related responses to all system responses.

b. Measurement. System completeness measures the (percent) success the system experienced in identifying the equipment under consideration. A completeness of 100% indicates that the system identified all equipments presented by the user for consideration. System completeness is computed as the ratio of the number of responses where the system recognized the equipment (regardless of whether an ERC was successfully assigned) to the total number of responses (equipment recognized and not recognized).

The measure, computed using the cells of the performance data matrix and computed as a percentage for the Combat Units, Support Units and All Units, is as follows:

$$\begin{aligned} \text{Completeness} &= (A1+A2+A3) / (A1+A2+A3+A4) \times 100 \quad (\text{Combat Units}) \\ &= (B1+B2+B3) / (B1+B2+B3+B4) \times 100 \quad (\text{Support Units}) \\ &= (C1+C2+C3) / (C1+C2+C3+C4) \times 100 \quad (\text{All Units}) \end{aligned}$$

B-6.2 System Accuracy.

a. Significance. System accuracy assesses the success of the ERC assignment by the system. This accuracy is based on three separate considerations. The first consideration is the ability of the system to produce an ERC assignment, based on the inputs provided by the user. The second consideration is the correctness of system assignment, based on a review of the assignment by competent authority. The third consideration is the failure of the system to produce an ERC, based on the inputs provided by the user. System accuracy is a comparison of the correct ERC responses, as certified by competent authority, to all ERC-related responses (correct or otherwise).

b. Measurement. System accuracy measures the (percent) success the system experienced in assigning an ERC to the equipment identified to the system. An accuracy of 100% indicates that an ERC was assigned in all cases where the equipment was identified. System accuracy is computed as the ratio of the number of ERC correct responses to the number of those responses where the system recognized the equipment (regardless of whether an ERC was successfully assigned).

The measure, computed using the cells of the performance data matrix and computed as a percentage for the Combat Units, Support Units and All Units, is as follows:

$$\text{Accuracy} = A1 / (A1+A2+A3) \times 100 \quad (\text{Combat Units})$$

$$B1 / (B1+B2+B3) \times 100 \quad (\text{Support Units})$$

$$C1 / (C1+C2+C3) \times 100 \quad (\text{All Units})$$

B-6.3 System Effectiveness.

a. Significance. A successful consultation consists of the system correctly identifying the equipment (completeness) and then correctly identifying the equipment use in the unit (accuracy). To the extent that these operations are jointly successful, the system is effective in its operation.

b. Measurement. System effectiveness measures the (percent) success the system experienced in making ERC assignments under field conditions. An effectiveness of 100% indicates that all ERC were appropriately assigned to all equipment considered by the system.

The measure, in general, may be expressed as:

$$\text{Effectiveness} = \text{Completeness} \times \text{Accuracy}$$

The measure, computed using the cells of the performance data matrix and computed as a percentage for the Combat Units, Support Units and All Units, is as follows:

$$\begin{aligned} \text{Effectiveness} &= A1 / (A1+A2+A3+A4) \times 100 \quad (\text{Combat Units}) \\ &= B1 / (B1+B2+B3+B4) \times 100 \quad (\text{Support Units}) \\ &= C1 / (C1+C2+C3+C4) \times 100 \quad (\text{All Units}) \end{aligned}$$

B-7. Performance Summary. The system performance measures will be summarized as shown in Table B-2, to provide the desired quantitative assessment of the system performance under field conditions.

Table B-2. System Performance Summary

Performance Measure	Combat Units	Support Units	All Units
	Percent	Percent	Percent
System Completeness	___ %	___ %	___ %
System Accuracy	___ %	___ %	___ %
System Effectiveness	___ %	___ %	___ %

APPENDIX H
VALIDATION PROCEDURES MANUAL

INTRODUCTION. The validation procedures manual, shown in this appendix is a facsimile of the manual developed to evaluate the performance of the ERCRULES expert system. The manual served as the basis for the conduct of the field validation of the system. The manual is loosely modeled on the documentation standard for the User's Manual in DOD 7935.1 - Automation Documentation Standards (Reference 1). Substantial departures from the User's Manual standard have been made to meet the specialized testing needs of the ERCRULES expert system, not provided for in the DOD standard.

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EQUIPMENT READINESS CODE RULE SYSTEM
(ERCRULES)

VALIDATION PROCEDURES MANUAL

Including

System Use Procedures
and
Supervisory Review Procedures

APRIL 1988

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PART I - INTRODUCTION

BACKGROUND

The Equipment Readiness Code Rule System (ERC RULES) has been developed to assist TOE documentation personnel with the identification of the core equipment (includes all pacing items and selected ERC A items) in a unit and the assignment of ERC to the equipment in the unit.

In its fully configured form, the system will have core equipment for all unit types and include all cases of equipment use needed for ERC assignment.

In its present configuration, the system has an illustrative set of core equipments and includes those cases of equipment associated with ERC assignment which have been identified to date. The design is based largely on information collected at the ERC workshops conducted at Ft Gordon, GA, in October/November 1987.

The use of the system in the validation activity departs from the intended use of the system in two significant ways:

1. The user will carry out ERC assignments for a list of equipments, which are selected to broadly represent equipments present in Army units. In normal system use, ERC assignments are sought only where assistance in coding is specifically needed.
2. The user will generate an extensive set of records (printouts) documenting the use of the system, for testing purposes. In normal system use, no record keeping is anticipated.

VALIDATION OBJECTIVE

The objective of the validation is to establish the level of performance of the Equipment Readiness Code Rule System in the assignment of appropriate Equipment Readiness Codes (ERC), when used in the field operating environment.

Part of the validation procedure calls for a review of the results, and the generation of comments for revision and update of the system. The validation, therefore, will both establish the level of performance of the system and provide information for upgrade of the system to a higher level of performance.

SYSTEM DESCRIPTION

ERC RULES is a microcomputer-based expert system (using the M.1 expert system shell from Teknowledge, Inc.) and an associated knowledge base. The system operates interactively with the user. The user provides the information which allows the system to search its knowledge base for the appropriate core equipment or ERC assignment rule and display the result. Each such session of user interaction with the system is referred to as a 'consultation' with the system. The user can readily control the cycling of the system from one consultation to the next.

The system functions in two modes of operation: a Core Consultation Mode and an ERC Consultation Mode.

Core Consultation Mode

In this mode, the user indicates the unit mission and mission-task. The system responds by identifying the core item(s) of equipment associated with the mission and mission-task, including the ERC of the core equipment. The ERC assigned may be either ERC-A (essential) or ERC-P (pacing), depending upon the type of equipment involved, as prescribed by AR 220-1.

ERC Consultation Mode

In this mode, the user indicates the type and the nature of use of an item of equipment in a unit. The system responds with:

- (1) ERC assignment (ERC-A, ERC-B, or ERC-C)
- (2) Number of the rule used to make the ERC assignment
- (3) Category of equipment use in unit

The ERC assignment is the immediately desired item of information. The rule number is provided for reference. The category of use is a generic support equipment classification assigned by the system.

VALIDATION ITEMS

The items needed to conduct the validation are as follows:

Validation Items

Quantity	Item	Status
1	Microcomputer, with 512K memory (min)	On-site item
1	Printer, 80 col paper	On-site item
1	M.I Shell Disk	Note 1
1	ERCRULES Disk	Note 2
1	ERCRULES Listing	Note 2
1	System Validation Procedure	Note 2
4	TOE listing (Note 3)	On-site item

Notes:

1. Distributed at ERC Workshops October/November 1987.
2. Provided by Concepts Analysis Agency via mail distribution.
3. TOE identified in TRADOC HQ tasking message.

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PART II - SYSTEM LOADING PROCEDURE

HOST SYSTEM COMPONENTS

System Disk Drives

ERCRULES can be used on either a dual-floppy drive computer or a hard-disk computer. If used on a dual-floppy drive system, the M.1 Shell Disk is used in drive A and the ERCRULES disk is used in drive B. If used on a hard-disk computer, the ERCRULES Disk is loaded into the hard-disk sub-directory which contains the M.1 shell. Procedures are provided for loading and operating either configuration.

System Printer

The system printer is used to make a record of each consultation. These records will be subsequently used to review and evaluate the system performance. In using the printer, be sure to advance the form to the top of the page after each use. The balance of the sheet will be used for review annotations.

LOADING DUAL FLOPPY DRIVE SYSTEM

NOTE: In this and other procedures described herein, the term 'Enter' means to type the command shown and then hit the 'Return' key.

- Step 1. Insert M.1 Shell Disk in drive A.
- Step 2. Insert ERCRULES Disk in drive B.
- Step 3. Enter command 'B:' (to set default drive - do not include quotes).
- Step 4. Enter command 'ERCVAL_F'.

- Step 5. Observe ERCRULES banner on screen and message: Loading...
- Step 6. When loading is complete, observe system message requesting: 'Who is proponent for this unit'.
- Step 7. Enter 3-letter code from menu (in lower case) for your school/center.
- Step 8. Observe system message requesting: 'What is the name of the unit'.
- Step 9. Enter a convenient abbreviation of the unit name for the TOE, enclosed in quotes.
- Step 10. Observe system message requesting: 'What is the TOE of the unit'.
- Step 11. Enter the 9-character TOE, again enclosed in quotes.
- Step 12. Observe the system message requesting selection of the mode of operation desired.
- Step 13. This completes the loading process. See following procedures for use of the system in either the CORE CONSULTATION MODE or ERC CONSULTATION MODE.

LOADING HARD-DISK SYSTEM

- Step 1. If system is not already on, power-up computer and wait for the DOS prompt.
- Step 2. Identify sub-directory on hard-disk containing the M.1 System Shell. If not already installed on the hard disk, install M.1 as follows:
- Step 2.a. Enter 'make directory' command: 'md\erc'.
- Step 2.b. Enter the 'change directory' command: 'cd\erc'.
- Step 2.c. Insert the disk containing the M.1 System Shell in Drive A.
- Step 2.d. Enter copy command: 'copy A: m1.exe c:'.
- Step 2.e. Observe system responses:
 'M1.EXE'
 '1 File(s) copied'.
- Step 3. Enter 'change directory' command to switch to hard disk sub-directory containing the M.1 system shell (for example, enter 'cd\erc', if the sub-directory is 'erc').
- Step 4. Insert ERCRULES disk in drive A.
- Step 5. Enter command 'copy A;*.* c:', to transfer the system rules data from the disk to the sub-directory.
- Step 6. Observe system responses:
 'ERCVAl.CFG'
 'ERCVAl.RUL'
 'ERCVAl_C.BAT'
 'ERCVAl_M.BAT'
 '4 File(s) copied'.
- Step 7. Enter command: 'ERCVAl_H'.
- Step 8. Continue loading process using Step 5 to Step 13 of the LOADING DUAL-FLOPPY DRIVE SYSTEM procedure.

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PART III - CORE CONSULTATION PROCEDURE

- Step 1. Load and activate system per SYSTEM LOADING PROCEDURE.
- Step 2. Select the CORE CONSULTATION mode of operation.
- Step 3. Respond to the system prompt for mission of the unit with a selection from menu, appropriate to TOE under consideration.
- Step 4. Respond to the system prompt for mission-task of the unit, with a selection from menu appropriate to TOE under consideration.
- Step 5. Observe system to indicate a consultation is in progress (in lower right of screen).
- Step 6. In course, system will respond with a 'CONSULTATION NOTICE - CORE EQUIPMENT ADVISED' for the TOE, displaying the core equipment and the ERC associated with each core equipment.
- Step 7. Locate these core items in the appropriate TOE paragraphs and annotate the ERC on the TOE listing.
- Step 8. The notice also includes a prompt to proceed to the next coding activity. Before responding to the prompt, print out the core equipment notice on the screen (as a record of the consultation) by following the instructions provided on the screen.
- Step 9. Respond to prompt to proceed, as instructed on screen.
- Step 10. Repeat CORE CONSULTATION for any additional mission-tasks associated with the mission of the unit.

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PART IV - ERC CONSULTATION PROCEDURE

Step 1. Before stating the ERC CONSULTATION mode of operation on the microcomputer, take the TOE and mark or highlight every FOURTH item of equipment in each paragraph of the TOE listing.

Step 2. To mark each fourth item, start with the first LIN of the first paragraph. Select every fourth LIN encountered, moving continuously from paragraph to paragraph, without regard to the start of new paragraphs. Include any LIN previously marked in the core consultation procedure. This mark-up process is estimated to yield approximately 80 LIN in a TOE.

Step 3. If not already loaded, load and activate system per SYSTEM LOADING PROCEDURE.

Step 4. Working from the marked TOE listing, select each marked LIN in turn, for validation, as follows.

Step 5. Observe the system prompt for the type of consultation desired.

Step 6. Select the ERC Consultation mode of operation from the menu.

Step 7. Observe the system prompt for the TOE paragraph.

Step 8. Enter the TOE paragraph number in which the LIN appears, enclose the paragraph number in quotes.

Step 9. Observe the system prompt for the LIN.

Step 10. Enter the LIN by its six-character codes, enclose the LIN in quotes.

Step 11. Observe the system prompt for the classification which best identifies the LIN.

Step 12. Enter the best LIN classification, by number, at the prompt. If appropriate, enter the number 25 to display the extended list of item types.

Step 13. If, at this point in the procedure, the system displays a 'CONSULTATION NOTICE - EQUIPMENT NOT RECOGNIZED' (see Figure 1, top panel), decide whether to repeat the session re-identifying the same LIN, or go on to the next LIN marked in the TOE.

- Step 14. If the choice is to repeat the session, respond to the prompt to proceed and DO NOT MAKE A COPY of the screen.
- Step 15. If the choice is to go on to the next marked LIN, DO MAKE A COPY of the screen before proceeding.
- Step 16. In the absence of a notice, observe, in turn, the sequence of prompts for information about the use of the equipment in the unit. Enter a response to each prompt using the number corresponding to your selection.
- Step 17. In course, the system will display a 'CONSULTATION NOTICE - ERC ADVISED' (see Figure 1, middle panel). The notice includes the ERC of the item and the number of the rule used to arrive at the ERC assignment.
- Step 18. Alternately, the system will display a 'CONSULTATION NOTICE - ERC NOT ADVISED' (see Figure 1, bottom panel). Decide whether to repeat the session re-identifying the LIN usage, or go on to the next LIN marked in the TOE.
- Step 19. If the choice is to repeat the session, respond to the prompt to proceed and DO NOT MAKE A COPY of the screen.
- Step 20. If the choice is to go on to the next marked LIN, DO MAKE A COPY of the screen before proceeding.
- Step 21. The display includes a prompt to proceed to the next coding activity.
- Step 22. Respond to the prompt to proceed as instructed on the screen.
- Step 23. Repeat Steps 5 to Step 22 for each marked LIN in the TOE, generating a printout for each LIN as a record of the consultation.

PART V - CONTINGENCY PROCEDURES

CONSULTATION ABORT

In the event the system produces an unexpected response, for example, the query 'What is the value of (some expression)', proceed as follows:

- Step 1. Terminate the consultation with the Command (Alt + A), that is, hold down the Alt and A keys simultaneously.
- Step 2. Observe system (at top of screen) to confirm command with query 'Abort consultation [y/n]?'. Enter 'y'.
- Step 3. Resume a new consultation with the Command (Alt + G).

SESSION ABORT

If it becomes necessary, at any point, to conclude the operation of the system, proceed as follows:

- Step 1. Terminate the session with the Command (Alt + Q).
- Step 2. Observe system (at top of screen) to confirm command with query 'Exit to DOS [y/n]?'. Enter 'y'.
- Step 3. To restart session, reload system as follows:

DUAL-FLOPPY SYSTEM: Follow procedure for loading dual-floppy drive system starting at step 1.

HARD-DISK SYSTEM: Follow procedure for loading hard disk system starting at step 7.

PART VI - SUPERVISORY REVIEW PROCEDURES

The TOE documentation supervisor (or designated representative) on-site will:

- o Review and annotate each ERC CONSULTATION MODE notice (printout), following the procedures provided. No review of the notices from the CORE CONSULTATION MODE activity is required.
- o Prepare a summary of these consultations for each TOE examined, following the procedures provided.
- o Transmit results of validation activity to TRADOC HQ.

NOTE: These activities will be conducted by the supervisor or representative), even if this is the person who conducted the original consultations.

RULE DOCUMENTATION:

The individual rules used to assign ERC are contained in the blue cover document, ERC Rule System (ERCRULES) DRAFT, dated April 1988, distributed as part of the validation material. The rules which assign the ERC are contained in Section 4, 5 and 6 of the document. The first two numbers of each rule (separated by a period) correspond to the Sections identified in the table of contents of the ERCRULES drafted above. The last digit(s) of the rule number are consecutive numbering within the section. The rule number is shown on the last line of each rule.

NOTICE REVIEW PROCEDURE - ERC ADVISED NOTICE^a

- Step 1. If in agreement with code assigned, place check mark to left of ERC.
- Step 2. If in disagreement with code assigned, place X-mark to left of ERC, and annotate the more appropriate code, again at the left.
- Step 3. If appropriate, review the rule used to assign the code, by consulting the ERCRULES draft.
- Step 4. Use lower half of printout to indicate the change needed in rule to correct situation or, alternatively, propose a new rule.

^aSee Figure 1, center panel.

NOTICE REVIEW PROCEDURE - ERC NOT ADVISED NOTICE^b

- Step 1. Examine the queries leading to the failure to advise an ERC.
- Step 2. As needed, rerun the consultation to clarify the questions asked and refer to the ERCRULES draft for the text of the rule.
- Step 3. To the extent possible:
 - a. Cite an existing, relevant rule and recommend change needed in the rule to correct the coding situation.
 - b. Alternatively, consider recommendation of a new rule to deal with the coding situation.
 - c. Use the lower half of printout to record the recommendation.

NOTICE REVIEW PROCEDURE - EQUIPMENT NOT RECOGNIZED NOTICE^c

- Step 1. Examine the equipment types presented, leading to the inability to make an appropriate selection.
 - Step 2. As needed, rerun the consultation to clarify equipment types presented for consideration.
 - Step 3. To the extent possible:
 - a. Consider change(s) needed in the existing equipment menus to correct the situation.
 - b. Use the lower half of printout to record the recommendation.
- a See Figure 1, bottom panel.
b See Figure 1, top panel.

NOTICE SUMMARY PROCEDURE

The TOE documentation supervisor (or designated representative) will prepare a summary of the ERC CONSULTATION MODE activity by completing a TOE Worksheet (see Figure 2) for each TOE. Copies of the worksheet will be reproduced as needed, from the worksheet figure included herein.

NOTE: The summary will be based on the initial results from use of the system. It will not include anticipated results from improvements in system operation, expected to result from incorporation of recommended changes.

- Step 1. Enter the Branch, TOE code the unit name on the lines provided.
- Step 2. Examine each notice in turn and determine which type of consultation response is involved.
- Step 3. If the notice is ERC ADVISED, check the annotation to see if the ERC assignment is appropriate.
- Step 3.a If appropriate, place a slash in the row for the 'correct' ERC assignment involved.
- Step 3.b If the ERC is inappropriate place a slash in the row for the 'incorrect' ERC assignment.
- Step 4. If the notice is ERC NOT ADVISED, place a slash in the corresponding row in the form.
- Step 5. If the notice is EQUIPMENT NOT RECOGNIZED, place a slash in the corresponding row in the form.
- Step 6. When all notices have been accounted for with slashes, count the slashes in each row and enter the totals in the columns at the right.
- Step 7. Sum the row totals into a final total and enter on form in the lower right.
- Step 8. Repeat Step 1 to Step 9 for each of the four TOE validated.

RESULTS TRANSMITTAL PROCEDURE

Upon completion of the validation activity, the results will be forwarded to TRADOC HQ. The materials to be forwarded are as follows:

Test Results Transmittal

Quantity	Item
Each	Consultation notice generated (with annotations)
4	TOE Worksheet
4	Marked-up TOE showing LIN selected for use in validation

The ERCRULES disk and other validation material does not have to be returned.

***** CONSULTATION NOTICE - ERC ADVISED *****
Branch: qms
Unit Name: SUPPLY & SERVICE CO
TOE: 42007J400
LIN Para: 02
LIN: Y36844
Equipment: Water quality control set
The readiness code advised is:
ERC A (Rule 5.5.14)
The code is based on use of the equipment for support of an individual within unit with an item needed to apply skills to task.
* To PRINT notice: Form-feed paper, enter [Shift + Prtsc].
* To CONTINUE on: Type any alphanumeric key, then return key.

***** CONSULTATION NOTICE - ERC NOT ADVISED *****
Branch: qms
Unit Name: SUPPLY & SERVICE CO
TOE: 42007J400
LIN Para: 02
Equipment: GSE
An ERC cannot be advised based on the equipment use presented. You may wish to:
1. Reconsider the use and redo the consultation or
2. Consult with your supervisor about the need for an appropriate usage entry/rule change in system.
* To PRINT notice: Form-feed paper, enter [Shift + Prtsc].
* To CONTINUE on: Type any alphanumeric key, then return key.

***** CONSULTATION NOTICE - EQUIPMENT NOT RECOGNIZED *****
Branch: qms
Unit Name: SUPPLY & SERVICE CO
TOE: 42007J400
LIN: W99880
LIN Para: 02
An ERC cannot be advised based on the equipment identification presented. You may wish to:
1. Reconsider whether it may be possible to associate the equipment with an existing ITEM TYPE, CATEGORY or USE or
2. Consult with your supervisor about the need for an appropriate equipment entry/rule change in system.
* To PRINT notice: Form-feed paper, enter [Shift + Prtsc].
* To CONTINUE on: Type any alphanumeric key, then return key.

Figure 1. ERC Consultation Notices

 TOE Worksheet

Branch: _____

TOE: _____

Unit Name: _____

Consultation Response	Mark slash Step ? each time condition generated by consultation (collect slashes in groups of 5, separated by commas)				Total Slashes
A - Correct	,	,	,	,	_____
	,	,	,	,	
	,	,	,	,	
B - Correct	,	,	,	,	_____
	,	,	,	,	
	,	,	,	,	
C - Correct	,	,	,	,	_____
	,	,	,	,	
	,	,	,	,	
A - Incorrect	,	,	,	,	_____
	,	,	,	,	
	,	,	,	,	
B - Incorrect	,	,	,	,	_____
	,	,	,	,	
	,	,	,	,	
C - Incorrect	,	,	,	,	_____
	,	,	,	,	
	,	,	,	,	
ERC Not Advised	,	,	,	,	_____
	,	,	,	,	
	,	,	,	,	
Equipment Not Recognized	,	,	,	,	_____
	,	,	,	,	
	,	,	,	,	
Total of Above Responses					_____

Figure 2. TOE Worksheet

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GLOSSARY

AR	Army Regulation
audit trail	a record of the consultation with the rule system for general reference, and use by higher authority
consultation	one cycle of use of the system during the course of a session of system operation
core equipment	equipment essential to the performance of the unit mission
support equipment	equipment in unit other than the core equipment
ERC	Equipment Readiness Code, a three-level code (A (highest), B, or C) which is assigned to an equipment in a unit, to indicate its importance to the conduct of the unit mission.
ERCRULES	acronym for Equipment Readiness Code Rule System
expert system	A computer program that uses knowledge and logical inference procedures to solve problems that normally require human expertise for their solution.
K	thousand
M.1	trade name for expert system shell marketed by Teknowledge, Inc.
knowledge base	collection of knowledge (facts, rules of thumb) structured as a set of rules, for use in an expert system
LIN	line item number, the basic Army reference number for an item of equipment
padding equipment	equipment of the highest essentiality to a unit as defined in AR 220-1
session	period of use of the system involving one or more consultations
TOE	table of organization and equipment
unit	Army unit; as used by the rule system a company-size element

validation	process of testing to establish that a system produces outputs that are appropriate in terms of the real world problem the system is devised to address
verification	process of testing to establish that the system performs in accordance with its design, i.e., test that the system is essentially 'bug-free'

APPENDIX I
KNOWLEDGE BASE

INTRODUCTION. This appendix contains the knowledge base for the Equipment Readiness Code Rule System (ERCRULES). It is in machine-readable format and has been prepared for review and reference in conjunction with operation of the system at field workstations.

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EQUIPMENT READINESS CODE RULE SYSTEM
(ERCRULES)

KNOWLEDGE BASE

JUNE 1988

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/*

MODULE 1
SYSTEM OPERATION

1.1 INTRODUCTION

a. Background. This equipment readiness code rule system (ERC RULES) is an expert system which identifies essential (core) equipment, and advises on the assignment of equipment readiness codes (ERC) to items of equipment within (company-size) units. The core equipment for each unit are identified on the basis of the unit mission and a mission-task. The ERC are advised based on the type of equipment, and its use in the unit. The ERC, as defined in AR 220-1, are assigned at one of three levels:

- o ERC-A Essential to unit mission
- o ERC-B Supplemental to unit mission
- o ERC-C Supportive of unit mission

b. Development Features

(1) Rule Development. The system rules were basically developed by representatives from the TRADOC combat development user community during the course of two workshops conducted at the AI Training Cell, Ft Gordon, in October and November of 1987. The users provided their inputs in rule form and the these individual rules were then integrated into an single system by the US Army Concepts Analysis Agency.

(2) Equipment Classification. Equipment classification is organized using a multidimensional approach to equipment classification. This approach has been adopted to mirror the way in which equipment is considered in the Army. In some instances, particular items are of interest (ITEM BY TYPE). In other instances, the technology category (ITEM BY CATEGORY) is used to characterize the equipment. In still other instances, the way in which the item is functionally used (ITEM BY FUNCTION), is employed to characterize the equipment. In all, the item classification structure can provide up to 1410 choices, based on selection from two successive menus. Where an item might be reasonably associated with more than one group, it appears in each menu where it is appropriate. Items which appear on more than one menu are identified by a (^) symbol to the right of the menu entry.

(3) Rule System Organization. The rule system has been organized in seven modules as follows:

1. System Operation
2. Branch and Equipment Identification
3. Equipment Use Identification
4. Item Type Rules
5. Item Category Rules
6. Item Function Rules
7. Core Equipment Identification

(4) Rule System Operation.

(a) The principal concern in system operation is convenience to the user. In general, the inputs identifying each equipment and its use are via selection from menus. They menus are ordered to ask for progressively more detail about the equipment until an assignment is made or a notice is generated that an assignment cannot be made based on the information provided. In addition, the user is provided with menus to control the cycling of the system from one equipment to the next.

(b) The requirement for an summary record for each consultation have necessitated requests to the user for unit and equipment identification, which become part of the output display. To minimize the requests for these inputs, control features have been added to pass as much input from consultation to the next as possible.

(c) The knowledge base of the system is provided in a fast-loading format, which appreciably reduces the system loading time, over the knowledge base in a text file format.

(5) Core Equipment Identification.

(a) At present, a limited set of core equipments, based on those currently identified, has been incorporated into the system.

(b) The total complement of core equipment information is estimated to be an appreciable part of the size of the system and may exceed the limit of the memory capacity of the field microcomputers hosting the system. To meet this situation, the core equipment knowledge base may have to be segmented and distributed by proponent, or alternately, distributed in a separate knowledge base.

c. System Release Record. This paragraph is intended as a record of the progression of the releases of the system. The latest release number should be kept in agreement with the release number shown in the display clause of the 'sign_on_completed' rule in Module 1.2.

System Release Record

Release Number	Release Description	Release Date
1.0	Initial release as documented in CAA study report CAA-SR-88-14.	June 1988

*/

```

/* 1.2 CONTROL RULES */

/* ----- START ----- */
initialdata = done.
enumeratedanswers(ALL).

/* ----- done ----- */
if  sign_on_completed and
    branch_identified and
    unit_identified and
    consult_activity_identified and
    consult_activity_completed and
    next_consult_activity_identified and
    next_consult_reset_completed
then done.

/* ----- sign_on_completed ----- */
if  display(['
-----
                WELCOME TO THE EQUIPMENT READINESS CODE
                RULE SYSTEM (ERCRULES 1.0)
-----

ERCRULES operates in two modes to assist with:
  o Identification of essential unit equipment
    (CORE CONSULTATION mode)
  o Assignment of ERC (ERC CONSULTATION mode)

ERCRULES presumes user knowledge about the organization
and purpose of the unit, the equipment being coded, and
the uses of the equipment in the unit.

Questions and suggestions on the use of ERCRULES may be
addressed to TRADOC HQ, ATCD-OP, Mr. Bill Randolph,
AV 680-2477.

-----
])
    and
    sign_on is sought
then  sign_on_completed.

/* ----- question(sign_on) ----- */
question(sign_on) =

```

To CONTINUE - type any alphanumeric key, then Enter key'.

```
/* ----- branch_identified ----- */
```

```
if branch is known
then branch_identified.
```

```
/* ----- unit_identified ----- */
```

```
if unit_name is known and
   unit_toe is known
then unit_identified.
```

```
/* ----- consult_activity_identified ----- */
```

```
if consult_activity is known
then consult_activity_identified.
```

```
/* ----- question(consult_activity) ----- */
```

```
question(consult_activity) = '\f
```

```
*** CONSULTATION MENU ***
```

Which type of consultation is desired?

1. CORE CONSULTATION - Identify core item(s) of equipment in the CURRENTLY identified unit.
2. ERC CONSULTATION - Identify the ERC for an item of equipment in the CURRENTLY identified unit.

Enter number corresponding to your choice.

'.

```
legalvals(consult_activity) = [core_consult,
                               erc_consult].
```

```
/* ----- consult_activity_completed ----- */
```

```
if core_equipment_identified or
   erc_identified
then consult_activity_completed.
```

```

/* ----- core_equipment_identified ----- */
if   consult_activity = core_consult and
     unit_mission_identified and
     unit_mission_task_identified and
     core_equipment_displayed
then core_equipment_identified.

/* ----- unit_mission_identified ----- */
/* core equipment is present in system for all branches
   except isc, ins and sof - set-up next 2 rules to
   suppress core equipment query for these branches */
if   branch = isc or
     branch = ins or
     branch = sof
then unit_mission_identified = no.

if   branch = B and
     not(branch = isc) and
     not(branch = ins) and
     not(branch = sof) and
     B-unit_msn = M
then unit_msn = M.

if   unit_msn is known and
     not(unit_msn = 'None of above')
then unit_mission_identified.

if   unit_msn is known and
     unit_msn = 'None of above'
then unit_mission_identified = no.

/*
if   branch = B and
     B-unit_msn = M
then unit_msn = M.

if   unit_msn is known and
     not(unit_msn = 'None of above')
then unit_mission_identified.

if   unit_msn is known and
     unit_msn = 'None of above'
then unit_mission_identified = no.
*/

/* ----- unit_mission_task_identified ----- */
if   branch = B and

```

```

    unit_msn = M and
    M-B-task = T
then msn_task = T.

```

```

if msn_task is known and
not(msn_task = 'None of above')
then unit_mission_task_identified.

```

```

if msn_task is known and
msn_task = 'None of above'
then unit_mission_task_identified = no.

```

```

/* ----- core_equipment_displayed ----- */

```

```

if branch = B and
unit_name = NAME and
unit_toe = TOE and
unit_msn = M and
msn_task = T and
core_eqp(B,M,T) = TEXT and
display(
  ['\f

```

```

*** CONSULTATION NOTICE - CORE EQUIPMENT ADVISED ***

```

```

        BRANCH: ',B,'
        UNIT: ',NAME,'
        TOE: ',TOE,'
UNIT MISSION: ',M,'
MISSION TASK: ',T,'\n

```

The core equipment advised for this unit is/are:\n\n', TEXT]) and

continue_on is sought

then core_equipment_displayed.

```

/* ----- question(continue_on) ----- */

```

```

question(continue_on) =

```

- * To PRINT notice: Form-feed paper, enter [Shift + Prtsc].
- * To CONTINUE on: Type any alphanumeric key, then Enter key.'

```

/* ----- erc_identified ----- */

```

```

if consult_activity = erc_consult and
equipment_lin_identified and
equipment_type_identified and
erc_assigned is known and

```

```

    erc_assignment_displayed
then erc_identified.

/* ----- equipment_lin_identified ----- */
if lin_para is known and
   lin is known
then equipment_lin_identified.

/* ----- unit_name & unit_toe (See Section 2) ----- */

/* ----- lin_para & lin (See Section 2) ----- */

/* ----- equipment_type_identified ----- */
if eqp = X and
   sub_eqp(X) = yes and
   sub_eqp-X = Y
then equipment = Y.

if eqp = X and
   sub_eqp(X) = no
then equipment = X.

if equipment is known and
   not equipment = 'None of above' and
   not equipment = 'Return to main menu'
then equipment_type_identified.

if equipment is known and
   equipment = 'None of above' or
   equipment = 'Return to main menu'
then equipment_type_identified = no.

/* ----- erc_assignment_displayed ----- */
if branch = BRANCH and
   unit_name = UNIT and
   unit_toe = TOE and
   lin = LIN and
   lin_para = PARA and
   equipment = E and
   erc_assigned = [ESR,ERC,RULE] and
   txt_esr(ESR) = ESRTXT and

   display(['\f\n',
'     *** CONSULTATION NOTICE - ERC ADVISED ***\n\n',
'           Branch: ',BRANCH, '\n',
'           Unit Name: ',UNIT, '\n',

```

```

'          TOE: ',TOE, '\n',
'          LIN Para: ',PARA,'\n',
'          LIN: ',LIN, '\n',
'          Equipment: ',E,'\n\n',
'The readiness code advised is:\n\n',
'          ',ERC,' ( Rule ',RULE,' )\n\n',
'The code is based on use of the equipment for ',ESRTEXT,'.']) and
  continue_on is sought

```

then erc_assignment_displayed.

```
/* ----- question(next_consult_activity) ----- */
```

```
question(next_consult_activity) =
```

```
'\f
          *** NEXT CONSULTATION MENU ***
```

Which type of consultation is desired next?

CORE CONSULTATION with

2. Same Branch, Unit, Unit Mission
3. Same Branch, Unit.
4. Same Branch.
5. Entirely new parameters.

ERC CONSULTATION with

6. Same Branch, Unit, TOE Paragraph.
7. Same Branch, Unit.
8. Same Branch.
9. Entirely new parameters.

OR 10. Quit Consultation system.

Enter number corresponding to your choice.'

```
legalvals(next_consult_activity) =
  [erc_developer_option,
   core_with_branch_unit_mission_saved,
   core_with_branch_unit_saved,
   core_with_branch_saved,
   core_with_nothing_saved,
   erc_with_branch_unit_para_saved,
   erc_with_branch_unit_saved,
   erc_with_branch_saved,
   erc_with_nothing_saved,
   quit_system].
```

```
/* ----- next_consult_activity_identified ----- */
```

```

if next_consult_activity is known
then next_consult_activity_identified .

```

```

/* ----- next_consult_reset_completed (1) ----- */

```

```

if next_consult_activity =
    core_with_branch_unit_mission_saved and
    unit_msn is known and
    cached(sign_on_completed = YES) and
    cached(branch = BRANCH) and
    cached(unit_name = UNIT) and
    cached(unit_toe = TOE) and
    cached(unit_msn = MISSION) and
    do(reset) and
    do(set sign_on_completed = YES) and
    do(set branch = BRANCH) and
    do(set unit_name = UNIT) and
    do(set unit_toe = TOE) and
    do(set unit_msn = MISSION) and
    do(set consult_activity = core_consult) and
    do(restart)
then next_consult_reset_completed.

```

```

/* ----- next_consult_reset_completed (1A) ----- */

```

```

if next_consult_activity =
    core_with_branch_unit_mission_saved and
    unit_msn is unknown and
    cached(sign_on_completed = YES) and
    cached(branch = BRANCH) and
    cached(unit_name = UNIT) and
    cached(unit_toe = TOE) and
    do(reset) and
    do(set sign_on_completed = YES) and
    do(set branch = BRANCH) and
    do(set unit_name = UNIT) and
    do(set unit_toe = TOE) and
    do(set consult_activity = core_consult) and
    do(restart)
then next_consult_reset_completed.

```

```

/* ----- next_consult_reset_completed (2) ----- */

```

```

if next_consult_activity = core_with_branch_unit_saved and
    cached(sign_on_completed = YES) and
    cached(branch = BRANCH) and
    cached(unit_name = UNIT) and
    cached(unit_toe = TOE) and
    do(reset) and
    do(set sign_on_completed = YES) and
    do(set branch = BRANCH) and

```

```

do(set unit_name = UNIT) and
do(set unit_toe = TOE) and
do(set consult_activity = core_consult) and
do(restart)
then next_consult_reset_completed.

```

```

/* ----- next_consult_reset_completed (3) ----- */

```

```

if next_consult_activity = core_with_branch_saved and
cached(sign_on_completed = YES) and
cached(branch = BRANCH) and
do(reset) and
do(set sign_on_completed = YES) and
do(set branch = BRANCH) and
do(set consult_activity = core_consult) and
do(restart)
then next_consult_reset_completed.

```

```

/* ----- next_consult_reset_completed (4) ----- */

```

```

if next_consult_activity = core_with_nothing_saved and
cached(sign_on_completed = YES) and
do(reset) and
do(set sign_on_completed = YES) and
do(set consult_activity = core_consult) and
do(restart)
then next_consult_reset_completed.

```

```

/* ----- next_consult_reset_completed (5) ----- */

```

```

if next_consult_activity = erc_with_branch_unit_para_saved and
lin_para is known and
cached(sign_on_completed = YES) and
cached(branch = BRANCH) and
cached(unit_name = UNIT) and
cached(unit_toe = TOE) and
cached(lin_para = PARA) and
do(reset) and
do(set sign_on_completed = YES) and
do(set branch = BRANCH) and
do(set unit_name = UNIT) and
do(set unit_toe = TOE) and
do(set lin_para = PARA) and
do(set consult_activity = erc_consult) and
do(restart)
then next_consult_reset_completed.

```

```

/* ----- next_consult_reset_completed (5A) ----- */

```

```

if next_consult_activity = erc_with_branch_unit_para_saved and

```

```

lin_para is unknown and
cached(sign_on_completed = YES) and
cached(branch = BRANCH) and
cached(unit_name = UNIT) and
cached(unit_toe = TOE) and
do(reset) and
do(set sign_on_completed = YES) and
do(set branch = BRANCH) and
do(set unit_name = UNIT) and
do(set unit_toe = TOE) and
do(set consult_activity = erc_consult) and
do(restart)
then next_consult_reset_completed.

```

```

/* ----- next_consult_reset_completed (6) ----- */

```

```

if next_consult_activity = erc_with_branch_unit_saved and
cached(sign_on_completed = YES) and
cached(branch = BRANCH) and
cached(unit_name = UNIT) and
cached(unit_toe = TOE) and
do(reset) and
do(set sign_on_completed = YES) and
do(set branch = BRANCH) and
do(set unit_name = UNIT) and
do(set unit_toe = TOE) and
do(set consult_activity = erc_consult) and
do(restart)
then next_consult_reset_completed.

```

```

/* ----- next_consult_reset_completed (7) ----- */

```

```

if next_consult_activity = erc_with_branch_saved and
cached(sign_on_completed = YES) and
cached(branch = BRANCH) and
do(reset) and
do(set sign_on_completed = YES) and
do(set branch = BRANCH) and
do(set consult_activity = erc_consult) and
do(restart)
then next_consult_reset_completed.

```

```

/* ----- next_consult_reset_completed (8) ----- */

```

```

if next_consult_activity = erc_with_nothing_saved and
cached(sign_on_completed = YES) and
do(reset) and
do(set sign_on_completed = YES) and
do(set consult_activity = erc_consult) and
do(restart)
then next_consult_reset_completed.

```

```
/* ----- next_consult_reset_completed (9) ----- */
```

```
if next_consult_activity = quit_system and
do(quit)
then next_consult_reset_completed.
```

```
/* ----- next_consult_reset_completed (10) ----- */
```

```
if next_consult_activity = erc_developer_option and
cached(sign_on_completed = YES) and
cached(branch = BRANCH) and
do(reset) and
do(set sign_on_completed = YES) and
do(set lin = 'DUMMY') and
do(set lin_para = 'DUMMY') and
do(set unit_name = 'DUMMY') and
do(set unit_toe = 'DUMMY') and
do(set branch = BRANCH) and
do(set consult_activity = erc_consult) and
do(restart)
then next_consult_reset_completed.
```

```
/* ----- done (RETURN TO MAIN MENU) ----- */
```

```
if consult_activity = erc_consult and
equipment is known and
equipment = 'Return to main menu' and
cached(sign_on_completed = YES) and
cached(branch = BRANCH) and
cached(unit_name = UNIT) and
cached(unit_toe = TOE) and
cached(lin_para = PARA) and
cached(lin = LIN) and
do(reset) and
do(set sign_on_completed = YES) and
do(set branch = BRANCH) and
do(set unit_name = UNIT) and
do(set unit_toe = TOE) and
do(set lin_para = PARA) and
do(set lin = LIN) and
do(set consult_activity = erc_consult) and
do(restart)
```

```
then done.
```

```
/* ----- done (EQUIPMENT NOT RECOGNIZED) ----- */
```

```
if consult_activity = erc_consult and
equipment is known and
```

```

equipment = 'None of above' and
branch = BRANCH and
unit_name = UNIT and
unit_toe = TOE and
lin = LIN and
lin_para = PARA and
display(['\f\n
*** CONSULTATION NOTICE - EQUIPMENT NOT RECOGNIZED ***

      Branch: ',BRANCH, '\n',
      Unit Name: ',UNIT, '\n',
      TOE: ',TOE, '\n',
      LIN: ',LIN, '\n',
      LIN Para: ',PARA,
'\n\nAn ERC cannot be advised based on the equipment
identification presented. You may wish to:

1. Reconsider whether it may be possible to associate the
   equipment with an existing ITEM TYPE, CATEGORY or USE or

2. Consult with your supervisor about the need for an
   appropriate equipment entry/rule change in system.'])

and

continue_on is sought and

cached(sign_on_completed = YES) and
cached(branch = BRANCH) and
cached(unit_name = UNIT) and
cached(unit_toe = TOE) and
do(reset) and
do(set sign_on_completed = YES) and
do(set branch = BRANCH) and
do(set unit_name = UNIT) and
do(set unit_toe = TOE) and
do(restart)

then done.

/* ----- done (ERC NOT ADVISED) ----- */

if consult_activity = erc_consult and
equipment_type_identified and
erc_identified is unknown and
branch = BRANCH and
unit_name = UNIT and
unit_toe = TOE and
lin = LIN and
lin_para = PARA and
equipment = E and
display(['\f\n
*** CONSULTATION NOTICE - ERC NOT ADVISED ***

```

```

      Branch: ',BRANCH, '\n',
      Unit Name: ',UNIT, '\n',
      TOE: ',TOE, '\n',
      LIN Para: ',PARA, '\n',
      LIN: ',LIN, '\n',
      Equipment: ',E,
'\n\nAn ERC cannot be advised based on the information
presented. You may wish to:

```

1. Reconsider the use and redo the consultation or
2. Consult with your supervisor about the need for an appropriate usage entry/rule change in system.'])

and

continue_on is sought and

```

cached(sign_on_completed = YES) and
cached(branch = BRANCH) and
cached(unit_name = UNIT) and
cached(unit_toe = TOE) and
do(reset) and
do(set sign_on_completed = YES) and
do(set branch = BRANCH) and
do(set unit_name = UNIT) and
do(set unit_toe = TOE) and
do(restart)

```

then done.

```

/* ----- done (ERC NEEDED) ----- */

```

```

if   consult_activity = erc_consult and
     equipment_type_identified and
     erc_identified is unknown and
     erc_sptd_sys = 'Unknown' and
     branch = BRANCH and
     unit_name = UNIT and
     unit_toe = TOE and
     lin = LIN and
     lin_para = PARA and
     equipment = E and
     display(['\f\n
             *** CONSULTATION NOTICE - ERC NEEDED ***

```

```

      Branch: ',BRANCH, '\n',
      Unit Name: ',UNIT, '\n',
      TOE: ',TOE, '\n',
      LIN Para: ',PARA, '\n',
      LIN: ',LIN, '\n',
      Equipment: ',E,'

```

The consultation on the presently identified equipment cannot proceed, since the ERC of the equipment it supports is needed.

To proceed, establish the ERC for the supported equipment in a separate consultation and then redo this consultation.'])

and

continue_on is sought and

```
cached(sign_on_completed = YES) and
cached(branch = BRANCH) and
cached(unit_name = UNIT) and
cached(unit_toe = TOE) and
do(reset) and
do(set sign_on_completed = YES) and
do(set branch = BRANCH) and
do(set unit_name = UNIT) and
do(set unit_toe = TOE) and
do(restart)
```

then done.

/* ----- done (UNIT MISSION NOT RECOGNIZED) ----- */

```
if consult_activity = core_consult and
unit_mission_identified = no and
branch = BRANCH and
unit_name = NAME and
unit_toe = TOE and
```

```
display(['\f\n
*** CONSULTATION NOTICE - UNIT MISSION NOT RECOGNIZED ***
```

```
        BRANCH: ',BRANCH,'
        UNIT: ',NAME,'
        TOE: ',TOE,'\n\n
```

Core equipment cannot be advised based on the information presented. You may wish to:

1. Reconsider whether it may be possible to associate the equipment with an existing mission or
2. Consult with your supervisor about the need for an additional mission/core equipment entry in system.'])

and

continue_on is sought and

```
cached(sign_on_completed = YES) and
```

```

cached(branch = BRANCH) and
cached(unit_name = UNIT) and
cached(unit_toe = TOE) and
do(reset) and
do(set sign_on_completed = YES) and
do(set branch = BRANCH) and
do(set unit_name = UNIT) and
do(set unit_toe = TOE) and
do(restart)

```

then done.

```
/* ----- done (UNIT MISSION-TASK NOT RECOGNIZED) ----- */
```

```

if consult_activity = core_consult and
unit_mission_identified and
unit_mission_task_identified = no and
branch = BRANCH and
unit_name = NAME and
unit_toe = TOE and

```

```
display(['\f\n
```

```
*** CONSULTATION NOTICE - UNIT MISSION-TASK NOT RECOGNIZED ***
```

```

          BRANCH: ',BRANCH,'
          UNIT: ',NAME,'
          TOE: ',TOE,'\n

```

Core equipment cannot be advised based on the information presented. You may wish to:

1. Reconsider whether it may be possible to associate the equipment with an existing mission-task or
2. Consult with your supervisor about the need for an additional mission-task/core equipment entry in system.'])

and

continue_on is sought and

```

cached(sign_on_completed = YES) and
cached(branch = BRANCH) and
cached(unit_name = UNIT) and
cached(unit_toe = TOE) and
do(reset) and
do(set sign_on_completed = YES) and
do(set branch = BRANCH) and
do(set unit_name = UNIT) and
do(set unit_toe = TOE) and
do(restart)

```

then done.

```
/* 1.3 UTILITY RULES */
```

```
/* ----- utility rule (night_msn) ----- */
```

```
if  branch = inf or  
    branch = arm or  
    branch = avn or  
    branch = mps or  
    branch = sof  
then night_msn = 'Requires night operations'.
```

```
if  not(branch = inf) and  
    not(branch = arm) and  
    not(branch = avn) and  
    not(branch = mps) and  
    not(branch = sof)  
then night_msn = 'Does not require night operations'.
```

```
/* ----- utility rule (Combat arms) ----- */
```

```
if  branch = inf or  
    branch = arm or  
    branch = fas or  
    branch = sof or  
    branch = eng or  
    branch = ada or  
    branch = avn  
then branch_designation = 'Combat arms'.
```

```
/* 1.4 SUPPORT RELATIONSHIP TABLES */
```

```
/* ----- txt_esr (core equipment) ----- */
```

```
txt_esr(core equip) =
('support of the \
unit mission as an item of core equipment of the unit').
```

```
/* ----- txt_esr table (supported equipment) ----- */
```

```
txt_esr(adapt_sptd equip) =
('adapting the \
supported equipment to the desired mode of operation').
```

```
txt_esr(back_up_sptd equip) =
('support of the \
supported equipment by providing a back-up capability').
```

```
txt_esr(control_sptd equip) =
('providing control \
over the operation of the supported equipment').
```

```
txt_esr(enhance_sptd equip) =
('enhancing the \
operational capability of the supported equipment').
```

```
txt_esr(exercise_sptd equip) =
('simulated \
operation of the supported equipment for training purposes').
```

```
txt_esr(handle_sptd equip) =
('handling \
the supported equipment within the local area of unit activity').
```

```
txt_esr(initialize_sptd equip) =
('establishing the \
initial conditions associated with supported equipment operation').
```

```
txt_esr(maintain_sptd equip) =
('maintenance \
of the supported equipment').
```

```
txt_esr(position_sptd equip) =
('movement of the \
supported equipment into position for operation').
```

```
txt_esr(power_sptd equip) =
('providing power \
for supported equipment operation').
```

```
txt_esr(shelter_sptd equip) =
('sheltering the \
```

supported equipment during operation').

txt_esr(supply_sptd equip) =
('scheduled \
supply of supported equipment').

txt_esr(sustain_sptd equip) =
('demand \
supply of supported equipment').

txt_esr(transport_sptd equip) =
('movement of the \
supported equipment into the locale of operation').

/* ----- txt_esr table (unit spt) ----- */

txt_esr(unit_control) =
('support\
of unit operations by providing for control of the unit').

txt_esr(unit_defense) =
('support\
of unit operations by providing for active defense of the unit').

txt_esr(unit_mobility) =
('support\
of unit operations by providing for mobility of the unit').

txt_esr(unit_nbc_defense) =
('support\
of unit operations by providing for NBC defense of the unit').

txt_esr(unit_concealment) =
('support\
of unit operations by providing for concealment of the unit').

txt_esr(unit_personnel_services) =
('support\
of unit operations by providing services for unit personnel').

txt_esr(unit_critical_facility) =
('support\
of unit operations by providing a critical facility within the \
work area of the unit').

txt_esr(unit_important_facility) =
('support\
of unit operations by providing an important facility within the \
work area of the unit').

txt_esr(unit_useful_facility) =
('support\
of unit operations by providing a useful facility within the \
work area of the unit').

work area of the unit').

```
txt_esr(unit_equip_maintenance) =  
( 'support\  
of unit operations by providing for maintenance of the\  
unit equipment').
```

```
txt_esr(unit_training_facility) =  
( 'support\  
of unit operations by providing for training in unit\  
equipment operation').
```

```
/* ----- txt_esr table (indv spt) ----- */
```

```
txt_esr(indv_situation_assessment) =  
( 'support\  
of an individual within unit with a means to assess a situation').
```

```
txt_esr(indv_skill_application) =  
( 'support\  
of an individual within unit with an item needed to \  
apply skills to task').
```

```
txt_esr(indv_productivity) =  
( 'support\  
of an individual within unit with a means to improve \  
task productivity').
```

```
txt_esr(indv_mobility) =  
( 'support\  
of an individual within unit with vehicular mobility for  
conduct of specialized duty').
```

```
txt_esr(indv_protection) =  
( 'support\  
of an individual within unit with an item needed for \  
individual protection in performance of duty').
```

```

/*
                                MODULE 2
                                BRANCH & EQUIPMENT IDENTIFICATION
*/
/* 2.1 BRANCH IDENTIFICATION */

/* - - - - - branch_identified - - - - - */

```

```

question(branch) =
['\f\n\nWho is the proponent for this unit?

```

ahs	Acad of Health Science	ada	Air Defense Artillery
arm	Armor	avn	Aviation
avl	Aviation Logistics	cml	Chemical
cac	Combined Arms Center	eng	Engineer
fas	Field Artillery	inf	Infantry
isc	Info Sys Command *	ins	Intel & Scty Cmd *
ics	Intelligence School	lgc	Logistics Center
mps	Military Police	mmc	Missile and Munitions
ord	Ordnance	qms	Quartermaster
sig	Signal	ssc	Soldier Support Center
sof	Special Warfare Center *	trn	Transportation

* CORE EQUIPMENT MODE of operation not available for branch

Enter three-letter branch code from the above list.

'].

```

legalvals(branch) =
[ahs,ada,arm,avn,avl,cac,cml,eng,fas,inf,ins,isc,ics,lgc,
mps,mmc,ord,qms,sig,ssc,sof,trn].

```

```
/* 2.2 UNIT IDENTIFICATIION */
```

```
/* ----- question(unit_name) ----- */
```

```
question(unit_name) = '\f\n\nWhat is the name of the unit?
```

```
Enter unit name - enclose name in single quotes\nabbreviations may be used - ex: FWD SPT MED CO.'
```

```
/* ----- question(unit_toe) ----- */
```

```
question(unit_toe) = '\f\n\nWhat is the TOE of the unit?
```

```
Enter 9-character TOE - enclose TOE in single quotes.'
```

```
/* 2.3 MAIN MENU EQUIPMENT IDENTIFICATION */
```

```
/* ----- question(lin) ----- */
```

```
question(lin) = '\f\n\nWhat is the LIN of the item?
```

Enter LIN - enclose LIN in single quotes.

'.

```
/* ----- question(lin_para) ----- */
```

```
question(lin_para) = '\f\n\nIn which TOE paragraph is the LIN?
```

Enter 2-digit TOE paragraph number

(enter leading zero for paragraph number less than 10).

'.

```
/* ----- question(eq) ----- */
```

```
question(eq) =
    {'\f\n\nWhich classification below, best identifies the item?
```

ITEM BY TYPE	ITEM BY CATEGORY	ITEM BY FUNCTION
1. Aircraft/hel	10. Comm-electronics	18. NBC defense
2. Night vision dev	11. Vehicle/trailer	19. System test/spt
3. Generator	12. Weapon	20. POL/water hndg
4. Light source equip	13. ADP equip	21. Equip/mat1 hndg
5. Dupl/repro machine	14. Kit/set/outfit	22. Shelter/storage
6. Air conditioner	15. Audio/visual	23. Medical spt
7. Camouflage system	16. Photo/graphics	24. Personnel spt
8. Binocular	17. Band equip	25. EOD spt
9. Wrist watch		26. Training spt

```
|-----> 27. Show me the extended list of ITEM BY TYPE.
           28. None of above.
```

Enter the number corresponding to the best identification.

'].

```
legalvals(eq) = ['Aircraft/hel',
                 'Night vision device',
                 'Generator',
                 'Light source equip',
                 'Dupl/repro machine',
                 'Air conditioner',
```

'Camouflage system',
 'Binocular',
 'Wrist watch',

 'Communications-electronics',
 'Vehicle/trailer',
 'Weapon',
 'ADP equipment',
 'Kit/set/outfit',
 'Audio/visual',
 'Photo/graphics',
 'Band equipment',

 'NBC defense',
 'System test/spt',
 'POL/water hndg',
 'Equip/matl hndg',
 'Shelter/storage',
 'Medical spt',
 'Personnel spt',
 'EOD spt',
 'Training spt',

 'Extended list',
 'None of above'].

/* ----- sub_eqp table ----- */

sub_eqp('Aircraft/hel')	= no.
sub_eqp('Night vision device')	= yes.
sub_eqp('Generator')	= no.
sub_eqp('Light source equip')	= no.
sub_eqp('Dupl/repro machine')	= no.
sub_eqp('Air conditioner')	= no.
sub_eqp('Camouflage system')	= no.
sub_eqp('Binocular')	= no.
sub_eqp('Wrist watch')	= no.
sub_eqp('Communications-electronics')	= yes.
sub_eqp('Vehicle/trailer')	= yes.
sub_eqp('Weapon')	= yes.
sub_eqp('ADP equipment')	= yes.
sub_eqp('Kit/set/outfit')	= yes.
sub_eqp('Audio/visual')	= yes.
sub_eqp('Photo/graphics')	= yes.
sub_eqp('Band equipment')	= yes.
sub_eqp('NBC defense')	= yes.
sub_eqp('System test/spt')	= yes.
sub_eqp('POL/water hndg')	= yes.
sub_eqp('Equip/matl hndg')	= yes.
sub_eqp('Shelter/storage')	= yes.
sub_eqp('Medical spt')	= yes.
sub_eqp('Personnel spt')	= yes.

sub_eqp('EOD spt')	= no.
sub_eqp('Training spt')	= no.
sub_eqp('Extended list')	= yes.
sub_eqp('None of above')	= no.

```
/* 2.4 SUB-MENU EQUIPMENT IDENTIFICATION */
```

```
/* -----question(sub_eqp-'ADP equipment')----- */
```

```
question(sub_eqp-'ADP equipment') =
  ['\f\nWhat type of ADP equipment are you considering?
```

Enter the number corresponding to the type of equipment.

```
'].
```

```
legalvals(sub_eqp-'ADP equipment') =
  ['TACCS',
   'TACCS Remote Terminal',
   'DAS-3 Power Plant',
   'DAS-3 Data Processing Display Group',
   'DAS-3 Remote Printer',
   'Data analysis central',
   '',
   'Return to main menu',
   'None of above'].
```

```
automaticmenu(sub_eqp-'ADP equipment').
```

```
/* ----- question(sub_eqp-'Audio/visual') ----- */
```

```
question(sub_eqp-'Audio/visual') =
  ['\f\nWhat type of audio or visual equipment is this item?
```

Enter the number corresponding to the type of equipment.

```
'].
```

```
legalvals(sub_eqp-'Audio/visual') =
  ['Sound Recorder',
   'Loudspeaker',
   'Public address set^',
   '',
   'Return to main menu',
   'None of above'].
```

```
automaticmenu(sub_eqp-'Audio/visual').
```

```
/* ----- question(sub_eqp-'Band equipment') ----- */
```

```
question(sub_eqp-'Band equipment') =
  ['\f\nWhat type of band equipment is this item?
```

Enter the number corresponding to the type of equipment.

'].

```
legalvals(sub_eqp-'Band equipment') =
    ['Band instrument',
     'Drummers throne',
     'Metronome',
     'Music writer',
     'Risers',
     '',
     'Return to main menu',
     'None of above'].
```

```
automaticmenu(sub_eqp-'Band equipment').
```

```
/* ----- question(sub_eqp-'Communications-electronics') ----- */
```

```
question(sub_eqp-'Communications-electronics') =
    ['\f\nWhat type of comm-electronics equipment is this item?
```

Enter the number corresponding to the type of equipment.

- | | |
|-----------------------|-------------------------|
| 1. FM or HF radio | 13. COMSEC equip |
| 2. Multichannel radio | 14. Freq mgmt sys |
| 3. Marine radio | 15. Satellite sys |
| 4. Radio access kit^ | 16. Comm opns ctr |
| 5. Radio install kit^ | 17. Tpn/msg switch |
| 6. Antenna | 18. Facsimile |
| 7. Other radio item | 19. Power supply |
| 8. Radio-teletype | 20. Power supply veh^ |
| 9. PEWS | 21. Return to main menu |
| 10. Radar | 22. None of above |
| 11. Wire system | |
| 12. Wire asso item | |

'].

```
legalvals(sub_eqp-'Communications-electronics') =
    ['FM or HF radio',
     'Multichannel radio',
     'Marine radio',
     'Radio access kit^',
     'Radio install kit^',
     'Antenna',
     'Other radio item',
     'Radio-teletype',
     'PEWS',
     'Radar',
     'Wire system',
     'Wire asso item',
```

```

'COMSEC equip',
'Freq mgt equip',
'Satellite sys',
'Comm opns ctr',
'Tpn/msg switch',
'Facsimile',
'Power supply',
'Power supply vehicle^',
'Return to main menu',
'None of above'].

```

```
/* ----- question(sub_eqp-'Equip/matl hndg') ----- */
```

```
question(sub_eqp-'Equip/matl hndg') =
  ['\f\nWhat type of handling equipment is this item?
```

Enter the number corresponding to the type of equipment.

```
'].
```

```
legalvals(sub_eqp-'Equip/matl hndg') =
  ['Airdrop',
   'Aerial delivery',
   'Basket',
   'Conveyor belt',
   'Dolly set',
   'Crane boom extension',
   'Fork lift',
   'Other equip hndg item',
   'Other matl hndg item',
   ' ',
   'Return to main menu',
   'None of above'].

```

```
automaticmenu(sub_eqp-'Equip/matl hndg').
```

```
/* ----- question(sub_eqp-'Extended list') ----- */
```

```
question(sub_eqp-'Extended list') =
  ['\f
```

Enter the number corresponding to the type of equipment.

EXTENDED LIST OF ITEM TYPES

```
'].
```

```
legalvals(sub_eqp-'Extended list') =
  ['Mine detecting equipment',
   'Survey/topo equipment',
   'Heater device',

```

```

        'Battery case or charger',
        'Lie detector',
        'Parachute',
        ' ',
        'Return to main menu',
        'None of above'].

automaticmenu(sub_eqp-'Extended list').

/* ----- question(sub_eqp-'Kit/set/outfit') ----- */
question(sub_eqp-'Kit/set/outfit') =
    ['\f
Enter number corresponding to the type of kit, set, or outfit.
'].

legalvals(sub_eqp-'Kit/set/outfit') =
    ['NBC sampling & analysis kit^',
     'Personnel ID kit^',
     'Radio install kit^',
     'Radio access kit^',
     'Sign painting kit^',
     'Tool kit',
     ' ',
     'Carpenter set',
     'Food inspection set',
     'Demolition set',
     'Pioneer set',
     'Public address set^',
     'Tool set',
     'Shop set',
     'Shop set related',
     'Water quality set^',
     ' ',
     'Tool outfit',
     'Return to main menu',
     'None of above'].

automaticmenu(sub_eqp-'Kit/set/outfit').

/* ----- question(sub_eqp-'Medical spt') ----- */
question(sub_eqp-'Medical spt') =
    ['\f\n
What type of medical support equipment is this item?

Enter the number corresponding to the type of equipment.

'].

legalvals(sub_eqp-'Medical spt') =

```

```

    ['Medical Equipment Set',
     'Medical Book Set',
     'DEPMEDS Equipment',
     'Other Medical Equipment',
     'Ambulance^',
     'Water quality set^',
     ', ',
     'Return to main menu',
     'None of above'].

```

```
automaticmenu(sub_eqp-'Medical spt').
```

```
/* ----- question(sub_eqp-'NBC defense') ----- */
```

```
question(sub_eqp-'NBC defense') =
['\f\nWhat type of NBC equipment is this item?
```

```
Enter the number corresponding to the type of equipment.'].

```

```
legalvals(sub_eqp-'NBC defense') =
  ['Dosimeter and charger',
   'Individual protective mask',
   ', ',
   'Detector/alarm',
   'Monitor',
   'NBC sampling & analysis kit^',
   'Radiacmeter',
   ', ',
   'Collective protection shelter',
   'Decon equipment/asso item',
   'Gas particulate filter unit (GPFU)',
   ', ',
   'Smoke generator',
   'Smoke grenade launcher',
   ', ',
   'Return to main menu',
   'None of above'].

```

```
automaticmenu(sub_eqp-'NBC defense').
```

```
/* ----- question(sub_eqp-'Night vision device') ----- */
```

```
question(sub_eqp-'Night vision device') =
  ['\f\n
What type of night vision device is this item?
```

```
Enter the number corresponding to the type of equipment.
```

```
'].

```

```
legalvals(sub_eqp-'Night vision device') =
```

```

        ['Night vision weapon sight',
         'Night vision goggles',
         'STANO',
         ' ',
         'Return to main menu',
         'None of above'].

automaticmenu(sub_eqp-'Night vision device').

/* ----- question(sub_eqp-'Personnel spt') ----- */
question(sub_eqp-'Personnel spt') =
    ['\f\nWhat type of personnel support equipment is this item?

Enter the number corresponding to the type of equipment.

'].

legalvals(sub_eqp-'Personnel spt') =
    ['Laundry equipment',
     'Mess equipment',
     'Clothing exchange and bath equipment',
     'Bakery',
     'Textile repair',
     'Graves registration',
     'Personnel ID kit^',
     ' ',
     'Return to main menu',
     'None of above'].

automaticmenu(sub_eqp-'Personnel spt').

/* ----- question(sub_eqp-'Photo/graphics') ----- */
question(sub_eqp-'Photo/graphics') =
    ['\f\nWhat type of Photo or graphics equipment is this item?

Enter the number corresponding to the type of equipment.

'].

legalvals(sub_eqp-'Photo/graphics') =
    ['Photographic equipment',
     'Drafting equipment',
     'Sign painting kit^',
     'Sealing iron',
     'Laminating press',
     ' ',
     'Return to main menu',
     'None of above'].

```

```
automaticmenu(sub_eqp-'Photo/graphics').
```

```
/* ----- question(sub_eqp-'POL/water hndg') ----- */
```

```
question(sub_eqp-'POL/water hndg') =
    ['\f\nWhat type of POL/water equipment is this item?
```

Enter the number corresponding to the type of equipment.

```
'].
```

```
legalvals(sub_eqp-'POL/water hndg') =
    ['Petroleum laboratory',
     'Water quality set^',
     ' ',
     'POL storage bag, 10000 gal and larger',
     'Other POL handling equipment',
     'Other water handling equipment',
     ' ',
     'Truck tank water^',
     'Water trailer^',
     ' ',
     'Return to main menu',
     'None of above'].
```

```
automaticmenu(sub_eqp-'POL/water hndg').
```

```
/* ----- question(sub_eqp-'Shelter/storage') ----- */
```

```
question(sub_eqp-'Shelter/storage') =
    ['\f\nWhat type of shelter or storage is this item?
```

Enter the number corresponding to the type of equipment.

```
'].
```

```
legalvals(sub_eqp-'Shelter/storage') =
    ['Command and control shelter',
     'Fire support operations shelter',
     'Intel operations shelter',
     'Admin-log operations shelter',
     'Equip operation shelter',
     'Maintenance facility shelter',
     'Repair parts storage shelter',
     ' ',
     'Return to main menu',
     'None of above'].
```

```
automaticmenu(sub_eqp-'Shelter/storage').
```

```
/* ----- question(sub_eqp-'System test/spt') ----- */
```

```
question(sub_eqp-'System test/spt') =
['\fWhat type of test or system support equipment is this item?
```

- | Type | Examples/description |
|-------------------------------|--|
| 1. Common TMDE | Meters, scopes, counters, recorders, signal generators, power supplies, etc. |
| 2. Peculiar TMDE | Specialized or dedicated versions of Common TMDE. |
| 3. Common Support Equipment | Mechanical, hydraulic, pneumatic, equip etc., asso with mission critical equip |
| 4. Peculiar Support Equipment | Specialized or dedicated versions of Common Support Equipment. |
| 5. GSE | Stations, facilities, vans etc. asso with mission critical equip. |
| 6. Return to Main Menu. | |

Enter the number corresponding to the type of equipment.'].

```
legalvals(sub_eqp-'System test/spt') =
['Common TMDE',
'Peculiar TMDE',
'Common Support Equipment',
'Peculiar Support Equipment (PSE)',
'GSE',
'Return to main menu'].
```

```
/* ----- question(sub_eqp-'Vehicle/trailer') ----- */
```

```
question(sub_eqp-'Vehicle/trailer') =
['\fWhat is the type of vehicle?
```

Enter the number corresponding to the type of vehicle.

- | | |
|----------------------|---------------------------|
| 1. Tank, IFV or CFV^ | 11. Trailer |
| 2. APC | 12. Water trailer^ |
| 3. Cmd post vehicle | 13. Recovery vehicle |
| 4. Ambulance^ | 14. Power supply vehicle^ |
| 5. Truck | 15. Return to main menu |
| 6. Truck tractor | 16. None of above |
| 7. Truck dump | |
| 8. Truck tank water^ | |
| 9. Semi trailer | |

10. Semi trailer van

'].

```
legalvals(sub_eqp-'Vehicle/trailer') =
    ['Tank, IFV or CFV^',
     'APC',
     'Cmd post vehicle',
     'Ambulance^',
     'Truck',
     'Truck tractor',
     'Truck dump',
     'Truck tank water^',
     'Semi trailer',
     'Semi trailer van',
     'Trailer',
     'Water trailer^',
     'Recovery vehicle',
     'Power supply vehicle^',
     'Return to main menu',
     'None of above'].
```

```
/* ----- question(sub_eqp-'Weapon') ----- */
```

```
question(sub_eqp-'Weapon') =
    ['\f\nWhat is the type of weapon or associated item?
```

```
Enter the number corresponding to the type of weapon/item.
'].
```

```
legalvals(sub_eqp-'Weapon') =
    ['Tank, IFV or CFV^',
     'Artillery',
     ' ',
     'Anti-armor weapon/associated item',
     'Crew-served weapon, cal.50 and under',
     'Mortar',
     ' ',
     'Grenade launcher',
     'Weapon mount',
     'Weapon fire-laying device',
     'Other weapon associated item',
     ' ',
     'Individual weapon',
     'Bayonet',
     ' ',
     'Return to main menu',
     'None of above'].
```

```
automaticmenu(sub_eqp-'Weapon').
```

```

/*
                                MODULE 3
                                EQUIPMENT USE IDENTIFICATION
*/

/* 3.1 USE META-FACTS (A-L) */

/* ----- question(air_conditioner_use) ----- */
question(air_conditioner_use) =
    ['\f\n\nHow is this air conditioner used?

Enter the number corresponding to the use.

'].

legalvals(air_conditioner_use) =
    ['Environmental control for computer operation',
     'Environmental control for perishables storage',
     'Other environmental control use'].

automaticmenu(air_conditioner_use).

/* -----question(acft_hel_use) ----- */
question(acft_hel_use) =
    '\f\nHow is this aircraft or helicopter used?

Enter the number corresponding to the use.

'.

legalvals(acft_hel_use) =
    ['Tactical operations',
     'Maintenance operations',
     'Medical evacuation',
     'Admin-log operations'].

automaticmenu(acft_hel_use).

/* -----question(antenna_use)----- */
question(antenna_use) =
    '\f\nHow is this antenna used? (Select one)

Enter the number corresponding to the use of the antenna.

'.

```

```
legalvals(antenna_use) =
    ['Mission task antenna',
     'Secondary antenna'].
```

```
automaticmenu(antenna_use).
```

```
/* ----- question(av_use) ----- */
```

```
question(av_use) =
    ['\f\n\nHow is this audio/visual equipment used?
```

```
Enter the number corresponding to the use.
```

```
'].
```

```
legalvals(av_use) =
    ['Support tactical operations',
     'Support non-tactical operations'].
```

```
automaticmenu(av_use).
```

```
/* ----- question(avl_maint_level) ----- */
```

```
question(avl_maint_level) =
    ['\f\n\nWhat is the level of maintenance?
```

```
Enter number corresponding to level of maintenance.
```

```
'].
```

```
legalvals(avl_maint_level) =
    ['Aviation unit maintenance (AVUM)',
     'Aviation intermediate maintenance (AVIM)'].
```

```
automaticmenu(avl_maint_level).
```

```
/* ----- question(avl_maint_use) ----- */
```

```
question(avl_maint_use) =
    ['\f\n\nHow is this equipment used?
```

```
Enter number corresponding to use from list below)
```

```
'].
```

```
legalvals(avl_maint_use) =
    ['Storage in controlled environment',
     'Storage in uncontrolled environment',
```

```
        'Positioning shop sets',
        'Positioning shelters'].

automaticmenu(avl_maint_use).

/* ----- question(battery_use) ----- */
question(battery_use) =
    ['\f\n\nHow is this battery equipment used?

Enter number corresponding to use.

'].

legalvals(battery_use) =
    ['Field operation of equipment',
     'Maintenance of unit equipment'].

automaticmenu(battery_use).

/* ----- question(comm_use) ----- */
question(comm_use) =
    ['\f\n\nHow is this communications system used in the unit?

Enter the number corresponding to use.

'].

legalvals(comm_use) = ['Primary means of communication',
                       'Alternate means of communication'].

automaticmenu(comm_use).

/* ----- question(depmeds_type) ----- */

question(depmeds_type) =
    ['\f\n\nWhat type of DEPMEDS is this item?

'].

legalvals(depmeds_type) =
    ['MMS Operating Room',
     'MMS Intensive Care Ward',
     'MMS Central Material Supply',
     'MMS X-Ray',
     'Other DEPMEDS'].
```

```

automaticmenu(depmeds_type).

/* ----- question(dupl_repro_use) ----- */
question(dupl_repro_use) =
    ['\f\n\nHow is the copy machine used in the unit?

'].

legalvals(dupl_repro_use) =
    ['Copies used in support of other unit operations',
     'Copies used in support of own unit operations'].

automaticmenu(dupl_repro_use).

/* ----- question(erc_sptd_sys) ----- */
question(erc_sptd_sys) =
    ['\f\n\n
What is the equipment readiness code (ERC) of the
system supported by this item (or the ERC of highest
system supported)?

Enter the number corresponding to the ERC status.

'].

legalvals(erc_sptd_sys) =
    ['ERC P',
     'ERC A',
     'ERC B',
     'Unknown'].

automaticmenu(erc_sptd_sys).

/* ----- question(facsimile_use) ----- */
question(facsimile_use) =
    ['\f\n\nHow is the facsimile machine used in the unit?

'].

legalvals(facsimile_use) =
    ['Transmit ops/intel information',
     'Transmit other than ops/intel information'].

automaticmenu(facsimile_use).

```

```
/* ----- question(fire_laying_use) ----- */
```

```
question(fire_laying_use) =  
    ['\f\n\nHow is the fire_laying used?
```

```
Enter the number corresponding to the use.
```

```
'].
```

```
legalvals(fire_laying_use) =  
    ['Primary means of fire control',  
     'Secondary means of fire control'].
```

```
automaticmenu(fire_laying_use).
```

```
/* ----- question(fork_lift_use) ----- */
```

```
question(fork_lift_use) =  
    ['\f\n\nHow is the fork lift used?
```

```
Enter the number corresponding to the use.
```

```
'].
```

```
legalvals(fork_lift_use) =  
    ['Ammunition supply handling',  
     'Ammunition maintenance handling',  
     'Non-ammunition handling'].
```

```
automaticmenu(fork_lift_use).
```

```
/* ----- question(generator_use) ----- */
```

```
question(generator_use) =  
    ['\f\n\nHow is the generator used?
```

```
Enter the number corresponding to the use.
```

```
'].
```

```
legalvals(generator_use) =  
    ['Sole power source for system',  
     'Alternate power source for system',  
     'Power source for illumination',  
     'Consolidated power source for unit'].
```

```
automaticmenu(generator_use).
```

```
/* ----- question(graphics_use) ----- */
```

```
question(graphics_use) =
    ['\f\n\nHow is the graphics product used?
```

Enter the number corresponding to the use.

```
'].
```

```
legalvals(graphics_use) =
    ['Produce ops/intel information',
     'Produce information supporting other units',
     'Produce information supporting own unit'].
```

```
automaticmenu(graphics_use).
```

```
/* ----- question(heater_use) ----- */
```

```
question(heater_use) =
    ['\f\n\nWhere is this equipment used?
```

```
'].
```

```
legalvals(heater_use) =
    ['Arctic operations',
     'Other operations'].
```

```
automaticmenu(heater_use).
```

```
/* -----question(intel_msn_task)----- */
```

```
question(intel_msn_task) =
    '\f\n\nWhat is the mission for this intelligence equipment?
```

Enter the number corresponding to the mission.

```
'].
```

```
legalvals(intel_msn_task) =
    ['Counterintelligence',
     'Communications Intelligence',
     'Human Intelligence',
     'MASINT',
     'Electronics Intelligence',
     'Interrogation and Exploitation',
     'Signals Security',
     'ECCM',
     'Technical Intelligence',
     'Imagery Intelligence',
     'Organic Equipment Maintenance',
     '24hr surveillance collection',
```

```

        'Aerial Intelligence/Visual Observation',
        'Direct Support Maintenance',
        'Intelligence Tasking',
        'Intelligence Reporting',
        'Aerial Reconnaissance Support'].

automaticmenu(intel_msn_task).

/* ----- question(intel_use)----- */
question(intel_use) = '\f\n\nHow is the intel equipment used?
'.

legalvals(intel_use) =
    ['Support photographic processing',
     'Communications electronics',
     'Process COMINT information',
     'Distribute intelligence data',
     'Control/position',
     'Chemical maintenance',
     'Medical maintenance',
     'Logistics maintenance',
     'Ordnance maintenance',
     'Mission specific equipment',
     'Store mission peculiar supplies',
     'Organic intermediate-level maintenance',
     'Reproduce imagery intelligence'].

automaticmenu(intel_use).

/* ----- question(light_source_use) ----- */
question(light_source_use) =
    ['\f\n\nHow is the light source equip used?

Enter the number corresponding to the use.

'].

legalvals(light_source_use) =
    ['Light for medical equipment system (MES)',
     'Light for command and control operations',
     'Light for maintenance operations',
     'Light for mission-specific operations',
     'Other light uses'].

automaticmenu(light_source_use).

```

```
/* 3.2 USE META-FACTS (M-Z) */
```

```
/* ----- question(maint_type) ----- */
```

```
question(maint_type) =
```

```
    ['\f\n\nWhat is the type of maintenance?
```

```
Enter number corresponding to use.
```

```
'].
```

```
legalvals(maint_type) =
```

```
    ['Unit maintenance',
     'Intermediate DS maintenance',
     'Intermediate GS maintenance',
     '',
     'Base shop or on-site maintenance (mmc use)'].
```

```
automaticmenu(maint_type).
```

```
/* ----- question(medical_unit_location) ----- */
```

```
question(medical_unit_location) =
```

```
    '\f\n\nWhere is this item of equipment located in the unit?
```

```
'].
```

```
legalvals(medical_unit_location) =
```

```
    ['Unit Headquarters',
     'Logistics Division/Branch',
     'Patient Administration Division/Branch',
     'Other'].
```

```
automaticmenu(medical_unit_location).
```

```
/* ----- question(medical_unit_type) ----- */
```

```
question(medical_unit_type) =
```

```
    '\f\n\nWhat type of medical unit is this equipment located:
```

```
']..
```

```
legalvals(medical_unit_type) =
```

```
    ['Division or Brigade Medical Unit',
     'Hospital',
     'Medical Logistics Unit',
     'Preventive Medicine Unit',
     'Dental Unit',
```

```

    'Evacuation Unit',
    'Laboratory Unit',
    'Command and Control Unit',
    'Veterinary Unit',
    'EAD Unit providing HSS on area basis',
    'Ancillary Support Unit'].

```

```
automaticmenu(medical_unit_type).
```

```
/* ----- question(mine_detect_msn) ----- */
```

```
question(mine_detect_msn) =
    '\f\n\nWhat mission does the mine detector support ?
```

```
'.
```

```
legalvals(mine_detect_msn) =
    ['Support other units',
     'Support own unit'].
```

```
automaticmenu(mine_detect_msn).
```

```
/* ----- question(nbc_msn) ----- */
```

```
question(nbc_msn) =
    ['\f\n\nWhat is the NBC mission of this unit?
```

```
Enter the number corresponding to the mission.
```

```
'].
```

```
legalvals(nbc_msn) =
    ['Decontamination',
     'Smoke generation',
     'NBC reconnaissance',
     'Other reconnaissance',
     'Unit self defense'].
```

```
automaticmenu(nbc_msn).
```

```
/* ----- question(night_mission) (see utility rules) ----- */
```

```
/* ----- question(parachute_use) ----- */
```

```
question(parachute_use) =
    ['\f\n\nHow is the parachute used?
```

```
Enter the number corresponding to the use.
```

```
'].
```

```
legalvals(parachute_use) =
    ['Used for air drop',
     'Used for personnel air insertion',
     'Used for flight personnel safety'].
```

```
automaticmenu(parachute_use).
```

```
/* ----- question(pol_msn) ----- */
```

```
question(pol_msn) =
    ['\f\n\nWhat is the POL mission of this unit?
```

```
Enter the number corresponding to the mission.
```

```
'].
```

```
legalvals(pol_msn) =
    ['Petroleum analysis',
     'Supply and service (S&S) unit',
     'Supply and transportation (S&T) unit',
     'POL supply operating company',
     'Other'].
```

```
automaticmenu(pol_msn).
```

```
/* ----- question(pol_use) ----- */
```

```
question(pol_use) =
    ['\f\n\nHow is this POL handling equipment used?
```

```
'].
```

```
legalvals(pol_use) =
    ['Support bulk storage mission',
     'Support distribution mission',
     'Unit refueling',
     'Auxillary support equipment - petroleum'].
```

```
automaticmenu(pol_use).
```

```
/* ----- question(power_source_use) ----- */
```

```
question(power_source_use) =
    ['\f\n\nHow is the power source used?
```

```
Enter the number corresponding to the use.
```

'].

```
legalvals(power_source_use) =
    ['Power for medical equipment system (MES)',
     'Power for maintenance operations',
     'Power for command and control operations',
     'Other power uses'].
```

automaticmenu(power_source_use).

```
/* ----- question(pse_use) ----- */
```

```
question(pse_use) = '\f\n
Is this item used with a Peculiar Support Equipment (PSE)
which performs a similar function.
```

Enter number corresponding to item use.

'].

```
legalvals(pse_use) =
    ['Used with PSE performing similiar function',
     'Not used with PSE performing similiar function'].
```

automaticmenu(pse_use).

```
/* ----- question(radar_surv_msn) ----- */
```

```
question(radar_surv_msn) =
['\f\n\nIs radar surveillance the primary mission of the unit?
```

Enter the number corresponding to the mission status.

'].

```
legalvals(radar_surv_msn) =
    ['Primary mission of unit',
     'Not primary mission of unit'].
```

automaticmenu(radar_surv_msn).

```
/* ----- question(radio_net) ----- */
```

```
question(radio_net) =
    ['\f\n\nI# which net is the radio used?
```

Enter the number corresponding to use.

```
'].  
  
legalvals(radio_net) =  
    ['Tactical Operations Net',  
     'Fire Direction Net',  
     'Admin-Log Net'].  
  
automaticmenu(radio_net).  
  
/* ----- question(radio_use) ----- */  
  
question(radio_use) =  
    ['\f\n\nWhat is the use of the radio in the unit?  
  
Enter the number corresponding to use.  
  
'].  
  
legalvals(radio_use) =  
    ['Control of unit operations',  
     'Control of maintenance team operations',  
     'Support own unit operations',  
     'Support other unit operations'].  
automaticmenu(radio_use).  
  
/* ----- question(recovery_veh_use) ----- */  
  
question(recovery_veh_use) =  
    ['\f\n\nHow is this recovery vehicle used?  
  
Enter the number corresponding to the use.  
  
'].  
  
legalvals(recovery_veh_use) =  
    ['Divisional Maintenance Co',  
     'Bn maintenance operations',  
     'Other maintenance unit operations',  
     'Support Class VII distribution/storage',  
     'Own unit vehicle recovery (non-maint units)'].  
  
automaticmenu(recovery_veh_use).  
  
/* ----- question(ssc_unit) ----- */  
  
question(ssc_unit) = '\f\n\nWhat type of ssc unit is this?  
  
'.
```

```

legalvals(ssc_unit) =
    ['Mobile Public Affairs Det',
     'Personnel Service Company',
     'Press Camp Headquarters',
     'Public Affairs Team',
     'Special Band',
     'PERSCOM',
     'Personnel and Administration Battalion',
     'Personnel Group',
     'Direct Support Postal Company',
     'General Support Postal Company',
     'Replacement Company',
     'Replacement Battalion',
     'Replacement Battalion S1 Section',
     'International Operations Law Team',
     'Court Martial Trial Team',
     'Legal Assistance Claims Team'].

automaticmenu(ssc_unit).

/* -----question(sys_spt_use)----- */
question(sys_spt_use) =
    ['\f\n\nHow is this system support equipment used?

Enter number corresponding to use.

'].

legalvals(sys_spt_use) =
    ['On-line operation of system',
     'Off-line maintenance'].

automaticmenu(sys_spt_use).

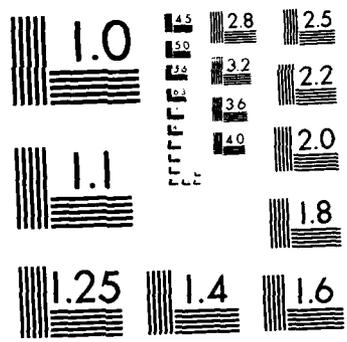
/* -----question(survey_topo_use)----- */
question(survey_topo_use) =
    ['\f\n\nHow is this survey or topographic equipment used?

Enter number corresponding to use.

'].

legalvals(survey_topo_use) =
    ['Fire preparation',

```

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

```

                                'Other than fire preparation'].

automaticmenu(survey_topo_use).

/* -----question(taccs_software)----- */
question(taccs_software) =
    ['\f\nWhat software will be run on the TACCS system?
                                     (choose one)
'].

legalvals(taccs_software) =
    ['SIDPERS - Personnel',
     'SAMS - Maintenance',
     'SARSS - Supply',
     'DAMMS - Movements',
     'TAMIS - Medical',
     'SAAS - Ammunition'].

automaticmenu(taccs_software).

/* ----- question(veh_use) ----- */
question(veh_use) =
    ['\f\nWhat is the most important use of the vehicle
in the unit?

    Enter the number corresponding to the use.
'].

legalvals(veh_use) =
    ['Mobility for unit commander',
     'Mobility for indiv/team in dedicated vehicle',
     '',
     'Move essential equipment in dedicated vehicle',
     'Move unit ammunition or fuel',
     'Move unit equipment and personnel',
     '',
     'Transport/store supplies for supported units',
     'Transport water for supported units',
     '',
     'Support maintenance operations',
     'Support combat field feeding system',
     'Support admin-log operations'].

automaticmenu(veh_use).

/* ----- question(water_use) ----- */

```

```
question(water_use) =  
  ['\f\n\nHow is the water trailer used?
```

```
  Enter the number corresponding to the use.
```

```
'].
```

```
legalvals(water_use) =  
  ['Support medical unit',  
   'Support combat field feeding system',  
   'Support personal hygiene and sanitation',  
   'Direct support of mission tasks'].
```

```
automaticmenu(water_use).
```

```
/* ----- question(water_use) ----- */
```

```
question(water_use) =  
  ['\f\n\nHow is this water handling equipment used?
```

```
'].
```

```
legalvals(water_use) =  
  ['Support medical mission',  
   'Support ammo handling/maintenance',  
   'Support bulk storage mission',  
   'Support distribution mission',  
   'Auxillary support equipment - water'].
```

```
automaticmenu(water_use).
```

```
/*
                                MODULE 4
                                ITEM TYPE RULES
*/
/* 4.1 AIRCRAFT/HEL RULES */

/* ----- erc_assigned (Aircraft/hel) ----- */
if  equipment = 'Aircraft/hel' and
    acft_hel_use = 'Tactical operations' or
    acft_hel_use = 'Maintenance operations' or
    acft_hel_use = 'Medical evacuation'
then erc_assigned = [core equip,'ERC P','4.1.1'].

if  equipment = 'Aircraft/hel' and
    acft_hel_use = 'Admin-log operations'
then erc_assigned = [core equip,'ERC A','4.1.2'].
```

```
/* 4.2 NIGHT VISION DEVICE RULES */

/* ----- erc_assigned (night_vision_device) ----- */

if not branch = ins and
   not branch = ics and
   equipment = 'Night vision weapon sight' or
   equipment = 'Night vision goggles' and
   night_msn = 'Requires night operations'
then erc_assigned = [indv_situation_assessment,'ERC A','4.2.1'].

if not branch = ins and
   not branch = ics and
   equipment = 'Night vision weapon sight' or
   equipment = 'Night vision goggles' and
   night_msn = 'Does not require night operations'
then erc_assigned = [indv_skill_application,'ERC B','4.2.2'].

if not branch = ins and
   not branch = ics and
   equipment = 'STANO'
then erc_assigned = [indv_situation_assessment,'ERC B','4.2.3'].

if branch = ins or
   branch = ics and
   equipment = 'Night vision goggles' and
   intel_msn_task = '24hr surveillance collection' or
   intel_msn_task = 'Aerial Intelligence/Visual Observation'
then erc_assigned = [core equip,'ERC A','4.2.4'].

if branch = ins or
   branch = ics and
   equipment = 'Night vision goggles' and
   not intel_msn_task = '24hr surveillance collection' and
   not intel_msn_task = 'Aerial Intelligence/Visual Observation'
then erc_assigned = [indv_situation_assessment,'ERC B','4.2.5'].
```

```
/* 4.3 GENERATOR USE RULES */
```

```
/* ----- erc_assigned (Generator) ----- */
```

```
if equipment = 'Generator' and
   generator_use = 'Sole power source for system' and
   erc_sptd_sys = 'ERC P' or
   erc_sptd_sys = 'ERC A'
then erc_assigned = [power_sptd equip, 'ERC A', '4.3.1'].
```

```
if equipment = 'Generator' and
   generator_use = 'Sole power source for system' and
   erc_sptd_sys = 'ERC B'
then erc_assigned = [power_sptd equip, 'ERC B', '4.3.2'].
```

```
if equipment = 'Generator' and
   generator_use = 'Alternate power source for system'
then erc_assigned = [unit_important_facility, 'ERC B', '4.3.3'].
```

```
if equipment = 'Generator' and
   generator_use = 'Power source for illumination' and
   light_source_use =
       'Light for medical equipment system (MES)' or
       'Light for command and control operations' or
       'Light for mission-specific operations'
then erc_assigned = [unit_critical_facility, 'ERC A', '4.3.4'].
```

```
if equipment = 'Generator' and
   generator_use = 'Power source for illumination' and
   light_source_use = 'Light for maintenance operations' and
   maint_type = 'Intermediate DS maintenance' or
   maint_type = 'Intermediate GS maintenance'
then erc_assigned = [unit_critical_facility, 'ERC A', '4.3.5'].
```

```
if equipment = 'Generator' and
   generator_use = 'Power source for illumination' and
   light_source_use = 'Light for maintenance operations' and
   maint_type = 'Unit maintenance'
then erc_assigned = [unit_important_facility, 'ERC B', '4.3.6'].
```

```
if equipment = 'Generator' and
   generator_use = 'Power source for illumination' and
   light_source_use = 'Other light uses'
then erc_assigned = [unit_important_facility, 'ERC B', '4.3.7'].
```

```
if equipment = 'Generator' and
   generator_use = 'Consolidated power source for unit' and
   erc_sptd_sys = 'ERC P' or
   erc_sptd_sys = 'ERC A'
then erc_assigned = [unit_critical_facility, 'ERC A', '4.3.8'].
```

```
if equipment = 'Generator' and
```

```
generator_use = 'Consolidated power source for unit' and  
erc_sptd_sys = 'ERC B'  
then erc_assigned = [unit_important_facility, 'ERC B', '4.3.9'].
```

```
/* 4.4 LIGHT SOURCE EQUIPMENT RULES */
```

```
/* ----- erc_assigned (light source equip) ----- */
```

```
if equipment = 'Light source equip' and  
   light_source_use =  
       'Light for medical equipment system (MES)' or  
   light_source_use =  
       'Light for command and control operations' or  
   light_source_use = 'Light for mission-specific operations'  
then erc_assigned = [unit_critical_facility, 'ERC A', '4.4.1'].
```

```
if equipment = 'Light source equip' and  
   light_source_use = 'Light for maintenance operations' and  
   maint_type = 'Intermediate DS maintenance' or  
   maint_type = 'Intermediate GS maintenance'  
then erc_assigned = [unit_critical_facility, 'ERC A', '4.4.2'].
```

```
if equipment = 'Light source equip' and  
   light_source_use = 'Light for maintenance operations' and  
   maint_type = 'Unit maintenance'  
then erc_assigned = [unit_important_facility, 'ERC B', '4.4.3'].
```

```
if equipment = 'Light source equip' and  
   light_source_use = 'Other light uses'  
then erc_assigned = [unit_important_facility, 'ERC B', '4.4.4'].
```

```

/* 4.5 DUPL/REPRO MACHINE RULES */

/* ----- erc_assigned (Dupl/repro machine) ----- */

if branch = ssc and
   equipment = 'Dupl/repro machine' and
   ssc_unit = 'Mobile Public Affairs Det' or
   ssc_unit = 'Personnel Service Company' or
   ssc_unit = 'Press Camp Headquarters' or
   ssc_unit = 'Public Affairs Team' or
   ssc_unit = 'Special Band' or
   ssc_unit = 'PERSCOM' or
   ssc_unit = 'Personnel and Administration Bn' or
   ssc_unit = 'Personnel Group' or
   ssc_unit = 'Direct Support Postal Company' or
   ssc_unit = 'General Support Postal Company' or
   ssc_unit = 'International Operations Law Team' or
   ssc_unit = 'Court Martial Trial Team' or
   ssc_unit = 'Legal Assistance Claims Team'
then erc_assigned = [unit_critical_facility,'ERC A','4.5.1'].

if branch = ssc and
   equipment = 'Dupl/repro machine' and
   ssc_unit = 'Replacement Battalion' or
   ssc_unit = 'Replacement Company'
then erc_assigned = [unit_important_facility,'ERC B','4.5.2'].

if branch = ssc and
   equipment = 'Dupl/repro machine' and
   ssc_unit = 'Replacement Battalion S1 Section'
then erc_assigned = [indv_productivity,'ERC C','4.5.3'].

if branch = ahs and
   equipment = 'Dupl/repro machine' and
   medical_unit_type = 'Hospital' and
   medical_unit_location =
       'Patient Administration Division/Branch'
then erc_assigned = [unit_important_facility,'ERC B','4.5.4'].

if branch = ahs and
   equipment = 'Dupl/repro machine' and
   medical_unit_type = 'Hospital' and
   not(medical_unit_location =
       'Patient Administration Division/Branch')
then erc_assigned = [unit_useful_facility,'ERC C','4.5.5'].

if branch = ahs and
   equipment = 'Dupl/repro machine' and
   not(medical_unit_type = 'Hospital')
then erc_assigned = [unit_useful_facility,'ERC C','4.5.6'].

if branch = ins and
   equipment = 'Dupl/repro machine' and

```

```
intel_use = 'Reproduce imagery intelligence'
then erc_assigned = [unit_critical_facility,'ERC A','4.5.7'].

if branch = ins and
   equipment = 'Dupl/repro machine' and
   not(intel_use = 'Reproduce imagery intelligence')
then erc_assigned = [unit_important_facility,'ERC B','4.5.8'].

if not(branch = ahs) and
   not(branch = ssc) and
   not(branch = ins) and
   equipment = 'Dupl/repro machine' and
   dupl_repro_use =
       'Copies used in support of other unit operations'
then erc_assigned = [unit_important_facility,'ERC B','4.5.9'].

if not(branch = ahs) and
   not(branch = ssc) and
   not(branch = ins) and
   equipment = 'Dupl/repro machine' and
   dupl_repro_use =
       'Copies used in support of own unit operations'
then erc_assigned = [unit_useful_facility,'ERC C','4.5.10'].
```

```
/* 4.6 AIR CONDITIONER RULES */
```

```
/* ----- erc_assigned (Air conditioner) ----- */
```

```
if not(branch = ins) and  
   equipment = 'Air conditioner' and  
   air_conditioner_use =  
     'Environmental control for computer operation' or  
   air_conditioner_use =  
     'Environmental control for perishables storage'  
then erc_assigned = [unit_critical_facility,'ERC A','4.6.1'].
```

```
if not(branch = ins) and  
   equipment = 'Air conditioner' and  
   air_conditioner_use = 'Other environmental control use'  
then erc_assigned = [unit_important_facility,'ERC B','4.6.2'].
```

```
if branch = ins and  
   equipment = 'Air conditioner' and  
   intel_msn_task = 'Imagery Intelligence' and  
   intel_use = 'Support photographic processing'  
then erc_assigned = [unit_critical_facility,'ERC A','4.6.3'].
```

```
if branch = ins and  
   equipment = 'Air conditioner' and  
   not intel_msn_task = 'Imagery Intelligence' and  
   not intel_use = 'Support photographic processing'  
then erc_assigned = [unit_important_facility,'ERC B','4.6.4'].
```

```
/* 4.7 CAMOUFLAGE SYSTEM RULE */
```

```
/* ----- erc_assigned (Camouflage system) ----- */
```

```
if equipment = 'Camouflage system'  
then erc_assigned = [unit_concealment, 'ERC C', '4.7.1'].
```

```
/* 4.8 BINOCULAR RULE */
```

```
/* ----- erc_assigned (Binocular) ----- */
```

```
if equipment = 'Binocular'  
then erc_assigned = [indv_situation_assessment, 'ERC B', '4.8.1'].
```

```
/* 4.9 WRIST WATCH RULE */
```

```
/* ----- erc_assigned (Wrist watch) ----- */
```

```
if equipment = 'Wrist watch'  
then erc_assigned = [indv_situation_assessment, 'ERC C', '4.9.1'].
```

```
/* 4.10 MINE DETECTING EQUIPMENT RULES */
```

```
if equipment = 'Mine detecting equipment' and  
mine_detect_msn = 'Support other units'  
then erc_assigned = [core equip, 'ERC A', '4.10.1'].
```

```
if equipment = 'Mine detecting equipment' and  
mine_detect_msn = 'Support own unit'  
then erc_assigned = [unit_important_facility, 'ERC B', '4.10.2'].
```

```
/* 4.11 SURVEY/TOPO EQUIPMENT RULES */  
  
if branch = eng and  
   equipment = 'Survey/topo equipment'  
then erc_assigned = [core equip, 'ERC A', '4.11.1'].  
  
if not branch = eng and  
   equipment = 'Survey/topo equipment' and  
   survey_topo_use = 'Fire preparation'  
then erc_assigned = [unit_critical_facility, 'ERC A', '4.11.2'].  
  
if not branch = eng and  
   equipment = 'Survey/topo equipment' and  
   survey_topo_use = 'Other than fire preparation'  
then erc_assigned = [unit_important_facility, 'ERC B', '4.11.3'].
```

```
/* 4.12 HEATER DEVICE RULES */
```

```
if branch = qms and  
   equipment = 'Heater device' and  
   heater_use = 'Arctic operations'  
then erc_assigned = [unit_critical_facility, 'ERC A', '4.12.1'].
```

```
if branch = qms and  
   equipment = 'Heater device' and  
   heater_use = 'Other operations'  
then erc_assigned = [unit_important_facility, 'ERC B', '4.12.2'].
```

```
if not(branch = qms) and  
   equipment = 'Heater device'  
then erc_assigned = [unit_important_facility, 'ERC B', '4.12.3'].
```

/* 4.13 BATTERY CASE & CHARGER RULES */

```
if  equipment = 'Battery case or charger' and  
    battery_use = 'Field operation of equipment' and  
    erc_sptd_sys = 'ERC P' or  
    erc_sptd_sys = 'ERC A'  
then erc_assigned = [power_sptd equip, 'ERC A', '4.13.1'].
```

```
if  equipment = 'Battery case or charger' and  
    battery_use = 'Field operation of equipment' and  
    erc_sptd_sys = 'ERC B'  
then erc_assigned = [power_sptd equip, 'ERC B', '4.13.2'].
```

```
if  equipment = 'Battery case or charger' and  
    battery_use = 'Maintenance of unit equipment'  
then erc_assigned = [unit equip maintenance, 'ERC B', '4.13.3'].
```

```
/* 4.14 LIE DETECTOR RULES */
```

```
if branch = ins and  
   equipment = 'Lie detector' and  
   intel_msn_task = 'Interrogation and Exploitation'  
then erc_assigned = [core equip, 'ERC A', '4.14.1'].
```

```
if branch = ins and  
   equipment = 'Lie detector' and  
   not(intel_msn_task = 'Interrogation and Exploitation')  
then erc_assigned = [unit_important_facility, 'ERC B', '4.14.2'].
```

```
if not branch = ins and  
   equipment = 'Lie detector'  
then erc_assigned = [unit_important_facility, 'ERC B', '4.14.3'].
```

```
/* 4.15 PARACHUTE RULES */
```

```
/* ----- erc_assigned(parachute) ----- */
```

```
if equipment = 'Parachute' and  
   parachute_use = 'Used for air drop' or  
   parachute_use = 'Used for personnel air insertion'  
then erc_assigned = [core equip, 'ERC A', '4.15.1'].
```

```
if equipment = 'Parachute' and  
   parachute_use = 'Used for flight personnel safety'  
then erc_assigned = [indv protection, 'ERC B', '4.15.2'].
```

```

/*
                MODULE 5
            ITEM CATEGORY RULES
*/

/* 5.1 COMMUNICATION-ELECTRONICS RULES */

/* ----- erc_assigned (communication-electronics) ----- */

if  branch = sig or
    branch = isc and
    equipment = 'Multichannel radio' and
    radio_use = 'Support other unit operations'
then erc_assigned = [core equip,'ERC P','5.1.1'].

if  not branch = sig and
    not branch =isc and
    equipment = 'Multichannel radio' and
    radio_use = 'Support other unit operations'
then erc_assigned = [unit_critical_facility,'ERC A','5.1.2'].

if  not branch = sig and
    not branch =isc and
    equipment = 'Multichannel radio' and
    radio_use = 'Support own unit operations'
then erc_assigned = [unit_important_facility,'ERC B','5.1.3'].

if  equipment = 'Radar' and
    radar_surv_msn = 'Primary mission of unit'
then erc_assigned = [core equip,'ERC P','5.1.4'].

if  equipment = 'Radar' and
    radar_surv_msn = 'Not primary mission of unit'
then erc_assigned = [unit_defense,'ERC B','5.1.5'].

if  branch = ins or
    branch = ics and
    equipment = 'FM or HF radio' and
    intel_msn_task = 'Intelligence Tasking' and
    intel_use = 'Control/position'
then erc_assigned = [control_sptd equip,'ERC A','5.1.6'].

if  branch = ins or
    branch = ics and
    equipment = 'FM or HF radio' and
    intel_msn_task = 'Intelligence Reporting' and
    intel_use = 'Distribute intelligence data'
then erc_assigned = [core equip,'ERC A','5.1.7'].

if  branch = ins or
    branch = ics and
    equipment = 'FM or HF radio' and

```

```

    not intel_msn_task = 'Intelligence Tasking' and
    not intel_msn_task = 'Intelligence Reporting'
then erc_assigned = [unit_control,'ERC B','5.1.8'].

if not branch = ins and
   not branch = ics and
   equipment = 'FM or HF radio' and
   radio_net = 'Tactical Operations Net' or
   radio_net = 'Fire Direction Net'
then erc_assigned = [unit_control,'ERC A','5.1.9'].

if branch = qms and
   equipment = 'FM or HF radio' and
   radio_net = 'Admin-Log Net'
then erc_assigned = [unit_control,'ERC A','5.1.10'].

if not branch = qms and
   equipment = 'FM or HF radio' and
   radio_net = 'Admin-Log Net'
then erc_assigned = [unit_control,'ERC B','5.1.11'].

if branch_designation = 'Combat arms' or
   branch = mps or
   branch = qms and
   equipment = 'FM or HF radio' and
   radio_use = 'Control of unit operations' or
   radio_use = 'Control of maintenance team operations'
then erc_assigned = [unit_control,'ERC A','5.1.12'].

if not(branch_designation = 'Combat arms') and
   not(branch = mps) and
   not(branch = ins) and
   not(branch = qms) and
   equipment = 'FM or HF radio' and
   radio_use = 'Control of unit operations' or
   radio_use = 'Control of maintenance team operations'
then erc_assigned = [unit_control,'ERC B','5.1.13'].

if equipment = 'Marine radio' and
   comm_use = 'Primary means of communication'
then erc_assigned = [unit_control,'ERC A','5.1.14'].

if equipment = 'Marine radio' and
   comm_use = 'Alternate means of communication'
then erc_assigned = [unit_important_facility,'ERC B','5.1.15'].

if branch = sig or
   branch = isc and
   equipment = 'Wire system'
then erc_assigned = [core equip,'ERC A','5.1.16'].

if not branch = sig and
   not branch = isc and
   equipment = 'Wire system'

```

```

then erc_assigned = [unit_important_facility , 'ERC B', '5.1.17'].

if  equipment = 'Wire asso item' and
   erc_sptd_sys = 'ERC P' or
   erc_sptd_sys = 'ERC A'
then erc_assigned = [adapt_sptd equip, 'ERC A', '5.1.18'].

if  equipment = 'Wire asso item' and
   erc_sptd_sys = 'ERC B'
then erc_assigned = [enhance_sptd equip, 'ERC B', '5.1.19'].

if  equipment = 'Radio-teletype' and
   comm_use = 'Primary means of communication'
then erc_assigned = [core equip, 'ERC A', '5.1.20'].

if  equipment = 'Radio-teletype' and
   comm_use = 'Alternate means of communication'
then erc_assigned = [unit_important_facility, 'ERC B', '5.1.21'].

if  equipment = 'COMSEC equip' or
   equipment = 'Radio access kit^' or
   equipment = 'Radio install kit^' or
   equipment = 'Other radio item' and
   erc_sptd_sys = 'ERC P' or
   erc_sptd_sys = 'ERC A'
then erc_assigned = [adapt_sptd equip, 'ERC A', '5.1.22'].

if  equipment = 'COMSEC equip' or
   equipment = 'Radio access kit^' or
   equipment = 'Radio install kit^' or
   equipment = 'Other radio item' and
   erc_sptd_sys = 'ERC B'
then erc_assigned = [enhance_sptd equip, 'ERC B', '5.1.23'].

if  branch_designation = 'Combat arms' and
   equipment = 'PEWS'
then erc_assigned = [unit_defense, 'ERC A', '5.1.24'].

if  not branch_designation = 'Combat arms' and
   equipment = 'PEWS'
then erc_assigned = [unit_defense, 'ERC B', '5.1.25'].

if  branch = sig or
   branch = isc and
   equipment = 'Freq mgt equip' or
   equipment = 'Satellite sys' or
   equipment = 'Comm opns ctr' or
   equipment = 'Tpn/msg switch'
then erc_assigned = [core equip, 'ERC A', '5.1.26'].

if  not branch = sig and
   not branch = isc and
   equipment = 'Freq mgt equip' or
   equipment = 'Satellite sys' or

```

```
    equipment = 'Comm opns ctr' or
    equipment = 'Tpn/msg switch'
then erc_assigned = [unit_important_facility,'ERC B','5.1.27'].

if   equipment = 'Antenna' and
     antenna_use = 'Mission task antenna' and
     erc_sptd_sys = 'ERC P' or
     erc_sptd_sys = 'ERC A'
then erc_assigned = [adapt_sptd equip,'ERC A','5.1.28'].

if   equipment = 'Antenna' and
     antenna_use = 'Mission task antenna' and
     erc_sptd_sys = 'ERC B'
then erc_assigned = [enhance_sptd equip,'ERC B','5.1.29'].

if   equipment = 'Antenna' and
     antenna_use = 'Secondary antenna'
then erc_assigned = [enhance_sptd equip,'ERC B','5.1.30'].

if   equipment = 'Facsimile' and
     facsimile_use = 'Transmit ops/intel information'
then erc_assigned = [unit_critical_facility,'ERC A','5.1.31'].

if   equipment = 'Facsimile' and
     facsimile_use = 'Transmit other than ops/intel information'
then erc_assigned = [unit_important_facility,'ERC B','5.1.32'].

if   equipment = 'Power supply' or
     equipment = 'Power supply vehicle^' and
     erc_sptd_sys = 'ERC P' or
     erc_sptd_sys = 'ERC A'
then erc_assigned = [power_sptd equip,'ERC A','5.1.33'].

if   equipment = 'Power supply' or
     equipment = 'Power supply vehicle^' and
     erc_sptd_sys = 'ERC B'
then erc_assigned = [power_sptd equip,'ERC B','5.1.34'].
```

```

/* 5.2 VEHICLE/TRAILER RULES */

/* ----- erc_assigned (Vehicle/trailer) ----- */
if equipment = 'Cmd post vehicle'
then erc_assigned = [unit_control,'ERC A','5.2.1'].

if branch = inf and
   equipment = 'APC'
then erc_assigned = [core equip,'ERC P','5.2.2'].

if not(branch = inf) and
   equipment = 'APC' and
   veh_use = 'Mobility for unit commander' or
   veh_use = 'Mobility for indiv/team in dedicated vehicle'
then erc_assigned = [indv_mobility,'ERC A','5.2.3'].

if equipment = 'Truck' or
   equipment = 'Trailer' and
   veh_use = 'Mobility for unit commander' or
   veh_use = 'Mobility for indiv/team in dedicated vehicle'
then erc_assigned = [indv_mobility,'ERC A','5.2.4'].

if branch = ahs and
   equipment = 'Ambulance'
then erc_assigned = [core equip,'ERC A','5.2.5'].

if not branch = ahs and
   equipment = 'Ambulance'
then erc_assigned = [unit_personnel_services,'ERC B','5.2.6'].

if equipment = 'Truck' or
   equipment = 'Trailer' or
   equipment = 'Truck tractor' or
   equipment = 'Semi trailer' and
   veh_use = 'Move essential equipment in dedicated vehicle'
then erc_assigned = [position_sptd equip,'ERC A','5.2.7'].

if branch = fas and
   equipment = 'Truck' or
   equipment = 'Trailer' or
   equipment = 'Truck tractor' or
   equipment = 'Semi trailer' and
   veh_use = 'Move unit equipment and personnel'
then erc_assigned = [unit_mobility,'ERC A','5.2.8'].

if not branch = fas and
   equipment = 'Truck' or
   equipment = 'Trailer' or
   equipment = 'Truck tractor' or
   equipment = 'Semi trailer' and
   veh_use = 'Move unit equipment and personnel'
then erc_assigned = [unit_mobility,'ERC B','5.2.9'].

```

```
if equipment = 'Truck' or
equipment = 'Trailer' or
equipment = 'Truck tractor' or
equipment = 'Semi trailer' and
veh_use = 'Move unit ammunition or fuel'
then erc_assigned = [sustain_sptd equip, 'ERC A', '5.2.10'].
```

```
if equipment = 'Truck' or
equipment = 'Truck tractor' or
equipment = 'Semi trailer' or
equipment = 'Trailer' and
veh_use = 'Transport water for supported units'
then erc_assigned = [core equip, 'ERC A', '5.2.11'].
```

```
if equipment = 'Truck' or
equipment = 'Truck tractor' or
equipment = 'Semi trailer' or
equipment = 'Trailer' and
veh_use =
'Transport/store supplies for supported units'
then erc_assigned = [core equip, 'ERC A', '5.2.12'].
```

```
if equipment = 'Truck' or
equipment = 'Trailer' and
veh_use = 'Support combat field feeding system'
then erc_assigned = [unit_mobility, 'ERC B', '5.2.13'].
```

```
if equipment = 'Truck' or
equipment = 'Trailer' or
equipment = 'Truck tractor' or
equipment = 'Semi trailer' and
veh_use = 'Support maintenance operations' and
maint_type = 'Intermediate DS maintenance' or
maint_type = 'Intermediate GS maintenance'
then erc_assigned = [unit equip_maintenance, 'ERC A', '5.2.14'].
```

```
if equipment = 'Truck' or
equipment = 'Truck tractor' or
equipment = 'Semi trailer' or
equipment = 'Trailer' and
veh_use = 'Support maintenance operations' and
maint_type = 'Unit maintenance'
then erc_assigned = [unit equip_maintenance, 'ERC B', '5.2.15'].
```

```
if equipment = 'Recovery vehicle' and
recovery_veh_use = 'Divisional Maintenance Co' or
recovery_veh_use = 'Bn maintenance operations'
then erc_assigned = [core equip, 'ERC P', '5.2.16'].
```

```
if equipment = 'Recovery vehicle' and
recovery_veh_use = 'Other maintenance unit operations'
then erc_assigned = [core equip, 'ERC A', '5.2.17'].
```

```

if equipment = 'Recovery vehicle' and
  recovery_veh_use =
    'Support Class VII distribution/storage'
then erc_assigned = [core equip, 'ERC A', '5.2.18'].

if equipment = 'Recovery vehicle' and
  recovery_veh_use =
    'Own unit vehicle recovery (non-maint units)'
then erc_assigned = [unit equip_maintenance, 'ERC B', '5.2.19'].

if equipment = 'Truck tank water^' or
  equipment = 'Water trailer^' and
  water_use = 'Support medical unit' or
  water_use = 'Direct support of mission tasks'
then erc_assigned = [core equip, 'ERC A', '5.2.20'].

if equipment = 'Truck tank water^' or
  equipment = 'Water trailer^' and
  water_use = 'Support personal hygiene and sanitation'
then erc_assigned = [unit_personnel_services, 'ERC B', '5.2.21'].

if equipment = 'Truck tank water^' or
  equipment = 'Water trailer^' and
  water_use = 'Support combat field feeding system'
then erc_assigned = [unit_useful_facility, 'ERC C', '5.2.22'].

if branch = ins and
  equipment = 'Truck tank water^' and
  intel_msn_task = 'Imagery Intelligence' and
  intel_use = 'Support photographic processing'
then erc_assigned = [sustain_sptd equip, 'ERC A', '5.2.23'].

if branch = ins and
  equipment = 'Truck tank water^' and
  not intel_msn_task = 'Imagery Intelligence' and
  not intel_use = 'Support photographic processing'
then erc_assigned = [unit_important_facility, 'ERC B', '5.2.24'].

if branch = avl and
  equipment = 'Semi trailer van' and
  avl_maint_use = 'Storage in controlled environment'
then erc_assigned = [unit_critical_facility, 'ERC A', '5.2.25'].

if branch = avl and
  equipment = 'Semi trailer van' and
  avl_maint_use = 'Storage in uncontrolled environment'
then erc_assigned = [unit_important_facility, 'ERC B', '5.2.26'].

if not branch = avl and
  equipment = 'Semi trailer van' and
  veh_use =
    'Transport/store supplies for supported units'
then erc_assigned = [supply_sptd equip, 'ERC A', '5.2.27'].

```

```
if not branch = avl and
   equipment = 'Semi trailer van' and
   veh_use = 'Support maintenance operations' and
   maint_type = 'Intermediate DS maintenance' or
   maint_type = 'Intermediate GS maintenance'
then erc_assigned = [maintain_sptd equip,'ERC A','5.2.28'].

if not branch = avl and
   equipment = 'Semi trailer van' and
   veh_use = 'Support maintenance operations' and
   maint_type = 'Unit maintenance'
then erc_assigned = [unit equip maintenance,'ERC B','5.2.29'].

if not branch = ins and
   equipment = 'Truck tank water^' and
   veh_use = 'Transport water for supported units'
then erc_assigned = [core equip,'ERC A','5.2.30'].

if equipment = 'Truck' or
   equipment = 'Trailer' or
   equipment = 'Truck tractor' or
   equipment = 'Semi trailer' and
   veh_use = 'Support admin-log operations'
then erc_assigned = [transport_sptd equip,'ERC B','5.2.31'].

if equipment = 'Truck dump'
then erc_assigned = [core equip,'ERC A','5.2.32'].
```

```

/* 5.3 WEAPON/ASSO EQUIPMENT RULES */

/* ----- erc_assigned ('Weapon') ----- */

if  equipment = 'Tank, IFV or CFV^' or
    equipment = 'Artillery'
then erc_assigned = [core equip,'ERC P','5.3.1'].

if  branch = inf or
    branch = sof and
    equipment = 'Individual weapon' or
    equipment = 'Crew-served weapon, cal.50 and under' or
    equipment = 'Anti-armor weapon/associated item' or
    equipment = 'Mortar' or
    equipment = 'Bayonet'
then erc_assigned = [core equip,'ERC A','5.3.2'].

if  not branch = inf and
    not branch = sof and
    branch_designation = 'Combat arms' and
    equipment = 'Individual weapon' or
    equipment = 'Crew-served weapon, cal.50 and under' or
    equipment = 'Anti-armor weapon/associated item' or
    equipment = 'Mortar'
then erc_assigned = [unit_defense,'ERC A','5.3.3'].

if  not branch_designation = 'Combat arms' and
    equipment = 'Individual weapon' or
    equipment = 'Crew-served weapon, cal.50 and under'
then erc_assigned = [unit_defense,'ERC B','5.3.4'].

if  branch = mps and
    equipment = 'Individual weapon' and
    equipment = 'Crew-served weapon, cal.50 and under'
then erc_assigned = [core equip,'ERC A','5.3.5'].

if  not(branch = inf) and
    not(branch = sof) and
    equipment = 'Bayonet'
then erc_assigned = [unit_defense,'ERC B','5.3.6'].

if  equipment = 'Grenade launcher' or
    equipment = 'Weapon mount' or
    equipment = 'Other weapon associated item' and
    erc_sptd_sys = 'ERC P' or
    erc_sptd_sys = 'ERC A'
then erc_assigned = [adapt_sptd equip,'ERC A','5.3.7'].

if  equipment = 'Grenade launcher' or
    equipment = 'Weapon mount' or
    equipment = 'Other weapon associated item' and
    erc_sptd_sys = 'ERC B'
then erc_assigned = [enhance_sptd equip,'ERC B','5.3.8'].

```

```
if equipment = 'Weapon fire-laying device' and  
   fire_laying_use = 'Primary means of fire control'  
then erc_assigned = [control_sptd equip, 'ERC A', '5.3.9'].
```

```
if equipment = 'Weapon fire-laying device' and  
   fire_laying_use = 'Secondary means of fire control'  
then erc_assigned = [enhance_sptd equip, 'ERC B', '5.3.10'].
```

```
/* 5.4 ADP EQUIPMENT RULES */
```

```
/* ----- erc_assigned(ADP equipment) -----*/
```

```
if branch = ssc and
   equipment = 'TACCS' or
   equipment = 'TACCS Remote Terminal' and
   taccs_software = 'SIDPERS - Personnel' and
   ssc_unit = 'PERSCOM' or
   ssc_unit = 'Personnel and Administration Bn' or
   ssc_unit = 'Personnel Service Company' or
   ssc_unit = 'Personnel Group'
then erc_assigned = [core equip,'ERC A','5.4.1'].
```

```
if branch = ssc and
   equipment = 'TACCS' or
   equipment = 'TACCS Remote Terminal' and
   taccs_software = 'SIDPERS - Personnel' and
   not(ssc_unit = 'PERSCOM') and
   not(ssc_unit = 'Personnel and Administration Bn') and
   not(ssc_unit = 'Personnel Service Company') and
   not(ssc_unit = 'Personnel Group')
then erc_assigned = [unit_important_facility,'ERC B','5.4.2'].
```

```
if not(branch = ssc) and
   equipment = 'TACCS' or
   equipment = 'TACCS Remote Terminal' and
   taccs_software = 'SAMS - Maintenance' or
   taccs_software = 'SARSS - Supply' or
   taccs_software = 'DAMMS - Movements' or
   taccs_software = 'TAMIS - Medical' or
   taccs_software = 'SAAS - Ammunition'
then erc_assigned = [core equip,'ERC A','5.4.3'].
```

```
if not(branch = ssc) and
   equipment = 'TACCS' or
   equipment = 'TACCS Remote Terminal' and
   taccs_software = 'SIDPERS - Personnel'
then erc_assigned = [unit_control,'ERC B','5.4.4'].
```

```
if equipment = 'DAS-3 Data Processing Display Group' or
   equipment = 'DAS-3 Remote Printer'
then erc_assigned = [core equip,'ERC A','5.4.5'].
```

```
if equipment = 'DAS-3 Power Plant'
then erc_assigned = [power_sptd equip,'ERC A','5.4.6'].
```

```
if branch = ins and
   equipment = 'Data analysis central'
then erc_assigned = [core equip,'ERC A','5.4.7'].
```

```
/* 5.5 KIT/SET/OUTFIT RULES */
```

```
/* ----- erc_assigned (Kit/set/outfit) ----- */
```

```
if branch = eng or
   branch = sof and
   equipment = 'Carpenter set' or
   equipment = 'Pioneer set' or
   equipment = 'Demolition set'
then erc_assigned = [indv_skill_application,'ERC A','5.5.1'].
```

```
if not(branch = eng) and
   not(branch = sof) and
   not(branch = ssc) and
   equipment = 'Carpenter set' or
   equipment = 'Pioneer set' or
   equipment = 'Demolition set'
then erc_assigned = [indv_skill_application,'ERC B','5.5.2'].
```

```
if branch = ssc and
   equipment = 'Carpenter set'
then erc_assigned = [indv_productivity,'ERC C','5.5.3'].
```

```
if branch = sig and
   equipment = 'Tool kit' or
   equipment = 'Tool set' and
   maint_type = 'Unit level maintenance'
then erc_assigned = [unit equip_maintenance,'ERC B','5.5.4'].
```

```
if branch = sig and
   equipment = 'Tool kit' or
   equipment = 'Tool set' and
   maint_type = 'Intermediate DS maintenance'
then erc_assigned = [maintain_sptd equip,'ERC A','5.5.5'].
```

```
if branch = ins and
   equipment = 'Tool kit' and
   intel_msn_task = 'Technical Intelligence' and
   intel_use = 'Organic intermediate-level maintenance' or
   intel_use = 'Communications electronics' or
   intel_use = 'Chemical maintenance' or
   intel_use = 'Medical maintenance' or
   intel_use = 'Logistics maintenance' or
   intel_use = 'Ordnance maintenance'
then erc_assigned = [unit equip_maintenance,'ERC A','5.5.6'].
```

```
if branch = ins and
   equipment = 'Tool kit' and
   intel_use = 'Organic intermediate-level maintenance'
then erc_assigned = [unit equip_maintenance,'ERC A','5.5.7'].
```

```
if branch = ins and
   equipment = 'Tool kit' and
```

```

    not intel_use = 'Organic intermediate-level maintenance'
then erc_assigned = [unit_equip_maintenance,'ERC B','5.5.8'].

if branch = avl and
   equipment = 'Tool kit' or
   equipment = 'Tool set' or
   equipment = 'Tool outfit' or
   equipment = 'Shop set' and
   avl_maint_level = 'Aviation intermediate maintenance (AVIM)'
then erc_assigned = [core_equip,'ERC A','5.5.9'].

if branch = avl and
   equipment = 'Tool kit' or
   equipment = 'Tool set' or
   equipment = 'Tool outfit' or
   equipment = 'Shop set' and
   avl_maint_level = 'Aviation unit maintenance (AVUM)'
then erc_assigned = [unit_equip_maintenance,'ERC B','5.5.10'].

if not(branch = avl) and
   not(branch = sig) and
   not(branch = ins) and
   equipment = 'Tool set' or
   equipment = 'Tool kit' or
   equipment = 'Tool outfit' or
   equipment = 'Shop set' or
   equipment = 'Shop set related' and
   maint_type = 'Intermediate DS maintenance' or
   maint_type = 'Intermediate GS maintenance'
then erc_assigned = [core_equip,'ERC A','5.5.11'].

if not(branch = avl) and
   not(branch = sig) and
   not(branch = ins) and
   equipment = 'Tool set' or
   equipment = 'Tool kit' or
   equipment = 'Tool outfit' or
   equipment = 'Shop set' or
   equipment = 'Shop set related' and
   maint_type = 'Unit maintenance'
then erc_assigned = [unit_equip_maintenance,'ERC B','5.5.12'].

if branch = ssc or
   branch = mps and
   equipment = 'Personnel ID kit^'
then erc_assigned = [unit_important_facility,'ERC B','5.5.13'].

if not branch = ssc and
   not branch = mps and
   equipment = 'Personnel ID kit^'
then erc_assigned = [unit_useful_facility,'ERC C','5.5.14'].

if branch = qms or

```

```
branch = ahs and  
equipment = 'Water quality set^' or  
equipment = 'Food inspection set'  
then erc_assigned = [unit_critical_facility, 'ERC A', '5.5.15'].
```

```
if not branch = qms and  
not branch = ahs and  
equipment = 'Water quality set^' or  
equipment = 'Food inspection set'  
then erc_assigned = [unit_useful_facility, 'ERC C', '5.5.16'].
```

```
/* 5.6 AUDIO/VISUAL EQUIPMENT RULES */
```

```
if branch = ssc and  
   equipment = 'Sound Recorder' and  
   ssc_unit = 'International Operations Law Team' or  
   ssc_unit = 'Court Martial Trial Team' or  
   ssc_unit = 'Legal Assistant Claims Team'  
then erc_assigned = [unit_critical_facility, 'ERC A', '5.6.1'].  
  
if not branch = ssc and  
   equipment = 'Sound Recorder'  
then erc_assigned = [unit_important_facility, 'ERC B', '5.6.2'].  
  
if equipment = 'Loudspeaker' or  
   equipment = 'Public address set^' and  
   av_use = 'Support tactical operations'  
then erc_assigned = [unit_critical_facility, 'ERC A', '5.6.3'].  
  
if equipment = 'Loudspeaker' or  
   equipment = 'Public address set^' and  
   av_use = 'Support non-tactical operations'  
then erc_assigned = [unit_important_facility, 'ERC B', '5.6.4'].
```

```

/* 5.7 PHOTO/GRAPHICS EQUIPMENT RULERS */

/* ----- erc_assigned (Photo/Graphics equipment) ----- */

if branch = ins or
   branch = ics and
   equipment = 'Photographic equipment' and
   intel_msn_task = 'Counterintelligence' or
   intel_msn_task = 'Technical Intelligence' or
   intel_msn_task = 'Imagery Intelligence'
then erc_assigned = [core_equip,'ERC A','5.7.1'].

if branch = ins or
   branch = ics and
   equipment = 'Photographic equipment' and
   not intel_msn_task = 'Counterintelligence' and
   not intel_msn_task = 'Technical Intelligence' and
   not intel_msn_task = 'Imagery Intelligence'
then erc_assigned = [unit_important_facility,'ERC B','5.7.2'].

if branch = ssc and
   equipment = 'Photographic equipment' and
   ssc_unit = 'Mobile Public Affairs Det' or
   ssc_unit = 'Personnel Service Company' or
   ssc_unit = 'Press Camp Headquarters' or
   ssc_unit = 'Public Affairs Team'
then erc_assigned = [unit_critical_facility,'ERC A','5.7.3'].

if branch = ssc and
   equipment = 'Photographic equipment' and
   not(ssc_unit = 'Mobile Public Affairs Det') and
   not(ssc_unit = 'Personnel Service Company') and
   not(ssc_unit = 'Press Camp Headquarters') and
   not(ssc_unit = 'Public Affairs Team') or
   not(branch = ssc)
then erc_assigned = [unit_important_facility,'ERC B','5.7.4'].

if not branch = ins and
   not branch = ics and
   not branch = ssc and
   equipment = 'Photographic equipment'
then erc_assigned = [unit_important_facility,'ERC B','5.7.5'].

if branch = ssc and
   equipment = 'Laminating press' and
   ssc_unit = 'Personnel Service Company'
then erc_assigned = [unit_critical_facility,'ERC A','5.7.6'].

if equipment = 'Drafting equipment' and
   graphics_use = 'Produce ops/intel information'
then erc_assigned = [unit_critical_facility,'ERC A','5.7.7'].

if equipment = 'Drafting equipment' or

```

```
equipment = 'Sign painting kit^' and  
graphics_use = 'Produce information supporting other units'  
then erc_assigned = [unit_important_facility,'ERC B','5.7.8'].
```

```
if equipment = 'Drafting equipment' and  
graphics_use = 'Produce information supporting own unit'  
then erc_assigned = [unit_useful_facility,'ERC C','5.7.9'].
```

```
if equipment = 'Sign painting kit^' or  
equipment = 'Sealing iron'  
then erc_assigned = [indv_productivity,'ERC C','5.7.10'].
```

```
/* 5.7 BAND EQUIPMENT RULES */
```

```
/* ----- erc_assigned (Band equipment) ----- */
```

```
if branch = ssc and  
   equipment = 'Band instrument' and  
   ssc_unit = 'Special Band'  
then erc_assigned = [core_equip,'ERC A','5.8.1'].
```

```
if branch = ssc and  
   equipment = 'Band instrument' and  
   not(ssc_unit = 'Special Band')  
then erc_assigned = [core_equip,'ERC B','5.8.2'].
```

```
if branch = qms and  
   equipment = 'Band instrument'  
then erc_assigned = [core_equip,'ERC B','5.8.3'].
```

```
if not(branch = ssc) and  
   not(branch = qms) and  
   equipment = 'Band instrument'  
then erc_assigned = [indv_skill_application,'ERC C','5.8.4'].
```

```
if branch = ssc and  
   equipment = 'Drummers throne' and  
   ssc_unit = 'Special Band'  
then erc_assigned = [indv_skill_application,'ERC A','5.8.5'].
```

```
if branch = ssc and  
   equipment = 'Metronome' or  
   equipment = 'Music writer' or  
   equipment = 'Risers' and  
   ssc_unit = 'Special Band'  
then erc_assigned = [indv_skill_application,'ERC B','5.8.6'].
```

```
if branch = ssc and  
   equipment = 'Drummers throne' or  
   equipment = 'Metronome' or  
   equipment = 'Music writer' or  
   equipment = 'Risers' and  
   not(ssc_unit = 'Special Band')  
then erc_assigned = [indv_skill_application,'ERC C','5.8.7'].
```

```
if not(branch = ssc) and  
   equipment = 'Drummers throne' or  
   equipment = 'Metronome' or  
   equipment = 'Music writer' or  
   equipment = 'Risers'  
then erc_assigned = [indv_skill_application,'ERC C','5.8.8'].
```

```

/*
                                MODULE 6
                                ITEM FUNCTION RULES
*/

/* 6.1 NBC DEFENSE EQUIPMENT RULES */

/* ----- erc_assigned (NBC defense) ----- */
if equipment = 'Individual protective mask'
then erc_assigned = [indv_protection,'ERC A','6.1.1'].

if equipment = 'Gas particulate filter unit (GPFU)'
then erc_assigned = [unit_nbc_defense,'ERC A','6.1.2'].

if equipment = 'Dosimeter and charger'
then erc_assigned = [unit_nbc_defense,'ERC B','6.1.3'].

if branch = ahs and
   equipment = 'Collective protection shelter'
then erc_assigned = [unit_critical_facility,'ERC A','6.1.4'].

if not(branch = ahs) and
   equipment = 'Collective protection shelter'
then erc_assigned = [unit_nbc_defense,'ERC B','6.1.5'].

if equipment = 'Decon equipment/asso item' and
   nbc_msn = 'Decontamination'
then erc_assigned = [core equip,'ERC P','6.1.6'].

if equipment = 'Decon equipment/asso item' and
   not(nbc_msn = 'Decontamination')
then erc_assigned = [unit_nbc_defense,'ERC B','6.1.7'].

if equipment = 'Smoke generator' and
   nbc_msn = 'Smoke generation'
then erc_assigned = [core equip,'ERC P','6.1.8'].

if equipment = 'Smoke generator' and
   not nbc_msn = 'Smoke generation' and
   erc_sptd_sys = 'ERC P' or
   erc_sptd_sys = 'ERC A'
then erc_assigned = [unit_concealment,'ERC A','6.1.9'].

if equipment = 'Smoke generator' and
   not nbc_msn = 'Smoke generation' and
   erc_sptd_sys = 'ERC B'
then erc_assigned = [unit_concealment,'ERC B','6.1.10'].

if equipment = 'Detector/alarm' and
   nbc_msn = 'NBC reconnaissance'
then erc_assigned = [core equip,'ERC A','6.1.11'].

```

```
if equipment = 'Detector/alarm' and
not(nbc_msn = 'NBC reconnaissance')
then erc_assigned = [unit_nbc_defense,'ERC B','6.1.12'].

if branch = ahs and
equipment = 'Monitor'
then erc_assigned = [unit_critical_facility,'ERC A','6.1.13'].

if not(branch = ahs) and
equipment = 'Monitor' and
nbc_msn = 'NBC reconnaissance' or
nbc_msn = 'Decontamination'
then erc_assigned = [core equip,'ERC A','6.1.14'].

if not(branch = ahs) and
equipment = 'Monitor' and
not(nbc_msn = 'NBC reconnaissance') and
not(nbc_msn = 'Other reconnaissance')
then erc_assigned = [unit_nbc_defense,'ERC B','6.1.15'].

if equipment = 'Radiacmeter' and
nbc_msn = 'NBC reconnaissance' or
nbc_msn = 'Other reconnaissance'
then erc_assigned = [core equip,'ERC A','6.1.16'].

if equipment = 'Radiacmeter' and
not(nbc_msn = 'NBC reconnaissance') and
not(nbc_msn = 'Other reconnaissance')
then erc_assigned = [unit_nbc_defense,'ERC B','6.1.17'].

if equipment = 'NBC sampling & analysis kit^' and
nbc_msn = 'NBC reconnaissance'
then erc_assigned = [core equip,'ERC A','6.1.18'].

if equipment = 'NBC sampling & analysis kit^' and
not nbc_msn = 'NBC reconnaissance'
then erc_assigned = [unit_important_facility,'ERC B','6.1.19'].

if equipment = 'Smoke grenade launcher' and
erc_sptd_sys = 'ERC P' or
erc_sptd_sys = 'ERC A'
then erc_assigned = [unit_concealment,'ERC A','6.1.20'].

if equipment = 'Smoke grenade launcher' and
erc_sptd_sys = 'ERC B'
then erc_assigned = [unit_concealment,'ERC B','6.1.21'].
```

```

/* 6.2 SYSTEM TEST/SUPPORT EQUIPMENT RULES */

/* -----erc_advised (System test/spt) ----- */

if  equipment = 'Common TMDE' or
    equipment = 'Peculiar TMDE' or
    equipment = 'Common support equipment' or
    equipment = 'Peculiar support equipment' or
    equipment = 'GSE' and
    sys_spt_use = 'On-line operation of system' and
    erc_sptd_sys = 'ERC P' or
    erc_sptd_sys = 'ERC A'
then erc_assigned = [sustain_sptd equip,'ERC A','6.2.1'].

if  equipment = 'Common TMDE' or
    equipment = 'Peculiar TMDE' or
    equipment = 'Common support equipment' or
    equipment = 'Peculiar support equipment' or
    equipment = 'GSE' and
    sys_spt_use = 'On-line operation of system' and
    erc_sptd_sys = 'ERC B'
then erc_assigned = [sustain_sptd equip,'ERC B','6.2.2'].

if  equipment = 'Peculiar TMDE' or
    equipment = 'Peculiar support equipment' or
    equipment = 'GSE' and
    sys_spt_use = 'Off-line maintenance' and
    maint_type = 'Intermediate DS maintenance' or
    maint_type = 'Intermediate GS maintenance'
then erc_assigned = [maintain_sptd equip,'ERC A','6.2.3'].

if  equipment = 'Common TMDE' or
    equipment = 'Common support equipment' and
    sys_spt_use = 'Off-line maintenance' and
    maint_type = 'Intermediate DS maintenance' or
    maint_type = 'Intermediate GS maintenance'
then erc_assigned = [maintain_sptd equip,'ERC B','6.2.4'].

if  equipment = 'Common TMDE' or
    equipment = 'Peculiar TMDE' or
    equipment = 'Common support equipment' or
    equipment = 'Peculiar support equipment' and
    sys_spt_use = 'Off-line maintenance' and
    maint_type = 'Unit maintenance'
then erc_assigned = [unit equip maintenance,'ERC B','6.2.5'].

if  equipment = 'Common Support Equipment' or
    equipment = 'Common TMDE' and
    sys_spt_use = 'Off-line maintenance' and
    maint_type =
        'Base shop or on-site maintenance (mmc use)' and
    pse_use = 'Not used with PSE performing similar function'
then erc_assigned = [core equip,'ERC A','6.2.6'].

```

```
if equipment = 'Common Support Equipment' or
   equipment = 'Common TMDE' and
   sys_spt_use = 'Off-line maintenance' and
   maint_type =
       'Base shop or on-site maintenance (mmc use)' and
   pse_use = 'Used with PSE performing similiar function'
then erc_assigned = [indv_skill_application, 'ERC B', '6.2.7'].

if equipment = 'Peculiar Support Equipment (PSE)'
then erc_assigned = [core equip, 'ERC A', '6.2.8'].

if equipment = 'Peculiar TMDE' and
   sys_spt_use = 'Off-line maintenance' and
   maint_type =
       'Base shop or on-site maintenance (mmc use)' and
   pse_use = 'Not used with PSE performing similiar function'
then erc_assigned = [indv_skill_application, 'ERC A', '6.2.9'].

if equipment = 'Peculiar TMDE' and
   sys_spt_use = 'Off-line maintenance' and
   maint_type =
       'Base shop or on-site maintenance (mmc use)' and
   pse_use = 'Used with PSE performing similiar function'
then erc_assigned = [indv_skill_application, 'ERC B', '6.2.10'].
```

```
/* 6.3 POL/WATER HANDLING EQUIPMENT RULES */
```

```
/* ----- erc_assigned (POL/water handling) ----- */
```

```
if equipment = 'Petroleum laboratory' and
   pol_msn = 'Petroleum analysis'
then erc_assigned = [core equip, 'ERC A', '6.3.1'].
```

```
if equipment = 'Petroleum laboratory' and
   not(pol_msn = 'Petroleum analysis')
then erc_assigned = [unit_important_facility, 'ERC B', '6.3.2'].
```

```
if equipment = 'POL storage bag, 10000 gal and larger' and
   pol_msn = 'Supply and service (S&S) unit' or
   pol_msn = 'Supply and transportation (S&T) unit' or
   pol_msn = 'POL supply operating company'
then erc_assigned = [core equip, 'ERC A', '6.3.3'].
```

```
if equipment = 'POL storage bag, 10000 gal and larger' and
   pol_msn = 'Other '
then erc_assigned = [unit_important_facility, 'ERC B', '6.3.4'].
```

```
if equipment = 'Other POL handling equipment' and
   pol_use = 'Support bulk storage mission' or
   pol_use = 'Support distribution mission'
then erc_assigned = [unit_critical_facility, 'ERC A', '6.3.5'].
```

```
if equipment = 'Other POL handling equipment' and
   pol_use = 'Unit refueling'
then erc_assigned = [sustain_sptd equip, 'ERC A', '6.3.6'].
```

```
if equipment = 'Other POL handling equipment' and
   pol_use = 'Auxillary support equipment - petroleum'
then erc_assigned = [enhance_sptd equip, 'ERC B', '6.3.7'].
```

```
if equipment = 'Other water handling equipment' and
   water_use = 'Support bulk storage mission' or
   water_use = 'Support distribution mission' or
   water_use = 'Support medical mission' or
   water_use = 'Support ammo handling/maintenance'
then erc_assigned = [unit_critical_facility, 'ERC A', '6.3.8'].
```

```
if branch = qms and
   equipment = 'Other water handling equipment' and
   water_use = 'Auxillary support equipment - water'
then erc_assigned = [adapt_sptd equip, 'ERC A', '6.3.9'].
```

```
if not(branch = qms) and
   equipment = 'Other water handling equipment' and
   water_use = 'Auxillary support equipment - water'
then erc_assigned = [enhance_sptd equip, 'ERC B', '6.3.10'].
```

```
/* 6.4 EQUIPMENT/MATERIEL HANDLING EQUIPMENT RULES */

/* ----- erc_assigned (Equip/matl hndg) ----- */

if  branch = qms or
    branch = sof and
    equipment = 'Airdrop' or
    equipment = 'Aerial delivery'
then erc_assigned = [core equip,'ERC A','6.4.1'].

if  not(branch = qms) and
    not(branch = sof) and
    equipment = 'Airdrop' or
    equipment = 'Aerial delivery'
then erc_assigned = [unit_important_facility,'ERC B','6.4.2'].

if  equipment = 'Basket' or
    equipment = 'Conveyor belt' or
    equipment = 'Dolly set'
then erc_assigned = [unit_critical_facility,'ERC A','6.4.3'].

if  equipment = 'Other equip hndg item' or
    equipment = 'Other matl hndg item' or
    equipment = 'Crane boom extension'
then erc_assigned = [unit_important_facility,'ERC B','6.4.4'].

if  equipment = 'Fork lift' and
    fork_lift_use = 'Ammunition supply handling'
then erc_assigned = [core equip,'ERC P','6.4.5'].

if  equipment = 'Fork lift' and
    fork_lift_use = 'Ammunition maintenance handling' or
    fork_lift_use = 'Non-ammunition handling'
then erc_assigned = [unit_critical_facility,'ERC A','6.4.6'].
```

```

/* 6.5 SHELTER/STORAGE EQUIPMENT RULES */

/* ----- erc_assigned (shelter/storage) ----- */

if not branch = ins and
   not branch = ics and
   equipment = 'Command and control shelter' or
   equipment = 'Fire support operations shelter'
then erc_assigned = [core_equip,'ERC A','6.5.1'].

if branch = ins or
   branch = ics and
   equipment = 'Intel operations shelter' and
   intel_msn_task = 'Commmunications Intelligence' or
   intel_msn_task = 'Intelligence Reporting' or
   intel_msn_task = 'Intelligence Tasking'
then erc_assigned = [unit_critical_facility,'ERC A','6.5.2'].

if branch = ins or
   branch = ics and
   equipment = 'Intel operations shelter' and
   not intel_msn_task = 'Commmunications Intelligence' and
   not intel_msn_task = 'Intelligence Reporting' and
   not intel_msn_task = 'Intelligence Tasking'
then erc_assigned = [unit_important_facility,'ERC B','6.5.3'].

if not branch = ins and
   not branch = ics and
   equipment = 'Admin-log operations shelter'
then erc_assigned = [core_equip,'ERC B','6.5.4'].

if not branch = ins and
   not branch = ics and
   equipment = 'Equip operation shelter' and
   erc_sptd_sys = 'ERC P' or
   erc_sptd_sys = 'ERC A'
then erc_assigned = [unit_critical_facility,'ERC A','6.5.5'].

if not branch = ins and
   not branch = ics and
   equipment = 'Equip operation shelter' and
   erc_sptd_sys = 'ERC B'
then erc_assigned = [unit_important_facility,'ERC B','6.5.6'].

if branch = ins or
   branch = ics and
   equipment = 'Maintenance facility shelter' and
   intel_msn_task = 'Direct Support Maintenance' and
   intel_use = 'Organic intermediate-level maintenance'
then erc_assigned = [unit_critical_facility,'ERC A','6.5.7'].

if branch = ins or
   branch = ics and

```

```
equipment = 'Maintenance facility shelter' and
intel_msn_task = 'Organic Equipment Maintenance' and
intel_use = 'Mission specific equipment'
then erc_assigned = [unit_critical_facility,'ERC A','6.5.8'].

if branch = ins or
branch = ics and
equipment = 'Maintenance facility shelter' and
not intel_msn_task = 'Direct Support Maintenance' and
not intel_use = 'Organic intermediate-level maintenance'
then erc_assigned = [unit_important_facility,'ERC B','6.5.9'].

if branch = ins or
branch = ics and
equipment = 'Maintenance facility shelter' and
not intel_msn_task = 'Organic Equipment Maintenance' and
not intel_use = 'Mission specific equipment'
then erc_assigned = [unit_important_facility,'ERC B','6.5.10'].

if branch = ins or
branch = ics and
equipment = 'Repair parts storage shelter' and
intel_msn_task = 'Direct Support Maintenance' and
intel_use = 'Store mission peculiar supplies'
then erc_assigned = [unit_critical_facility,'ERC A','6.5.11'].

if branch = ins or
branch = ics and
equipment = 'Repair parts storage shelter' and
not intel_msn_task = 'Direct Support Maintenance' and
not intel_use = 'Store mission peculiar supplies'
then erc_assigned = [unit_important_facility,'ERC B','6.5.12'].

if not branch = ins and
not branch = ics and
equipment = 'Maintenance facility shelter' or
equipment = 'Repair parts storage shelter' and
maint_type = 'Intermediate DS maintenance' or
maint_type = 'Intermediate GS maintenance'
then erc_assigned = [unit_critical_facility,'ERC A','6.5.13'].

if not branch = ins and
not branch = ics and
equipment = 'Maintenance facility shelter' or
equipment = 'Repair parts shelter facility' and
maint_type = 'Unit maintenance'
then erc_assigned = [unit equip_maintenance,'ERC B','6.5.14'].
```

```

/* 6.6 MEDICAL SUPPORT EQUIPMENT RULES */

/* ----- erc_assigned (Medical services) ----- */

if  branch = ahs or
    branch = qms and
    equipment = 'Medical Equipment Set' or
    equipment = 'Other Medical Equipment'
then erc_assigned = [core equip,'ERC A','6.6.1'].

if  not(branch = ahs) and
    not(branch = qms) and
    equipment = 'Medical Equipment Set' or
    equipment = 'Other Medical Equipment'
then erc_assigned = [unit_personnel_services,'ERC B','6.6.2'].

if  branch = ahs and
    equipment = 'Medical Book Set'
then erc_assigned = [indv_skill_application,'ERC B','6.6.3'].

if  not(branch = ahs) and
    equipment = 'Medical Book Set'
then erc_assigned = [indv_productivity,'ERC C','6.6.4'].

if  branch = ahs and
    equipment = 'DEPMEDS Equipment' and
    depmeds_type = 'MMS Operating Room' or
    depmeds_type = 'MMS Intensive Care Ward' or
    depmeds_type = 'MMS Central Material Supply' or
    depmeds_type = 'MMS X-Ray' and
    medical_unit_type = 'Hospital'
then erc_assigned = [core equip,'ERC P','6.6.5'].

if  branch = ahs and
    equipment = 'DEPMEDS Equipment' and
    depmeds_type = 'MMS Operating Room' or
    depmeds_type = 'MMS Intensive Care Ward' or
    depmeds_type = 'MMS Central Material Supply' or
    depmeds_type = 'MMS X-Ray' and
    not medical_unit_type = 'Hospital'
then erc_assigned = [core equip,'ERC A','6.6.6'].

if  branch = ahs and
    equipment = 'DEPMEDS Equipment' and
    depmeds_type = 'Other DEPMEDS'
then erc_assigned = [core equip,'ERC A','6.6.7'].

if  branch = ahs and
    equipment = 'Ambulance' and
    medical_unit_type = 'Division or Brigade Medical Unit' or
    medical_unit_type = 'Evacuation Unit'
then erc_assigned = [core equip,'ERC P','6.6.8'].

```

```
if branch = ahs and  
   equipment = 'Ambulance^' and  
   not medical_unit_type =  
       'Division or Brigade Medical Unit' and  
   not medical_unit_type = 'Evacuation Unit'  
then erc_assigned = [unit_critical_facility, 'ERC A', '6.6.9'].
```

```
if not branch = ahs and  
   equipment = 'Ambulance^'  
then erc_assigned = [unit_important_facility, 'ERC B', '6.6.10'].
```

```
/* 6.7 PERSONNEL SUPPORT EQUIPMENT RULES */
```

```
/* ----- erc_assigned (personnel support) ----- */
```

```
if branch = qms or  
   branch = lgc and  
   equipment = 'Laundry equipment' or  
   equipment = 'Clothing exchange and bath equipment'  
then erc_assigned = [core equip, 'ERC A', '6.7.1'].
```

```
if not(branch = qms) and  
   not(branch = lgc) and  
   equipment = 'Laundry equipment' or  
   equipment = 'Clothing exchange and bath equipment'  
then erc_assigned = [unit_important_facility, 'ERC B', '6.7.2'].
```

```
if branch = qms and  
   equipment = 'Bakery' or  
   equipment = 'Textile repair' or  
   equipment = 'Graves registration'  
then erc_assigned = [core equip, 'ERC A', '6.7.3'].
```

```
if not branch = qms and  
   equipment = 'Bakery' or  
   equipment = 'Textile repair' or  
   equipment = 'Graves registration'  
then erc_assigned = [unit_important_facility, 'ERC B', '6.7.4'].
```

```
if equipment = 'Mess equipment'  
then erc_assigned = [unit_personnel_services, 'ERC C', '6.7.5'].
```

/* 6.8 EOD SUPPORT RULE

/* ----- erc_assigned (EOD support) ----- */

if equipment = 'EOD spt'

then erc_assigned = [core equip, 'ERC A', '6.8.1'].

```
/* 6.9 TRAINING EQUIPMENT RULE */
```

```
/* ----- erc_assigned (training) ----- */
```

```
if equipment = 'Training spt'  
then erc_assigned = [unit_training_facility, 'ERC C', '6.9.1'].
```

```

/*
                                MODULE 7
                                CORE EQUIPMENT IDENTIFICATION
*/

/* ----- question(ahs-unit_msn) ----- */
question(ahs-unit_msn) =
'\f
What is the mission of the medical unit?

Enter the number corresponding to the mission.

'.

legalvals(ahs-unit_msn) =
    ['Division/unit health service support',
     'None of above'].

automaticmenu(ahs-unit_msn).

                                /* ----- */

question('Division/unit health service support'-ahs-task) =
'\f
What is the mission-task of the medical unit?

Enter the number corresponding to the mission-task.

'.

legalvals('Division/unit health service support'-ahs-task) =
    ['Ground evacuation of patients',
     'None of above'].

automaticmenu('Division/unit health service support'-ahs-task).

/* -----core_eqp(ahs) ----- */
core_eqp(ahs,
    'Division/unit health service support',
    'Ground evacuation of patients') =
,
                                Ambulance                ERC A
,
'.

```

```
/* ----- question(arm-unit_msn) ----- */
```

```
question(arm-unit_msn) =
'\f
What is the mission of the armor unit?
```

Enter the number corresponding to the mission.

'.

```
legalvals(arm-unit_msn) =
    ['Engage enemy maneuver units',
     'Reconnoiter enemy',
     'None of above'].
automaticmenu(arm-unit_msn).
```

```
/* ----- */
```

```
question('Engage enemy maneuver units'-arm-task) =
'\f
What is the mission-task of the armor unit?
```

Enter the number corresponding to the mission-task.

'.

```
legalvals('Engage enemy maneuver units'-arm-task) =
    ['Conduct tank assault with mixed calibre fires',
     'None of above'].
```

```
automaticmenu('Engage enemy maneuver units'-arm-task).
```

```
/* ----- */
```

```
question('Reconnoiter enemy'-arm-task) =
'\f
What is the mission-task of the armor unit?
```

Enter the number corresponding to the mission-task.

'.

```
legalvals('Reconnoiter enemy'-arm-task) =
    ['Ground search of designated area',
     'Airborne search of designated area',
     'None of above'].
```

```
automaticmenu('Reconnoiter enemy'-arm-task).
```

```
/* -----core_eqp(arm) ----- */
```

```
core_eqp(arm,
        'Engage enemy maneuver units',
        'Conduct tank assault with mixed calibre fires') =
```

```
'
          Tank          ERC P
'.
```

```
/* ----- */
```

```
core_eqp(arm,
        'Reconnoiter enemy',
        'Ground search of designated area') =
```

```
'
          CFV          ERC P
'.
```

```
/* ----- */
```

```
core_eqp(arm,
        'Reconnoiter enemy',
        'Airborne search of designated area') =
```

```
'
          Observation Helicopter          ERC P
'.
```

```
/* ----- question(ada-unit_msn) ----- */
```

```
question(ada-unit_msn) =
```

```
'\f
What is the mission of the air defense unit?
```

```
Enter the number corresponding to the mission.
```

```
'.
```

```
legalvals(ada-unit_msn) =
        ['Engage enemy aircraft',
         'None of above'].
```

```
automaticmenu(ada-unit_msn).
```

```
/* ----- */
```

```
question('Engage enemy aircraft'-ada-task) =
'\f
What is the mission-task of the air defense unit?
```

Enter the number corresponding to the mission.

'.

```
legalvals('Engage enemy aircraft'-ada-task) =
  ['Forward air defense against low-level sorties',
   'None of above'].
```

```
automaticmenu('Engage enemy aircraft'-ada-task).
```

```
/* -----core_eqp(ada) ----- */
```

```
core_eqp(ada,
  'Engage enemy aircraft',
  'Forward air defense against low-level sorties') =
  ,
  ADA missile launcher      ERC P
  .
```

```
/* ----- question(avn-unit_msn) ----- */
```

```
question(avn-unit_msn) =
'\f
What is the mission of the aviation unit?
```

Enter the number corresponding to the mission.

'.

```
legalvals(avn-unit_msn) =
  ['Engage enemy elements',
   'Air transport support operations',
   'None of above'].
```

```
automaticmenu(avn-unit_msn).
```

```
/* ----- */
```

```
question('Engage enemy elements'-avn-task) =
'\f
What is the mission-task of the aviation unit?
```

Enter the number corresponding to the mission_task.

'.

```
legalvals('Engage enemy elements'-avn-task) =
    ['Airborne attack with mixed ordnance',
     'None of above'].
```

```
automaticmenu('Engage enemy elements'-avn-task).
```

```
/* ----- */
```

```
question('Air transport support operations'-avn-task) =
'\f
What is the mission-task of the aviation unit?
```

```
Enter the number corresponding to the mission_task.
```

'.

```
legalvals('Air transport support operations'-avn-task) =
    ['Combat operations support' ,
     'None of above'].
```

```
automaticmenu('Air transport support operations'-avn-task).
```

```
/* -----core_eqp(avn) ----- */
```

```
core_eqp(avn,
    'Engage enemy elements',
    'Airborne attack with mixed ordnance') =
',
    Attack Helicopter          ERC P
'.
```

```
/* -----core_eqp(avn) ----- */
```

```
core_eqp(avn,
    'Air transport support operations',
    'Combat operations support') =
',
    Transport Helicopter      ERC P
'.
```

```
/* ----- question(avl-unit_msn) ----- */
```

```
question(avl-unit_msn) =
'\f
What is the mission of the aviation logistics unit?
```

Enter the number corresponding to the mission.

'.

```
legalvals(avl-unit_msn) =
    ['AVIM/backup AVUM to div avn units',
     'AVIM/backup AVUM to asgnd div assets',
     'AVIM/AVUM corp acft/passback AVIM div acft',
     'AVIM support for non-div units',
     'AVIM support to inf div (light)',
     'None of above'].
```

```
automaticmenu(avl-unit_msn).
```

```
/* ----- */
```

```
question('AVIM/backup AVUM to div avn units'-avl-task) =
'\f
What is the mission-task of the aviation logistics unit?
```

Enter the number corresponding to the mission-task.

'.

```
legalvals('AVIM/backup AVUM to div avn units'-avl-task) =
    ['Acft maintenance',
     'Repair parts supply',
     'Acft recovery',
     'None of above'].
```

```
automaticmenu('AVIM/backup AVUM to div avn units'-avl-task).
```

```
/* ----- */
```

```
question('AVIM/backup AVUM to asgnd div assets'-avl-task) =
'\f
What is the mission-task of the aviation logistics unit?
```

Enter the number corresponding to the mission-task.

'.

```
legalvals('AVIM/backup AVUM to asgnd div assets'-avl-task) =
    ['Acft maintenance',
     'Repair parts supply',
     'None of above'].
```

```
automaticmenu('AVIM/backup AVUM to asgnd div assets'-avl-task).
```

```
/* ----- */
```

```
question('AVIM/AVUM corp acft/passback AVIM div acft'-avl-task) =
```

```
'\f  
What is the mission-task of the aviation logistics unit?
```

```
Enter the number corresponding to the mission-task.
```

```
'.
```

```
legalvals('AVIM/AVUM corp acft/passback AVIM div acft'-avl-task) =  
  ['Acft maintenance',  
   'Repair parts supply support',  
   'Acft recovery',  
   'None of above'].
```

```
automaticmenu('AVIM/AVUM corp acft/passback AVIM div acft'-avl-task).
```

```
/* ----- */
```

```
question('AVIM support for non-div units'-avl-task) =
```

```
'\f  
What is the mission-task of the aviation unit?
```

```
Enter the number corresponding to the mission-task.
```

```
'.
```

```
legalvals('AVIM support for non-div units'-avl-task) =  
  ['Aviation maintenance',  
   'Aviation repair parts supply',  
   'Acft recovery',  
   'None of above'].
```

```
automaticmenu('AVIM support for non-div units'-avl-task).
```

```
/* ----- */
```

```
question('AVIM support to inf div (light)'-avl-task) =
```

```
'\f  
What is the mission-task of the aviation logistics unit?
```

```
Enter the number corresponding to the mission-task.
```

```

'.
legalvals('AVIM support to inf div (light)')-avl-task) =
    ['Acft maintenance',
     'Repair parts supply',
     'None of above'].

automaticmenu('AVIM support to inf div (light)')-avl-task).

/* ----- core_eqp table (avl) ----- */

core_eqp(avl,
  'AVIM/backup AVUM to div avn units',
  'Acft maintenance') =
'.
    Helicopter, utility: UH-1H                ERC P
    (Each) Elec shop, semi-trlr mtd          ERC A
    (Each) Shop set, AVIM, airmobile         ERC A
    Shop set, AVIM, elec instr repair       ERC A
'.

    /* ----- */

core_eqp(avl,
  'AVIM/backup AVUM to div avn units',
  'Repair parts supply') =
'.
    Trk, forklift: dsl drvn, 10,000         ERC B
'.

    /* ----- */

core_eqp(avl,
  'AVIM/backup AVUM to div avn units',
  'Acft recovery') =
'.
    Aerial recovery kit: Army acft          ERC A
    Trk, tractor wrecker: 5 ton            ERC A
    Semi-trlr, lowbed: 25 ton              ERC B
'.

    /* ----- */

core_eqp(avl,
  'AVIM/backup AVUM to asgnd div assets',
  'Acft maintenance') =
'.
    Helicopter, utility: UH-1H                ERC P
    (Each) Elec shop, semi-trlr mtd          ERC A
    (Each) Shop set, AVIM, airmobile         ERC A
'.

```

```

                /* ----- */
core_eqp(avl,
  'AVIM/backup AVUM to asgnd div assets',
  'Repair parts supply') =
  ,
    Trk, lift fork: dsl drvn 10,000lb          ERC A
  .

                /* ----- */
core_eqp(avl,
  'AVIM/AVUM corp acft/passback AVIM div acft',
  'Acft maintenance') =
  ,
    Helicopter, utility, UH-1H                  ERC P
    Data processing system: AN/MYQ-4           ERC P
    (Each) Elec shop, semi-trlr MTD            ERC A
    (Each) Shop set, AVIM, semi-trlr MTD      ERC A
  .

                /* ----- */
core_eqp(avl,
  'AVIM/AVUM corp acft/passback AVIM div acft',
  'Repair parts supply support') =
  ,
    Trk, lift fork: dsl drvn 10,000lb          ERC A
  .

                /* ----- */
core_eqp(avl,
  'AVIM/AVUM corp acft/passback AVIM div acft',
  'Acft recovery') =
  ,
    Aerial recovery kit: Army acft              ERC A
    Trk, tractor wrecker: 5 ton                 ERC B
    Semi-trlr, lowbed: 12 ton                   ERC B
  .

                /* ----- */
core_eqp(avl,
  'AVIM support for non-div units',
  'Aviation maintenance') =
  ,
    Helicopter, utility: UH-60A                 ERC P
    Data processing system: AN/MYQ-4           ERC P
    (Each) Elec shop, semi-trlr mtd            ERC A
    (Each) Shop set, AVIM, shelter mtd, non-div ERC A
  .

```

```

                /* ----- */
core_eqp(avl,
  'AVIM support for non-div units',
  'Repair parts supply') =
.
      TRK, forklift: dsl drvn, 10,000          ERC B
.

                /* ----- */
core_eqp(avl,
  'AVIM support for non-div units',
  'Acft recovery') =
.
      Aerial recovery kit: Army acft          ERC A
      Trk, tractor wrecker: 5 ton            ERC A
      Semi-trlr, lowbed: 12 ton              ERC B
.

                /* ----- */
core_eqp(avl,
  'AVIM support to inf div (light)',
  'Acft maintenance') =
.
      Helicopter, utility, UH-1H             ERC P
      (Each) Elec shop, shelter mtd         ERC A
      (Each) Shop set, AVIM, airmobile     ERC A
.

                /* ----- */
core_eqp(avl,
  'AVIM support to inf div (light)',
  'Repair parts supply') =
.
      Trk, forklift: dsl drvn, 4000 lb      ERC A
.

/* ----- question(cml-unit_msn) ----- */
question(cml-unit_msn) =
'\f
What is the mission of the chemical unit?

Enter the number corresponding to the mission.

.

legalvals(cml-unit_msn) =
  ['NBC decontamination',

```

```

        'None of above'].
automaticmenu(cml-unit_msn).

        /* ----- */
question('NBC decontamination'-cml-task) =
'\f
What is the mission-task of the chemical unit?

Enter the number corresponding to the mission_task.
'.
legalvals('NBC decontamination'-cml-task) =
        ['NBC decontamination',
        'None of above'].
automaticmenu('NBC decontamination'-cml-task).

        /* ----- */
question('Air transport support operations'-cml-task) =
'\f
What is the mission-task of the aviation unit?

Enter the number corresponding to the mission_task.
'.
legalvals('Air transport support operations'-cml-task) =
        ['Combat operations support' ,
        'None of above'].
automaticmenu('Air transport support operations'-cml-task).

/* -----core_eqp( cml) ----- */
core_eqp(cml,
        'NBC decontamination',
        'NBC decontamination') =
',
        Decontamination apparatus          ERC P
'.
```

```
/* ----- question(cac-unit_msn) ----- */
```

```
question(cac-unit_msn) =
'\f
What is the mission of the headquarters unit?
```

Enter the number corresponding to the mission.

'.

```
legalvals(cac-unit_msn) =
  ['Command, control, supervision of Div',
   'None of above'].
```

```
automaticmenu(cac-unit_msn).
```

```
/* ----- */
```

```
question('Command, control, supervision of Div'-cac-task) =
```

```
'\f
What is the mission-task of the headquarters unit?
```

Enter the number corresponding to the mission-task.

'.

```
legalvals('Command, control, supervision of Div'-cac-task) =
  ['Conduct tactical operations',
   'Conduct support operations',
   'None of above'].
```

```
automaticmenu('Command, control, supervision of Div'-cac-task).
```

```
/* -----core_eqp(cac) ----- */
```

```
core_eqp(cac,
  'Command, control, supervision of Div',
  'Conduct tactical operations') =
```

'

Commander vehicle	ERC A
(Each) Section chief vehicle	ERC A
(Each) Command net radio	ERC A
CSS computer system	ERC P

'.

```
/* ----- */
```

```
core_eqp(cac,
  'Command, control, supervision of Div',
  'Conduct support operations') =
```

```
'
      Commander vehicle           ERC A
      (Each) Section chief vehicle ERC A
      (Each) Admin-Log net radio  ERC A
      CSS computer system         ERC P
'
```

```
/* ----- question(eng-unit_msn) ----- */
```

```
question(eng-unit_msn) =
  '\f
  What is the mission of the engineer unit?
```

Enter the number corresponding to the mission.

```
'.
```

```
legalvals(eng-unit_msn) =
  ['Increase division effectiveness',
  'Unit maintenance',
  'None of above'].
```

```
automaticmenu(eng-unit_msn).
```

```
/* ----- */
```

```
question('Increase division effectiveness'-eng-task) =
  '\f
  What is the mission-task of the engineer unit?
```

Enter the number corresponding to the mission_task.

```
'.
```

```
legalvals('Increase division effectiveness'-eng-task) =
  ['Earthwork/roadwork construction',
  'Emplace assault bridging',
  'Prepare battle positions',
  'Unit maintenance',
  'Emplace gap crossing system',
  'None of above'].
```

```
automaticmenu('Increase division effectiveness'-eng-task).
```

```

/* ----- */
question('Unit maintenance'-eng-task) =
'\f
What is the mission-task of the engineer unit?

Enter the number corresponding to the mission_task.

'.

legalvals('Unit maintenance'-eng-task) =
    ['Unit maintenance',
     'None of above'].

automaticmenu('Unit maintenance'-eng-task).

/* -----core_eqp(eng) ----- */
core_eqp(eng,
    'Increase division effectiveness',
    'Earthwork/roadwork construction') =
    '
        Scooper-loader          ERC P
        Scraper                 ERC P
        Dump truck              ERC P
        Tractor                  ERC P
    '

/* ----- */
core_eqp(eng,
    'Increase division effectiveness',
    'Emplace assault bridging') =
    '
        Assault bridge launcher   ERC P
        Assault bridge sections   ERC P
    '

/* ----- */
core_eqp(eng,
    'Increase division effectiveness',
    'Prepare battle positions') =
    '
        Armored combat earthmover   ERC P
    '

```

```
/* ----- */
```

```
core_eqp(eng,
  'Increase division effectiveness',
  'Emplace gap crossing system') =
'
      Gap crossing system          ERC P
'
```

```
/* ----- */
```

```
core_eqp(eng,
  'Unit maintenance',
  'Unit maintenance') =
'
      Recovery vehicle             ERC P
      Wrecker                     ERC P
      Contact vehicle             ERC P
'
```

```
/* ----- question(fas-unit_msn) ----- */
```

```
question(fas-unit_msn) =
'\f
What is the mission of the field artillery unit?
```

Enter the number corresponding to the mission.

```
'.
```

```
legalvals(fas-unit_msn) =
  ['Engage enemy with indirect fires',
  'Locate enemy for engagement',
  'Service FA Bn',
  'None of above'].
```

```
automaticmenu(fas-unit_msn).
```

```
/* ----- */
```

```
question('Engage enemy with indirect fires'-fas-task) =
'\f
What is the mission-task of the field artillery unit?
```

Enter the number corresponding to the mission-task.

```
'.
```

```
legalvals('Engage enemy with indirect fires'-fas-task) =
    ['Conduct indirect heavy calibre fires',
     'Conduct massed rocket fires',
     'None of above'].
```

```
automaticmenu('Engage enemy with indirect fires'-fas-task).
```

```
/* ----- */
```

```
question('Locate enemy for engagement'-fas-task) =
'\f
What is the mission-task of the field artillery unit?
```

```
Enter the number corresponding to the mission-task.
```

```
'.
```

```
legalvals('Locate enemy for engagement'-fas-task) =
    ['Locate enemy movement',
     'Locate enemy artillery',
     'Locate enemy mortars',
     'None of above'].
```

```
automaticmenu('Locate enemy for engagement'-fas-task).
```

```
/* ----- */
```

```
question('Service FA Bn'-fas-task) =
'\f
What is the mission-task of the field artillery unit?
```

```
Enter the number corresponding to the mission-task.
```

```
'.
```

```
legalvals('Service FA Bn'-fas-task) =
    ['Supply Class I,II,III,,VII items',
     'Provide ammunition transfer point',
     'Automotive maintenance support',
     'None of above'].
```

```
automaticmenu('Service FA Bn'-fas-task).
```

```
/* -----core_eqp(fas) ----- */
```

```
core_eqp(fas,
    'Engage enemy with indirect fires',
```

```

    'Conduct indirect heavy calibre fires') =
    Heavy calibre cannon          ERC P

    /* ----- */

core_eqp(fas,
    'Engage enemy with indirect fires',
    'Conduct massed rocket fires') =
    Multiple launcher rocket system  ERC P

    /* ----- */

core_eqp(fas,
    'Locate enemy for engagement',
    'Locate enemy artillery') =
    Artillery location radar        ERC P

    /* ----- */

core_eqp(fas,
    'Locate enemy for engagement',
    'Locate enemy movement') =
    Moving target indicator radar    ERC P

    /* ----- */

core_eqp(fas,
    'Locate enemy for engagement',
    'Locate enemy mortars') =
    Mortar location radar            ERC P

    /* ----- */

core_eqp(fas,
    'Service FA Bn',
    'Supply Class I, II, III, VII items') =
    Tank truck                      ERC A
    Tank & pump unit                 ERC A

```

```

                Tank unit          ERC A
                Cargo truck        ERC A
'.

                /* ----- */

core_eqp(fas,
        'Service FA Bn',
        'Provide ammunition transfer point') =
'.
                Cargo truck with crane      ERC A
'.

                /* ----- */

core_eqp(fas,
        'Service FA Bn',
        'Automotive maintenance support') =
'.
                (Each) Equip specific tool set      ERC A
                (Each) Equip specific test set     ERC A
                Parts storage van                   ERC A
                Contact vehicle                     ERC A
                Recovery vehicle                    ERC A
'.

/* ----- question(Inf-unit_msn) ----- */

question(Inf-unit_msn) =
'\f
What is the mission of the infantry unit?

Enter the number corresponding to the mission.

'.

legalvals(Inf-unit_msn) =
        ['Engage enemy maneuver units',
         'Engage tanks',
         'None of above'].

automaticmenu(Inf-unit_msn).

                /* ----- */

question('Engage enemy maneuver units'-Inf-task) =
'\f
What is the mission-task of the infantry unit?

```

Enter the number corresponding to the mission-task.

'.

```
legalvals('Engage enemy maneuver units'-inf-task) =
  ['Conduct mounted assault with mixed calibre fires',
   'None of above'].
```

```
automaticmenu('Engage enemy maneuver units'-inf-task).
```

```
/* ----- */
```

```
question('Engage tanks'-inf-task) =
'\f
What is the mission-task of the infantry unit?
```

Enter the number corresponding to the mission-task.

'.

```
legalvals('Engage tanks'-inf-task) =
  ['Conduct reinforcing anti-tank fires',
   'None of above'].
```

```
automaticmenu('Engage tanks'-inf-task).
```

```
/* -----core_eqp(inf) ----- */
```

```
core_eqp(inf,
  'Engage enemy maneuver units',
  'Conduct mounted assault with mixed calibre fires') =
```

'

IFV

ERC P

'.

```
/* ----- */
```

```
core_eqp(inf,
  'Engage tanks',
  'Conduct reinforcing anti-tank fires') =
```

'

TOW launcher

ERC P

'.

```
/* ----- question(ins-unit_msn) ----- */
```

```
question(ins-unit_msn) =
'\f
What is the mission of the intelligence unit?
```

```
Enter the number corresponding to the mission.
```

```
'.
```

```
legalvals(ins-unit_msn) =
    ['Ground surveillance',
     'None of above'].
```

```
automaticmenu(ins-unit_msn).
```

```
/* ----- */
```

```
question('Ground surveillance'-ins-task) =
'\f
What is the mission-task of the intelligence unit?
```

```
Enter the number corresponding to the mission-task.
```

```
'.
```

```
legalvals('Ground surveillance'-ins-task) =
    ['Ground surveillance',
     'None of above'].
```

```
automaticmenu('Ground surveillance'-ins-task).
```

```
/* -----core_eqp(ins) ----- */
```

```
core_eqp(ins,
    'Ground surveillance',
    'Ground surveillance') =
```

```
'
```

```
    Ground surveillance radar      ERC P
```

```
'.
```

```
/* ----- question(lgc-unit_msn) ----- */
```

```
question(lgc-unit_msn) =
```

```
'\f
What is the mission of the headquarters unit?
```

Enter the number corresponding to the mission.

'.

```
legalvals(lgc-unit_msn) =
    ['Command, control, supervision of Bn',
     'Supervision of unit operations',
     'None of above'].
```

```
automaticmenu(lgc-unit_msn).
```

```
/* ----- */
```

```
question('Command, control, supervision of Bn'-lgc-task) =
```

```
'\f
What is the mission-task of the headquarters unit?
```

Enter the number corresponding to the mission-task.

'.

```
legalvals('Command, control, supervision of Bn'-lgc-task) =
    ['Conduct tactical operations',
     'Conduct support operations',
     'None of above'].
```

```
automaticmenu('Command, control, supervision of Bn'-lgc-task).
```

```
/* ----- */
```

```
question('Command, control, supervision of Bn'-lgc-task) =
```

```
'\f
What is the mission-task of the headquarters unit?
```

Enter the number corresponding to the mission-task.

'.

```
legalvals('Command, control, supervision of Bn'-lgc-task) =
    ['Conduct tactical operations',
     'Conduct support operations',
     'None of above'].
```

```
automaticmenu('Command, control, supervision of Bn'-lgc-task).
```

```

/* ----- */
question('Supervision of unit operations'-lgc-task) =
'\f
What is the mission-task of the headquarters unit?

Enter the number corresponding to the mission-task.

'.

legalvals('Supervision of unit operations'-lgc-task) =
['Conduct unit support operations',
'None of above'].

automaticmenu('Supervision of unit operations'-lgc-task).

/* -----core_eqp(lgs) ----- */
core_eqp(lgc,
'Command, control, supervision of Bn',
'Conduct tactical operations') =

'
Commander vehicle           ERC A
(Each) Section chief vehicle ERC A
(Each) Command net radio   ERC A
'.

/* ----- */
core_eqp(lgc,
'Command, control, supervision of Bn',
'Conduct support operations') =

'
Commander vehicle           ERC A
(Each) Section chief vehicle ERC A
(Each) Admin-Log net radio  ERC A
'.

/* ----- */
core_eqp(lgc,
'Supervision of unit operations',
'Conduct unit support operations') =

'
CSS computer system        ERC P
'.

```

```
/* ----- question(mps-unit_msn) ----- */
```

```
question(mps-unit_msn) =
'\f
What is the mission of the military police unit?
```

Enter the number corresponding to the mission.

'.

```
legalvals(mps-unit_msn) =
    ['Support forward/lateral movements',
     'None of above'].
```

```
automaticmenu(mps-unit_msn).
```

```
/* ----- */
```

```
question('Support forward/lateral movements'-mps-task) =
'\f
What is the mission-task of the military police unit?
```

Enter the number corresponding to the mission-task.

'.

```
legalvals('Support forward/lateral movements'-mps-task) =
    ['Battlefield circulation control',
     'None of above'].
```

```
automaticmenu('Support forward/lateral movements'-mps-task).
```

```
/* ----- core_eqp(mps) ----- */
```

```
core_eqp(mps,
    'Support forward/lateral movements',
    'Battlefield circulation control') =
```

,

```
    Utility vehicle      ERC A
    Command net radio    ERC A
```

'.

```
/* ----- question(mmc-unit_msn) ----- */
```

```
question(mmc-unit_msn) =
```

```

'\f
What is the mission of the ordnance unit?

Enter the number corresponding to the mission.

'.

legalvals(mmc-unit_msn) =
    ['Provide ammunition supply facility',
     'None of above'].

automaticmenu(mmc-unit_msn).

                /* ----- */

question('Provide ammunition supply facility'-mmc-task) =
'\f
What is the mission-task of the ordnance unit?

Enter the number corresponding to the mission-task.

'.

legalvals('Provide ammunition supply facility'-mmc-task) =
    ['Provide ammunition supply facility',
     'None of above'].

automaticmenu('Provide ammunition supply facility'-mmc-task).

/* -----core_eqp(mmc) ----- */

core_eqp(mmc,
    'Provide ammunition supply facility',
    'Provide ammunition supply facility') =

    Crane                ERC A
    Fork lift            ERC A

'.

/* ----- question(ord-unit_msn) ----- */

question(ord-unit_msn) =
'\f
What is the mission of the ordnance unit?

Enter the number corresponding to the mission.

```

'.

```
legalvals(ord-unit_msn) =
    ['Intermediate maintenance to Bde',
     'None of above'].
```

```
automaticmenu(ord-unit_msn).
```

```
/* ----- */
```

```
question('Intermediate maintenance to Bde'-ord-task) =
'\f
What is the mission-task of the ordnance unit?
```

Enter the number corresponding to the mission-task.

'.

```
legalvals('Intermediate maintenance to Bde'-ord-task) =
    ['Field maintenance',
     'None of above'].
```

```
automaticmenu('Intermediate maintenance to Bde'-ord-task).
```

```
/* -----core_eqp(ord) ----- */
```

```
core_eqp(ord,
    'Intermediate maintenance to Bde',
    'Field maintenance') =
```

'

(Each) Equip specific tool set	ERC A
(Each) Equip specific test set	ERC A
Parts storage van	ERC A
Contact vehicle	ERC A
Recovery vehicle	ERC A

'.

```
/* ----- question(qms-unit_msn) ----- */
```

```
question(qms-unit_msn) =
'\f
What is the mission of the quartermaster unit?
```

Enter the number corresponding to the mission.

'.

```
legalvals(qms-unit_msn) =
    ['Division support',
     'Brigade support',
     'None of above'].
```

```
automaticmenu(qms-unit_msn).
```

```
/* ----- */
```

```
question('Division support'-qms-task) =
'\f
What is the mission-task of the quartermaster unit?
```

```
Enter the number corresponding to the mission-task.
```

```
'.
```

```
legalvals('Division support'-qms-task) =
    ['Issue Class II, IV, VII supplies',
     'Provide water supply point',
     'Issue Class I supplies',
     'Provide petroleum storage and issue',
     'Provide petroleum distribution',
     'None of above'].
```

```
automaticmenu('Division support'-qms-task).
```

```
/* ----- */
```

```
question('Brigade support'-qms-task) =
'\f
What is the mission-task of the quartermaster unit?
```

```
Enter the number corresponding to the mission-task.
```

```
'.
```

```
legalvals('Brigade support'-qms-task) =
    ['Issue Class II, IV, VII supplies',
     'Issue Class I supplies',
     'None of above'].
```

```
automaticmenu('Brigade support'-qms-task).
```

```
/* -----core_eqp(qms) ----- */
```

```
core_eqp(qms,
```

'Division support',
'Issue Class II, IV, VII supplies') =

Tractor truck	ERC A
Semitrailer (flatbed)	ERC A
Semitrailer (supply van)	ERC A
Loading ramp vehicle	ERC A
Fork lift	ERC A

/* ----- */

core_eqp(qms,
'Division support',
'Provide water supply point') =

Water point supply system	ERC P
Water purification unit	ERC P
Collapsible fabric tank	ERC A
Centrifuge pump equipment	ERC A

/* ----- */

core_eqp(qms,
'Division support',
'Issue Class I supplies') =

Loading ramp vehicle	ERC A
Fork lift	ERC A

/* ----- */

core_eqp(qms,
'Division support',
'Provide petroleum storage and issue') =

Fuel system supply point	ERC A
Forward area refueling point	ERC A
Collapsible fabric tank	ERC A

/* ----- */

```

core_eqp(qms,
  'Division support',
  'Provide petroleum distribution') =
'
    Semitrailer (tank)           ERC A
    Tractor truck                ERC A
    Dispensing tank & pump unit  ERC A
    Dispensing tank unit        ERC A
'

```

```
/* ----- */
```

```

core_eqp(qms,
  'Brigade support',
  'Issue Class II, IV, VII supplies') =
'
    Tractor truck                ERC A
    Semitrailer (flatbed)       ERC A
    Semitrailer (supply van)    ERC A
    Fork lift                    ERC A
'

```

```
/* ----- */
```

```

core_eqp(qms,
  'Brigade support',
  'Issue Class I supplies') =
'
    Loading ramp vehicle        ERC A
    Fork lift                    ERC A
'

```

```
/* ----- question(sig-unit_msn) ----- */
```

```

question(sig-unit_msn) =
'\f
What is the mission of the signal unit?

```

```

Enter the number corresponding to the mission.
'

```

```

legalvals(sig-unit_msn) =
  ['Provide forward area signal centers',

```

```

        'None of above'].

automaticmenu(sig-unit_msn).

        /* ----- */

question('Provide forward area signal centers'-sig-task) =
'\f
What is the mission-task of the signal unit?

Enter the number corresponding to the mission-task.

'.

legalvals('Provide forward area signal centers'-sig-task) =
    ['Provide forward area signal centers',
     'None of above'].

automaticmenu('Provide forward area signal centers'-sig-task).

/* -----core_eqp(sig) ----- */

core_eqp(sig,
    'Provide forward area signal centers',
    'Provide forward area signal centers') =
    ,
        Secure multichannel terminal      ERC A
        Secure radio teletypewriter      ERC A
    ,

'.

/* ----- question(ssc-unit_msn) ----- */

question(ssc-unit_msn) =
'\f
What is the mission of the postal unit?

Enter the number corresponding to the mission.

'.

legalvals(ssc-unit_msn) =
    ['Provide GS postal services in theater',
     'None of above'].

automaticmenu(ssc-unit_msn).

        /* ----- */

```

```
question('Provide GS postal services in theater'-ssc-task) =
'\f
What is the mission-task of the postal unit?
```

Enter the number corresponding to the mission-task.

'.

```
legalvals('Provide GS postal services in theater'-ssc-task) =
  ['Provide GS postal services in theater',
   'None of above'].
```

```
automaticmenu('Provide GS postal services in theater'-ssc-task).
```

```
/* -----core_eqp(ssc) ----- */
```

```
core_eqp(ssc,
  'Provide GS postal services in theater',
  'Provide GS postal services in theater') =
,
      Cargo truck, 5 ton          ERC A
      Mail handler/sorter equipment ERC A
,.
```

```
/* ----- question(trn-unit_msn) ----- */
```

```
question(trn-unit_msn) =
'\f
What is the mission of the transportation unit?
```

Enter the number corresponding to the mission.

'.

```
legalvals(trn-unit_msn) =
  ['Provide truck transport',
   'None of above'].
```

```
automaticmenu(trn-unit_msn).
```

```
/* ----- */
```

```
question('Provide truck transport'-trn-task) =
'\f
What is the mission-task of the transportation unit?
```

Enter the number corresponding to the mission-task.

'.

```
legalvals('Provide truck transport'-trn-task) =
  ['Light load haul',
   'Medium load haul',
   'Heavy load haul',
   'None of above'].
```

```
automaticmenu('Provide truck transport'-trn-task).
```

```
/* -----core_eqp(trn) ----- */
```

```
core_eqp(trn,
  'Provide truck transport',
  'Light load haul') =
'
      Cargo truck, 5 ton      ERC A
'.
```

```
/* ----- */
```

```
core_eqp(trn,
  'Provide truck transport',
  'Medium load haul') =
'
      Tractor truck, 5 ton    ERC A
      Semitrailer (flatbed)  ERC A
'.
```

```
/* ----- */
```

```
core_eqp(trn,
  'Provide truck transport',
  'Heavy load haul') =
'
      HET tractor truck      ERC A
      Semitrailer (low bed)  ERC A
'.
```

APPENDIX J
TOE WORKSHEETS

INTRODUCTION. This appendix reproduces the TOE Worksheets prepared on site at each school and integration center in accordance with the validation plan and validation procedures manual. The four worksheets submitted by each site (one for each of the four TOE considered as part of the validation) are reproduced on a single page. The top of each worksheet identifies the site (branch), the TOE, and unit name. The body of the worksheet records the counts of ERC Correct, ERC Incorrect, ERC Not Advised, and Equipment Not Recognized for the equipment sampled in the TOE. These counts are the basis for the accumulated counts used in the analysis of system performance presented in Chapter 4.

Consultation Response Worksheet

Branch: ADA
 TOE: 44637600
 Unit Name: ADA BTRY PATRIOT

Consultation Response	Mark slash (/) each time condition generated by consultation (collect slashes in groups of 5, separated by commas)				Total Slashes
A - Correct	/// ///	/// |||	/// ///	/// ///	<u>28</u>
B - Correct	///	///	///	|	<u>16</u>
C - Correct	///	|||			<u>8</u>
A - Incorrect	||||				<u>4</u>
B - Incorrect	||				<u>2</u>
C - Incorrect					<u>-</u>
ERC Not Advised	///				<u>5</u>
Equipment Not Recognized					<u>-</u>
Total Above Responses					<u>63</u>

Consultation Response Worksheet

Branch: 44167600 ADA
 TOE: 44167600
 Unit Name: ADA BTRY GUNS (SP) / MAFAS

Consultation Response	Mark slash (/) each time condition generated by consultation (collect slashes in groups of 5, separated by commas)				Total Slashes
A - Correct	///	///	///	|||	<u>18</u>
B - Correct	/// ///	/// |||	///	///	<u>29</u>
C - Correct	///	|||			<u>8</u>
A - Incorrect	||||				<u>4</u>
B - Incorrect	|				<u>1</u>
C - Incorrect	|				<u>1</u>
ERC Not Advised	///	||			<u>7</u>
Equipment Not Recognized					<u>-</u>
Total Above Responses					<u>68</u>

Consultation Response Worksheet

Branch: ADA
 TOE: 44166600
 Unit Name: HITP ADA BTRY HEAVY DIV

Consultation Response	Mark slash (/) each time condition generated by consultation (collect slashes in groups of 5, separated by commas)				Total Slashes
A - Correct	///	///	///	///	<u>20</u>
B - Correct	/// /// ///	/// ///	/// ///	/// ///	<u>27</u>
C - Correct	///	///	|||		<u>14</u>
A - Incorrect	///				<u>5</u>
B - Incorrect	|||				<u>4</u>
C - Incorrect					<u>-</u>
ERC Not Advised	///	///	///	||	<u>17</u>
Equipment Not Recognized	|				<u>1</u>
Total Above Responses					<u>88</u>

Consultation Response Worksheet

Branch: ADA
 TOE: 44178600
 Unit Name: ADA BTRY MINE

Consultation Response	Mark slash (/) each time condition generated by consultation (collect slashes in groups of 5, separated by commas)				Total Slashes
A - Correct	///	|||			<u>9</u>
B - Correct	///	///	///		<u>15</u>
C - Correct	///	|			<u>6</u>
A - Incorrect	||				<u>2</u>
B - Incorrect					<u>-</u>
C - Incorrect					<u>-</u>
ERC Not Advised	///				<u>7</u>
Equipment Not Recognized					<u>-</u>
Total Above Responses					<u>39</u>

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TCE Worksheet					
Branch: <u>AVL</u>					
TCE: <u>019334200</u>					
Unit Name: <u>AVN Co (AVIM) 2 AH-64, HV. Div</u>					
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)				Total Slashes
A - Correct	/// /// ///	/// /// ///	/// /// ///	/// /// ///	<u>42</u>
B - Correct	/// /// ///	/// /// ///	/// /// ///	/// /// ///	<u>25</u>
C - Correct	///	///	///	///	<u>3</u>
A - Incorrect	/	///	///	///	<u>1</u>
B - Incorrect	/	///	///	///	<u>1</u>
C - Incorrect	///	///	///	///	<u>0</u>
LOGIC Not Advised	/// ///	///	///	///	<u>5</u>
Equipment Not Recognized	///	///	///	///	<u>0</u>
Total of Above Responses					<u>85</u>

TOE Worksheet		
Branch: <u>CML</u>		
TOE: <u>031576000</u>		
Unit Name: <u>CML Co, MVY DIV</u>		
Consultation Response	Mark slash (/) each time condition generated by consultation (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	///	<u>3</u>
B - Correct	### /### /### /###	<u>28</u>
C - Correct	### /	<u>6</u>
A - Incorrect	///	<u>4</u>
B - Incorrect		—
C - Incorrect		—
ERC Not Advised		—
Equipment Not Recognized		—
Total of Above Responses		<u>41</u>

TOE Worksheet		
Branch: <u>CML</u>		
TOE: <u>034276000</u>		
Unit Name: <u>NBC RECON CO</u>		
Consultation Response	Mark slash (/) each time condition generated by consultation (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	/	<u>1</u>
B - Correct	### /### /### /###	<u>20</u>
C - Correct	///	<u>4</u>
A - Incorrect		—
B - Incorrect		—
C - Incorrect		—
ERC Not Advised		—
Equipment Not Recognized		—
Total of Above Responses		<u>25</u>

TOE Worksheet		
Branch: <u>CML</u>		
TOE: <u>034576000</u>		
Unit Name: <u>CML CO (SMOKE/RECON)</u>		
Consultation Response	Mark slash (/) each time condition generated by consultation (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	### /	<u>6</u>
B - Correct	### /### /### /### /###	<u>19</u>
C - Correct	### /	<u>7</u>
A - Incorrect	///	<u>3</u>
B - Incorrect		—
C - Incorrect		—
ERC Not Advised		—
Equipment Not Recognized		—
Total of Above Responses		<u>35</u>

TOE Worksheet		
Branch: <u>CML</u>		
TOE: <u>034766000</u>		
Unit Name: <u>HAD CHEMICAL BN</u>		
Consultation Response	Mark slash (/) each time condition generated by consultation (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct		—
B - Correct	### /### /### /### /###	<u>26</u>
C - Correct	### /	<u>6</u>
A - Incorrect		—
B - Incorrect	/	<u>1</u>
C - Incorrect		—
ERC Not Advised		—
Equipment Not Recognized		—
Total of Above Responses		<u>33</u>

TOE Worksheet		
Branch: <u>CAC</u>		
TOE: <u>52413L000</u>		
Unit Name: <u>CORPS SPT GROUP RAOC</u>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	| : : : : :	<u>1</u>
B - Correct	|||| : : : : :	<u>5</u>
C - Correct	| : : : : :	<u>1</u>
A - Incorrect	|| : : : : :	<u>2</u>
B - Incorrect	| : : : : :	<u>1</u>
C - Incorrect	: : : : :	<u>—</u>
ERC Not Advised	|| : : : : :	<u>2</u>
Equipment Not Recognized	|||| : : : : :	<u>4</u>
Total of Above Responses		<u>16</u>

TOE Worksheet		
Branch: <u>CAC</u>		
TOE: <u>67042L000</u>		
Unit Name: <u>HHC, AIR ASSAULT BRIGADE</u>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	|||| | : : : : :	<u>13</u>
B - Correct	|||| : : : : :	<u>10</u>
C - Correct	|||| : : : : :	<u>9</u>
A - Incorrect	|| : : : : :	<u>3</u>
B - Incorrect	|||| : : : : :	<u>8</u>
C - Incorrect	| : : : : :	<u>1</u>
ERC Not Advised	|| : : : : :	<u>3</u>
Equipment Not Recognized	|||| : : : : :	<u>9</u>
Total of Above Responses		<u>56</u>

TOE Worksheet		
Branch: <u>CAC</u>		
TOE: <u>77004L000</u>		
Unit Name: <u>HHC LIGHT INFANTRY DIVISION</u>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	|||| | : : : : :	<u>13</u>
B - Correct	|||| : : : : :	<u>9</u>
C - Correct	|||| : : : : :	<u>7</u>
A - Incorrect	|| : : : : :	<u>3</u>
B - Incorrect	|||| : : : : :	<u>7</u>
C - Incorrect	| : : : : :	<u>1</u>
ERC Not Advised	|||| : : : : :	<u>11</u>
Equipment Not Recognized	|||| : : : : :	<u>7</u>
Total of Above Responses		<u>58</u>

TOE Worksheet		
Branch: <u>CAC</u>		
TOE: <u>B7042L100</u>		
Unit Name: <u>HHC, HVT DIV BDE (ARMOR)</u>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	: : : : :	<u>—</u>
B - Correct	|||| : : : : :	<u>14</u>
C - Correct	|||| : : : : :	<u>5</u>
A - Incorrect	|| : : : : :	<u>5</u>
B - Incorrect	|||| : : : : :	<u>8</u>
C - Incorrect	: : : : :	<u>—</u>
ERC Not Advised	|||| : : : : :	<u>10</u>
Equipment Not Recognized	|| : : : : :	<u>3</u>
Total of Above Responses		<u>45</u>

TOE Worksheet		
Branch: <u>ENG</u>		
TOE: <u>050374500</u>		
Unit Name: <u>EMER CAT CO, CORES</u>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	TM, TM, , IIII TM, TM	<u>21</u>
B - Correct	TM, TM, TM, I	<u>16</u>
C - Correct	IIII	<u>4</u>
A - Incorrect		<u>—</u>
B - Incorrect		<u>—</u>
C - Incorrect		<u>—</u>
ERC Not Advised	II	<u>2</u>
Equipment Not Recognized	I	<u>1</u>
Total of Above Responses		<u>47</u>

TOE Worksheet		
Branch: <u>ENG</u>		
TOE: <u>051471000</u>		
Unit Name: <u>EMER CO, EMER BELL HLY DIV</u>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	TM TM IIII	<u>14</u>
B - Correct	TM, TM, IIII TM, TM	<u>24</u>
C - Correct	IIII	<u>4</u>
A - Incorrect		<u>—</u>
B - Incorrect		<u>—</u>
C - Incorrect		<u>—</u>
ERC Not Advised	IIII	<u>4</u>
Equipment Not Recognized	TM I	<u>6</u>
Total of Above Responses		<u>52</u>

TOE Worksheet		
Branch: <u>ENG</u>		
TOE: <u>054131000</u>		
Unit Name: <u>EMER CO, CONST SUPPORT</u>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	III	<u>3</u>
B - Correct	TM, TM, TM, TM, TM, TM	<u>30</u>
C - Correct	II	<u>2</u>
A - Incorrect	IIII	<u>4</u>
B - Incorrect		<u>—</u>
C - Incorrect		<u>—</u>
ERC Not Advised	IIII	<u>4</u>
Equipment Not Recognized	TM, TM IIII	<u>14</u>
Total of Above Responses		<u>57</u>

TOE Worksheet		
Branch: <u>ENG</u>		
TOE: <u>054931000</u>		
Unit Name:		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	TM, III	<u>5</u>
B - Correct	TM, TM TM, III	<u>12</u>
C - Correct	III	<u>3</u>
A - Incorrect	III	<u>3</u>
B - Incorrect	I	<u>1</u>
C - Incorrect		<u>—</u>
ERC Not Advised	II	<u>2</u>
Equipment Not Recognized	TM	<u>5</u>
Total of Above Responses		<u>40</u>

TOE Worksheet		
Branch: Field Artillery		
TOE: 06369000		
Unit Name: Svc Btry, FA Bn, 155mm SP, Bvy Div		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	||||	<u>4</u>
B - Correct	|||||, |||||, |||||, |||||, |||||, |||||, |||||, |||||, |||||, |||||	<u>28</u>
C - Correct	|||||, //	<u>7</u>
A - Incorrect	//	<u>2</u>
B - Incorrect	|||	<u>3</u>
C - Incorrect	|	<u>1</u>
ERC Not Advised	|||	<u>3</u>
Equipment Not Recognized		<u>0</u>
Total of Above Responses		<u>48</u>

TOE Worksheet		
Branch: Field Artillery		
TOE: 06367000		
Unit Name: FA Btry, FA Bn, 155mm SP, Bvy Div		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	|||||, //	<u>7</u>
B - Correct	|||||, |||||, //	<u>12</u>
C - Correct	//	<u>2</u>
A - Incorrect	|	<u>1</u>
B - Incorrect	//	<u>2</u>
C - Incorrect		<u>0</u>
ERC Not Advised	||||	<u>4</u>
Equipment Not Recognized	//	<u>2</u>
Total of Above Responses		<u>30</u>

TOE Worksheet		
Branch: Field Artillery		
TOE: 06368200		
Unit Name: SSB, FA Bn, 155mm SP, Bvy Div		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	|||||, |||||, |||||, |||||, |	<u>21</u>
B - Correct	|||||, |||||, |||||	<u>14</u>
C - Correct	|||||, //	<u>2</u>
A - Incorrect		<u>0</u>
B - Incorrect	|	<u>1</u>
C - Incorrect		<u>0</u>
ERC Not Advised	|||||, |||||	<u>9</u>
Equipment Not Recognized	//	<u>2</u>
Total of Above Responses		<u>59</u>

TOE Worksheet		
Branch: Field Artillery		
TOE: 06303000		
Unit Name: Tgt Acq Btry, Bvy Div		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	|||||, |||||, |||||	<u>14</u>
B - Correct	|||||, |||||, |||||, |||||, |||||, |||||, |||||, |||||, |||||, |||||	<u>28</u>
C - Correct	|||||, |||||, |||||	<u>13</u>
A - Incorrect	||||	<u>4</u>
B - Incorrect	|||	<u>4</u>
C - Incorrect		<u>0</u>
ERC Not Advised	|||||, |||||, |||||, |||||, |||||, |||||, |||||, |||||, |||||, |||||	<u>16</u>
Equipment Not Recognized	||||	<u>4</u>
Total of Above Responses		<u>83</u>

TOE Worksheet		
Branch: INF		
TOE: 073122000		
Unit Name: 442 INF BN MTN		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	/// , /// , /// , /// ,	18
B - Correct	/// , /// , /// , /// , /// ,	42
C - Correct	/// , /// , /// , /// ,	22
A - Incorrect	/	1
B - Incorrect	/	1
C - Incorrect		0
ERC Not Advised	/// , /// , /// , /// ,	19
Equipment Not Recognized	///	5
Total of Above Responses		108

TOE Worksheet		
Branch: INF		
TOE: 073174000		
Unit Name: Rifle Co INF BN MTN		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	///	4
B - Correct	/// , ///	12
C - Correct		0
A - Incorrect	/	1
B - Incorrect		0
C - Incorrect		0
ERC Not Advised	///	2
Equipment Not Recognized		0
Total of Above Responses		15

TOE Worksheet		
Branch: INF		
TOE: 072481000		
Unit Name: Rifle Co INF BN MTN		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	/// , /	6
B - Correct	/// , /	6
C - Correct	///	3
A - Incorrect	/	1
B - Incorrect		0
C - Incorrect		0
ERC Not Advised	///	2
Equipment Not Recognized	///	2
Total of Above Responses		21

TOE Worksheet		
Branch: INF		
TOE: 072476000		
Unit Name: Rifle Co INF BN MTN		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	/// , /// ,	9
B - Correct	/// , /// ,	2
C - Correct	/// , ///	9
A - Incorrect	/	1
B - Incorrect	/	1
C - Incorrect		0
ERC Not Advised	///	4
Equipment Not Recognized	///	2
Total of Above Responses		29

TOE Worksheet		
Branch: ICS		
TOE: 34277L000		
Unit Name: COLL & JAM CO MI BN AASLT DIV		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	//// ; // ; // ; // ;	12
B - Correct	//// ; // ; // ; // ;	12
C - Correct	//// ; // ; // ; // ;	5
A - Incorrect	;	
B - Incorrect	;	
C - Incorrect	;	
ERC Not Advised	///	3
Equipment Not Recognized	/	1
Total of Above Responses		24

TOE Worksheet		
Branch: ICS		
TOE: 34207L000		
Unit Name: OPS CO OPS BN MI BDE		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	//// ; // ; // ; // ;	7
B - Correct	//// ; // ; // ; // ;	29
C - Correct	//// ; // ; // ; // ;	12
A - Incorrect	;	
B - Incorrect	;	
C - Incorrect	;	
ERC Not Advised	;	
Equipment Not Recognized	//	2
Total of Above Responses		48

TOE Worksheet		
Branch: ICS		
TOE: 34227L000		
Unit Name: CI-INTG CO TEB CORPS		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	//// ; // ; // ; // ;	12
B - Correct	//// ; // ; // ; // ;	18
C - Correct	//// ; // ; // ; // ;	4
A - Incorrect	;	
B - Incorrect	;	
C - Incorrect	;	
ERC Not Advised	////	4
Equipment Not Recognized	/	1
Total of Above Responses		39

TOE Worksheet		
Branch: ICS		
TOE: 34288L000		
Unit Name: INTEL & SURVL CO MI BN HVB DIV		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	///	3
B - Correct	//// ; // ; // ; // ;	15
C - Correct	///	3
A - Incorrect	;	
B - Incorrect	;	
C - Incorrect	;	
ERC Not Advised	//	2
Equipment Not Recognized	;	
Total of Above Responses		23

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TOE Worksheet		
Branch: <u>ISC</u>		
TOE: <u>11875000</u>		
Unit Name: <u>SIGNAL SUPPORT COMPANY (A)</u>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	||||| , ||||| , ||||| , ||||| ,	<u>21</u>
B - Correct	||||| , ||||| , ||||| , ||||| ,	<u>25</u>
C - Correct	||||| , ||||| ,	<u>11</u>
A - Incorrect	|	<u>1</u>
B - Incorrect	||	<u>2</u>
C - Incorrect		<u>—</u>
ERC Not Advised	||||| , ||	<u>7</u>
Equipment Not Recognized		<u>—</u>
Total of Above Responses		<u>67</u>

TOE Worksheet		
Branch: <u>ISC</u>		
TOE: <u>11895000</u>		
Unit Name: <u>MINOR SUPPORT COMPANY</u>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	||||| , ||||| ,	<u>9</u>
B - Correct	||||| , ||||| , ||||| ,	<u>14</u>
C - Correct	|||	<u>3</u>
A - Incorrect		<u>—</u>
B - Incorrect	||	<u>2</u>
C - Incorrect		<u>—</u>
ERC Not Advised	|||||	<u>5</u>
Equipment Not Recognized		<u>—</u>
Total of Above Responses		<u>33</u>

TOE Worksheet		
Branch: <u>ISC</u>		
TOE: <u>11625000</u>		
Unit Name: <u>STRATEGIC SIG BDE HHC</u>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct		<u>—</u>
B - Correct	|||	<u>3</u>
C - Correct	|||	<u>3</u>
A - Incorrect		<u>—</u>
B - Incorrect		<u>—</u>
C - Incorrect		<u>—</u>
ERC Not Advised		<u>—</u>
Equipment Not Recognized		<u>—</u>
Total of Above Responses		<u>6</u>

TOE Worksheet		
Branch: <u>lge</u>		
TOE: <u>632064000</u>		
Unit Name: <u>HFD, FWD, SPT, BN, HVYD, D</u>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	/	<u>1</u>
B - Correct	/, /, /, /, /	<u>26</u>
C - Correct	/, /	<u>6</u>
A - Incorrect		<u>—</u>
B - Incorrect		<u>—</u>
C - Incorrect		<u>—</u>
ERC Not Advised		<u>—</u>
Equipment Not Recognized		<u>—</u>
Total of Above Responses		<u>33</u>

TOE Worksheet		
Branch: <u>LGC</u>		
TOE: <u>63264000</u>		
Unit Name: <u>H, RT, K, NT, B, ID (MT2)</u>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	/, /, /	<u>13</u>
B - Correct	/, /, /, /, /, /, /	<u>51</u>
C - Correct	/, /, /, /, /	<u>9</u>
A - Incorrect	/	<u>1</u>
B - Incorrect	/	<u>4</u>
C - Incorrect		<u>—</u>
P-Incorrect	/	<u>1</u>
ERC Not Advised	/	<u>5</u>
Equipment Not Recognized	/, /, /	<u>4</u>
Total of Above Responses		<u>89</u>

TOE Worksheet		
Branch: <u>lge</u>		
TOE: <u>630026000</u>		
Unit Name: <u>H, C, H, M, L, S, P, T, C, M, D, H, V, Y, D, J</u>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	/, /, /	<u>5</u>
B - Correct	/, /, /, /, /, /, /, /, /, /, /, /, /, /, /	<u>33</u>
C - Correct	/, /, /, /	<u>12</u>
A - Incorrect	/	<u>1</u>
B - Incorrect		<u>—</u>
C - Incorrect	/	<u>1</u>
ERC Not Advised	/, /, /	<u>3</u>
Equipment Not Recognized	/	<u>1</u>
Total of Above Responses		<u>76</u>

TOE Worksheet		
Branch: <u>lge</u>		
TOE: <u>638664000</u>		
Unit Name: <u>H, M, T, S, P, T, S, O, D, N, A, C, R</u>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	/, /, /, /	<u>4</u>
B - Correct	/, /, /, /, /, /, /, /, /, /, /, /, /, /, /	<u>43</u>
C - Correct	/, /, /, /	<u>4</u>
A - Incorrect		<u>—</u>
B - Incorrect	/	<u>1</u>
C - Incorrect		<u>—</u>
ERC Not Advised	/, /, /, /	<u>9</u>
Equipment Not Recognized	/, /, /, /	<u>4</u>
Total of Above Responses		<u>64</u>

TOE Worksheet		
Branch: <i>MMC (USAOMMCS, Pol-tano Arsenal AL)</i>		
TOE: <i>09527LA00</i>		
Unit Name: <i>EOD CONTROL TEAM</i>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	/	<u>1</u> (6)
B - Correct	///	<u>5</u> (10)
C - Correct	//	<u>2</u> (3)
A - Incorrect		—
B - Incorrect		— (7)
C - Incorrect		—
ERC Not Advised	///	<u>6</u> (11)
Equipment Not Recognized	//	<u>2</u> (11)
Total of Above Responses		<u>16</u>

TOE Worksheet		
Branch: <i>MMC (USAOMMCS Pol-tano Arsenal AL)</i>		
TOE: <i>09527L000</i>		
Unit Name: <i>EOD Detachment</i>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	////	<u>4</u>
B - Correct	///	<u>6</u>
C - Correct	/	<u>1</u>
A - Incorrect		—
B - Incorrect	///	<u>6</u>
C - Incorrect		—
ERC Not Advised	///	<u>3</u>
Equipment Not Recognized	///	<u>5</u>
Total of Above Responses		<u>25</u>

TOE Worksheet		
Branch: <i>MMC (USAOMMCS Redstone Arsenal AL)</i>		
TOE: <i>09527L000</i>		
Unit Name: <i>AUG EOD Response TEAM</i>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	/	<u>1</u>
B - Correct	///	<u>3</u>
C - Correct		—
A - Incorrect		—
B - Incorrect	//	<u>2</u>
C - Incorrect		—
ERC Not Advised	//	<u>2</u>
Equipment Not Recognized	////	<u>4</u>
Total of Above Responses		<u>12</u>

TOE Worksheet		
Branch: <i>MMC (USAOMMCS Redstone Arsenal AL)</i>		
TOE: <i>09428L000</i>		
Unit Name: <i>ORO CO Ammo, Canv, GS</i>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	///	<u>11</u>
B - Correct	///	<u>18</u>
C - Correct	/	<u>1</u>
A - Incorrect	/	<u>1</u>
B - Incorrect	////	<u>4</u>
C - Incorrect		—
ERC Not Advised	///	<u>5</u>
Equipment Not Recognized	////	<u>4</u>
Total of Above Responses		<u>44</u>

TOE Worksheet		
Branch: <i>MMG (USAMMS Redstone Arsenal AL)</i>		
TOE: <i>09007L000</i>		
Unit Name: <i>ORD ASL SPT Co. INF DIV</i>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	<i>///</i> <i>////</i> : : : :	<u>7</u>
B - Correct	<i>///</i> <i>///</i> : : : : <i>///</i> : : : :	<u>20</u>
C - Correct	<i>///</i> <i>1</i> : : : : :	<u>6</u>
A - Incorrect	: : : : :	—
B - Incorrect	: : : : :	—
C - Incorrect	: : : : :	—
ERC Not Advised	<i>///</i> <i>1</i> : : : : :	<u>6</u>
Equipment Not Recognized	: : : : :	—
Total of Above Responses		<u>44</u>

TOE Worksheet		
Branch: <i>Military Police (mp)</i>		
TOE: <i>19172000</i>		
Unit Name: <i>44C MP BDE</i>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	////// , //// , //// , //	<u>18</u>
B - Correct	////// , //// , //// , //	<u>17</u>
C - Correct	//	<u>3</u>
A - Incorrect		<u>—</u>
B - Incorrect		<u>—</u>
C - Incorrect		<u>—</u>
ERC Not Advised	////// , ////	<u>10</u>
Equipment Not Recognized		<u>—</u>
Total of Above Responses		<u>48</u>

TOE Worksheet		
Branch: <i>Military Police (mp)</i>		
TOE: <i>19177000</i>		
Unit Name: <i>MP Combat Support Co</i>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	////// , //// , ////	<u>14</u>
B - Correct	////// , //// , //// , //	<u>17</u>
C - Correct	//	<u>2</u>
A - Incorrect		<u>—</u>
B - Incorrect	///	<u>3</u>
C - Incorrect		<u>—</u>
ERC Not Advised	//	<u>2</u>
Equipment Not Recognized	/	<u>1</u>
Total of Above Responses		<u>39</u>

TOE Worksheet		
Branch: <i>Military Police (mp)</i>		
TOE: <i>19333000</i>		
Unit Name: <i>MP Co 44th Div</i>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	////// , //// , ////	<u>15</u>
B - Correct	////// , //// , //// , //// , ////	<u>24</u>
C - Correct	//	<u>2</u>
A - Incorrect		<u>—</u>
B - Incorrect	///	<u>3</u>
C - Incorrect		<u>—</u>
ERC Not Advised	/	<u>1</u>
Equipment Not Recognized		<u>—</u>
Total of Above Responses		<u>45</u>

TOE Worksheet		
Branch: <i>Military Police (mp)</i>		
TOE: <i>19647000</i>		
Unit Name: <i>MP Escort Guard Co</i>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	////// , /	<u>6</u>
B - Correct	////// , ////	<u>9</u>
C - Correct	//	<u>2</u>
A - Incorrect		<u>—</u>
B - Incorrect	/	<u>1</u>
C - Incorrect		<u>—</u>
ERC Not Advised	/	<u>1</u>
Equipment Not Recognized		<u>—</u>
Total of Above Responses		<u>19</u>

TOE Worksheet		
Branch: <u>ORDNANCE</u>		
TOE: <u>430071000</u>		
Unit Name: <u>LIGHT MAINT Co. WY. DIV.</u>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct		<u>37</u>
B - Correct		<u>37</u>
C - Correct		<u>8</u>
A - Incorrect		<u>0</u>
B - Incorrect		<u>0</u>
C - Incorrect		<u>1</u>
ERC Not Advised		<u>7</u>
Equipment Not Recognized		<u>1</u>
Total of Above Responses		<u>91</u>

TOE Worksheet		
Branch: <u>ORDNANCE</u>		
TOE: <u>432091000</u>		
Unit Name: <u>NON-DIV. MAINT Co.</u>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct		<u>44</u>
B - Correct		<u>30</u>
C - Correct		<u>4</u>
A - Incorrect		<u>2</u>
B - Incorrect		<u>3</u>
C - Incorrect		<u>0</u>
ERC Not Advised		<u>9</u>
Equipment Not Recognized		<u>0</u>
Total of Above Responses		<u>92</u>

TOE Worksheet		
Branch: <u>ORDNANCE</u>		
TOE: <u>430091000</u>		
Unit Name: <u>FWD SUP MAINT Co. WY. DIV.</u>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct		<u>31</u>
B - Correct		<u>35</u>
C - Correct		<u>6</u>
A - Incorrect		<u>2</u>
B - Incorrect		<u>2</u>
C - Incorrect		<u>0</u>
ERC Not Advised		<u>14</u>
Equipment Not Recognized		<u>1</u>
Total of Above Responses		<u>91</u>

TOE Worksheet		
Branch: <u>ORDNANCE</u>		
TOE: <u>430081000</u>		
Unit Name: <u>HEAVY MAINT Co. WY. DIV.</u>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct		<u>23</u>
B - Correct		<u>36</u>
C - Correct		<u>6</u>
A - Incorrect		<u>0</u>
B - Incorrect		<u>2</u>
C - Incorrect		<u>0</u>
ERC Not Advised		<u>8</u>
Equipment Not Recognized		<u>0</u>
Total of Above Responses		<u>75</u>

TOE Worksheet			
Branch: <u>QMS</u>			
TOE: <u>42418L000</u>			
Unit Name: <u>SUPPLY COMPANY GS</u> page			
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes	
A - Correct	|| . . . . .	<u>3</u>	
B - Correct	|||| . . . . .	<u>10</u>	
C - Correct	||| . . . . .	<u>3</u>	
A - Incorrect	| . . . . .	<u>1</u>	
B - Incorrect	|||| . . . . .	<u>5</u>	
C - Incorrect	| . . . . .	<u>1</u>	
ERC Not Advised	|||| . . . . .	<u>8</u>	
Equipment Not Recognized	|||| . . . . .	<u>5</u>	
Total of Above Responses		<u>35</u>	

TOE Worksheet			
Branch: <u>QMS</u>			
TOE: <u>42007L100</u>			
Unit Name: <u>S&S Co. MAIN SPT BN Hvy DIV</u> page			
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes	
A - Correct	|||| . . . . .	<u>12</u>	
B - Correct	|||| . . . . .	<u>25</u>	
C - Correct	<u>0</u>	
A - Incorrect	|||| . . . . .	<u>5</u>	
B - Incorrect	|||| . . . . .	<u>4</u>	
C - Incorrect	<u>1</u>	
ERC Not Advised	|||| . . . . .	<u>4</u>	
Equipment Not Recognized	|||| . . . . .	<u>4</u>	
Total of Above Responses		<u>60</u>	

TOE Worksheet			
Branch: <u>QMS</u>			
TOE: <u>42004L100</u>			
Unit Name: <u>SUP Co FWD SPT BN Hvy DIV</u> page			
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes	
A - Correct	|||| . . . . .	<u>6</u>	
B - Correct	|||| . . . . .	<u>26</u>	
C - Correct	||| . . . . .	<u>3</u>	
A - Incorrect	||| . . . . .	<u>3</u>	
B - Incorrect	|| . . . . .	<u>2</u>	
C - Incorrect	<u>0</u>	
ERC Not Advised	<u>0</u>	
Equipment Not Recognized	|| . . . . .	<u>2</u>	
Total of Above Responses		<u>42</u>	

TOE Worksheet			
Branch: <u>QMS</u>			
TOE: <u>10468L000</u>			
Unit Name: <u>WATER SUPPLY Co</u> page			
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes	
A - Correct	|||| . . . . .	<u>5</u>	
B - Correct	|||| . . . . .	<u>26</u>	
C - Correct	|||| . . . . .	<u>5</u>	
A - Incorrect	|||| . . . . .	<u>4</u>	
B - Incorrect	| . . . . .	<u>1</u>	
C - Incorrect	<u>0</u>	
ERC Not Advised	<u>0</u>	
Equipment Not Recognized	||| . . . . .	<u>3</u>	
Total of Above Responses		<u>44</u>	

TOE Worksheet		
Branch: <u>SIG</u>		
TOE: <u>11603L100</u>		
Unit Name: <u>SIG TAC SPT LDM CO</u>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	LMT / : : : :	<u>6</u>
B - Correct	LMT LMT LMT / LMT LMT // : : : :	<u>32</u>
C - Correct	LMT : : : :	<u>5</u>
A - Incorrect	/ : : : :	<u>1</u>
B - Incorrect	// : : : :	<u>2</u>
C - Incorrect	: : : :	<u>0</u>
ERC Not Advised	//// : : : :	<u>4</u>
Equipment Not Recognized	// : : : :	<u>2</u>
Total of Above Responses		<u>47</u>

TOE Worksheet		
Branch: <u>SIG</u>		
TOE: <u>11417L200</u>		
Unit Name: <u>AREA CO CORPS AREA SIG BN</u>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	LMT LMT LMT / LMT : : : :	<u>20</u>
B - Correct	LMT LMT LMT / LMT LMT LMT : : : :	<u>30</u>
C - Correct	LMT LMT // : : : :	<u>12</u>
A - Incorrect	/ : : : :	<u>1</u>
B - Incorrect	: : : :	<u>0</u>
C - Incorrect	: : : :	<u>0</u>
ERC Not Advised	LMT / : : : :	<u>6</u>
Equipment Not Recognized	/// : : : :	<u>3</u>
Total of Above Responses		<u>72</u>

TOE Worksheet		
Branch: <u>SIG</u>		
TOE: <u>11208L000</u>		
Unit Name: <u>SIG SPT CO (AIR ASLT)</u>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	LMT LMT LMT / LMT LMT : : : :	<u>24</u>
B - Correct	LMT LMT : : : :	<u>12</u>
C - Correct	/ : : : :	<u>1</u>
A - Incorrect	// : : : :	<u>2</u>
B - Incorrect	: : : :	<u>0</u>
C - Incorrect	: : : :	<u>0</u>
ERC Not Advised	LMT // : : : :	<u>7</u>
Equipment Not Recognized	LMT : : : :	<u>5</u>
Total of Above Responses		<u>49</u>

TOE Worksheet		
Branch: <u>SIG</u>		
TOE: <u>11067L000</u>		
Unit Name: <u>AREA SIG CO, MSE</u>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	LMT LMT // : : : :	<u>13</u>
B - Correct	LMT LMT // : : : :	<u>12</u>
C - Correct	/// : : : :	<u>3</u>
A - Incorrect	LMT : : : :	<u>5</u>
B - Incorrect	: : : :	<u>0</u>
C - Incorrect	: : : :	<u>0</u>
ERC Not Advised	LMT : : : :	<u>5</u>
Equipment Not Recognized	/ : : : :	<u>1</u>
Total of Above Responses		<u>29</u>

TOE Worksheet		
Branch: <u>SOF</u>		
TOE: <u>31803L000</u>		
Unit Name: <u>Support Co SFGA</u>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	/// // // //	<u>25</u>
B - Correct	/// // // // //	<u>36</u>
C - Correct	/// //	<u>10</u>
A - Incorrect	/// 1	<u>6</u>
B - Incorrect		—
C - Incorrect		—
ERC Not Advised	///	<u>5</u>
Equipment Not Recognized	1	<u>1</u>
Total of Above Responses		<u>94</u>

TOE Worksheet		
Branch: <u>SOF</u>		
TOE: <u>31806L000</u>		
Unit Name: <u>HQ SFBN C-DET</u>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	////	<u>4</u>
B - Correct	//	<u>2</u>
C - Correct	///	<u>3</u>
A - Incorrect	//	<u>2</u>
B - Incorrect		—
C - Incorrect		—
ERC Not Advised		—
Equipment Not Recognized		—
Total of Above Responses		<u>11</u>

TOE Worksheet		
Branch: <u>SOF</u>		
TOE: <u>31807L000</u>		
Unit Name: <u>SF CO SFGA</u>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	/// // // // //	<u>19</u>
B - Correct	/// //	<u>7</u>
C - Correct		—
A - Incorrect	/// 1	<u>6</u>
B - Incorrect		—
C - Incorrect		—
ERC Not Advised		—
Equipment Not Recognized		—
Total of Above Responses		<u>32</u>

TOE Worksheet		
Branch: <u>SOF</u>		
TOE: <u>31701L000</u>		
Unit Name: <u>HHC SO CMD</u>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	/// //	<u>10</u>
B - Correct	/// // //	<u>12</u>
C - Correct	/// // 1	<u>11</u>
A - Incorrect	///	<u>3</u>
B - Incorrect	///	<u>5</u>
C - Incorrect		—
ERC Not Advised	/// //	<u>8</u>
Equipment Not Recognized		—
Total of Above Responses		<u>49</u>

TOE Worksheet		
Branch: SSC		
TOE: 45413000		
Unit Name: PERS. PUB. & ...		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	11	2
B - Correct	1111	6
C - Correct		
A - Incorrect		
B - Incorrect		
C - Incorrect		
ERC Not Advised	1111	6
Equipment Not Recognized		
Total of Above Responses		14

TOE Worksheet		
Branch: SSC		
TOE: 14412000		
Unit Name: ...		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct		
B - Correct	1111 1111 1111111	19
C - Correct		
A - Incorrect		
B - Incorrect		
C - Incorrect		
ERC Not Advised		
Equipment Not Recognized		
Total of Above Responses		19

TOE Worksheet		
Branch: SSC		
TOE: 12402000		
Unit Name: PERSANEL GROUP		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct		
B - Correct	1111 1111 1111111	18
C - Correct	111	3
A - Incorrect		
B - Incorrect		
C - Incorrect		
ERC Not Advised		
Equipment Not Recognized		
Total of Above Responses		21

TOE Worksheet		
Branch: SSC		
TOE: 14213000		
Unit Name: GEN SPT Postal Company		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct		
B - Correct	1111	4
C - Correct	1	1
A - Incorrect		
B - Incorrect		
C - Incorrect		
ERC Not Advised	11	2
Equipment Not Recognized		
Total of Above Responses		7

TOE Worksheet		
Branch: <u>TRANSPORTATION</u>		
TOE: <u>557194100</u>		
Unit Name: <u>TRANS LT-MED TRUCK CO</u>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	: : : : :	—
B - Correct	////// : : : : : //	<u>19</u>
C - Correct	////	<u>6</u>
A - Incorrect	: : : : :	—
B - Incorrect	: : : : :	—
C - Incorrect	: : : : :	—
ERC Not Advised	// : : : : :	<u>2</u>
Equipment Not Recognized	// : : : : :	<u>2</u>
Total of Above Responses		<u>29</u>

TOE Worksheet		
Branch: <u>TRANSPORTATION</u>		
TOE: <u>551784000</u>		
Unit Name: <u>TMT Co. SET BN, LT. ERF DIV</u>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	: : : : :	—
B - Correct	//////	<u>10</u>
C - Correct	////	<u>4</u>
A - Incorrect	: : : : :	—
B - Incorrect	: : : : :	—
C - Incorrect	: : : : :	—
ERC Not Advised	// : : : : :	<u>2</u>
Equipment Not Recognized	: : : : :	—
Total of Above Responses		<u>16</u>

TOE Worksheet		
Branch: <u>TRANSPORTATION</u>		
TOE: <u>558194000</u>		
Unit Name: <u>TRANS TERM SVC CO, BK B/LK</u>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	: : : : :	—
B - Correct	////// ////	<u>16</u>
C - Correct	//	<u>2</u>
A - Incorrect	//	<u>5</u>
B - Incorrect	: : : : :	—
C - Incorrect	: : : : :	—
ERC Not Advised	// : : : : :	<u>5</u>
Equipment Not Recognized	/ : : : : :	<u>1</u>
Total of Above Responses		<u>19</u>

TOE Worksheet		
Branch: <u>TRANSPORTATION</u>		
TOE: <u>556036000</u>		
Unit Name: <u>TRANS MOVEMENT CONTROL AGENCY</u>		
Consultation Response	Mark slash corresponding to response in each annotated notice (collect slashes in groups of 5, separated by commas)	Total Slashes
A - Correct	: : : : :	—
B - Correct	////	<u>6</u>
C - Correct	////	<u>3</u>
A - Incorrect	/	<u>1</u>
B - Incorrect	/	<u>1</u>
C - Incorrect	: : : : :	—
ERC Not Advised	/ : : : : :	<u>1</u>
Equipment Not Recognized	// : : : : :	<u>2</u>
Total of Above Responses		<u>14</u>

APPENDIX K
EQUIPMENT USE CLASSIFICATION

K-1. INTRODUCTION. This appendix describes the manner in which the uses of equipment in an Army unit are distinguished and specified in the conclusion part of the ERC assignment rules. The concept and initial statement of the use classifications was developed as part of the work on the prototype expert system (Reference 5) which preceded the present effort.

K-2. USE CLASSIFICATION. The equipment use classification appears in the conclusion part ("then" part) of each rule as shown in Figure K-1. It may be assigned by either the rule developer or system manager.

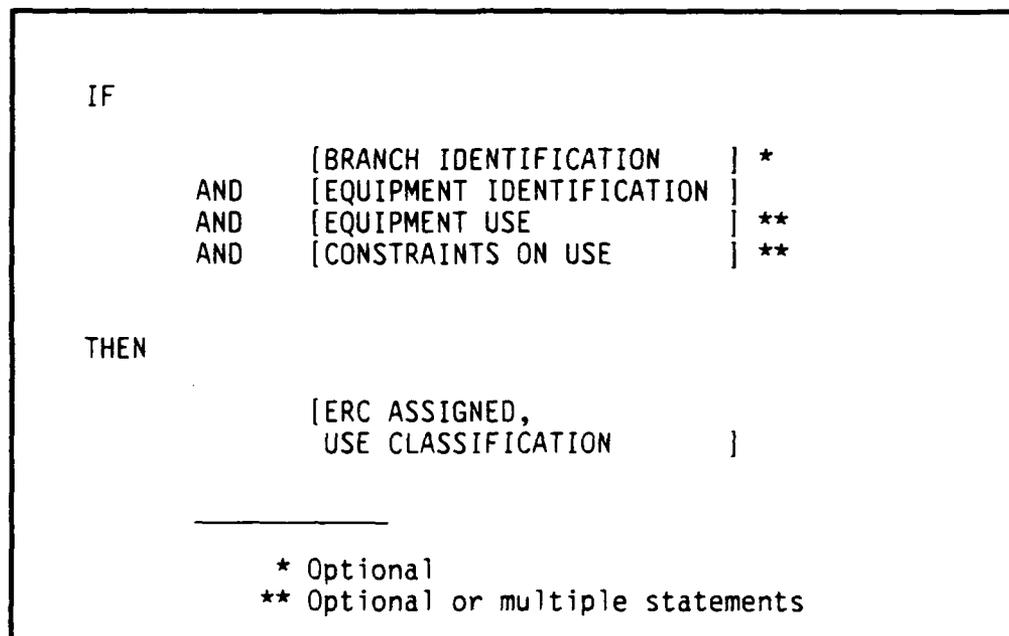


Figure K-1. Rule Structure

K-3. USE CLASSIFICATION SCHEMA. Equipment use, within the Army, is currently defined in terms of broad categories for major items of equipment. Three such categories are defined as follows (Reference 4):

- Component major items
- Associated support items of equipment
- Organization support equipment

These categories focus on the equipment by name (i.e., as commodities); they do not describe the nature of the support in any functional way. In order to distinguish among the essentiality of equipments, it is necessary to

establish the nature of the support. It is then possible to assess that some types of support are more immediate to the the performance of the unit mission than others. A schema identifying the various types of support was developed as part of the prior study (Reference 5), which examined the feasibility of applying expert system technology to the task of ERC assignment. The equipment classification schema developed in this study is shown in Figure K-2. The definitions of the types of equipment appearing in the schema are shown in Table K-1.

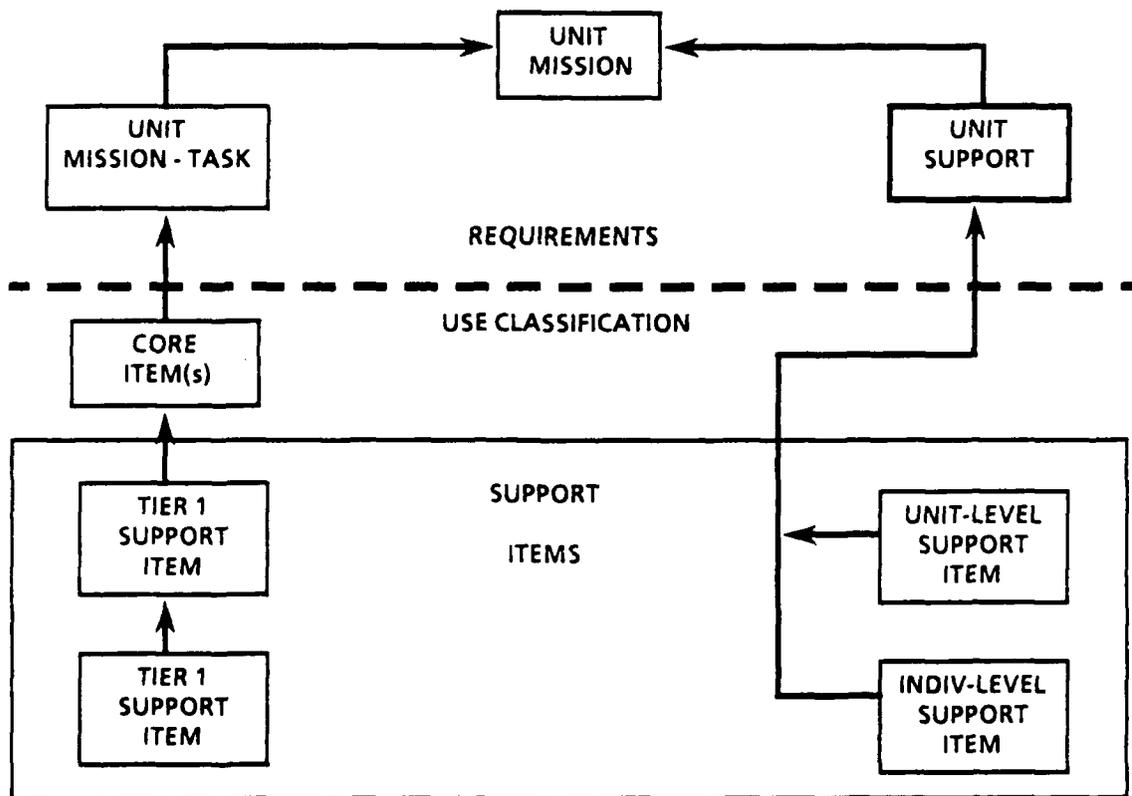


Figure K-2. Equipment Use Classification Schema.

Table K-1. Equipment Type Definitions

Equipment type	Definition
Core equipment	Equipment essential to the performance of the unit mission
Tier 1 support equipment	An equipment which directly supports the operation of a core equipment
Tier 2 support equipment	An equipment which directly supports the operation of a Tier 1 support equipment
Unit-level support	Equipment used to support unit operations and facilities
Individual-level support	Support equipment used personally by individuals to assist them with the performance of their duties

K-4. USE STATEMENTS. In identifying the equipment use within a rule, a specific form of use, associated with the type of support, is used. These forms, as developed in the prior study, for the Tier, Unit-level, and Individual-level support equipments are shown in Table K-2, Table K-3, and Table K-4, respectively. Each table contains both a full statement of the use as it appears in the ERC ADVISED notice, and an abbreviated form in which the use is identified in the individual ERC assignment rules (see Modules 4, 5, and 6 in Appendix I). The abbreviated form saves space in the rule system knowledge base while providing sufficient information to allow ready identification of the use to inspectors of the rule.

Table K-2. Tier Equipment Uses

Abbreviated form in rule	Text in display
adapt_sptd equip	adapting the supported equipment to the desired mode of operation
back_up_sptd equip	providing a backup capability to supported equipment
control_sptd equip	providing control over the operation of the supported equipment
enhance_sptd equip	enhancing the operational capability of the supported equipment
exercise_sptd equip	simulated operation of the supported equipment for training purposes
handle_sptd equip	handling the supported equipment within the local area of unit activity
initialize_sptd equip	establishing the initial conditions associated with supported equipment operation
maintain_sptd equip	maintenance of the supported equipment
position_sptd equip	movement of the supported equipment into position for operation
power_sptd equip	providing power for supported equipment operation
shelter_sptd equip	sheltering the supported equipment during operation
supply_sptd equip	scheduled supply support to the supported equipment during operation
sustain_sptd equip	demand supply support to the supported equipment during operation
transport_sptd equip	movement of the supported equipment into the locale of operation

Table K-3. Unit-level Equipment Uses

Abbreviated form in rule	Text in display
unit_control	support of unit operations by providing for control of the unit
unit_defense	support of unit operations by providing for active defense of the unit
unit_mobility	support of unit operations by providing for mobility of the unit
unit_nbc_defense	support of unit operations by providing for NBC defense of the unit
unit_concealment	support of unit operations by providing for concealment of the unit
unit_personnel_services	support of unit operations by providing services for unit personnel
unit_critical_facility	support of unit operations by providing a critical facility within the work area of the unit
unit_important_facility	support of unit operations by providing an important facility within the work area of the unit
unit_useful_facility	support of unit operations by providing a useful facility within the work area of the unit
unit_equip_maintenance	support of unit operations by providing for maintenance of the unit equipment
unit_training_facility	support of unit operations by providing for training in unit equipment operation

Table K-4. Individual-level Equipment Uses

Abbreviated form in rule	Text in display
indv_situation_assessment	support of an individual within unit with a means to assess a situation
indv_productivity	support of an individual within unit with a means to improve task productivity
indv_mobility	support of an individual within unit with vehicular mobility for conduct of specialized duty
indv_skill_application	support of an individual within unit with an item needed to apply skills to task
indv_nbc_defense	support of an individual within unit with an item needed for protection against NBC agents

K-5. USE DISPLAY. After the system has applied the rule which identifies the ERC for a particular item of equipment, it proceeds to a rule (see Appendix I, Module 1, "erc_assignment_displayed") which displays the ERC result. This rule generates the ERC ADVISED notice and includes, in the lower portion of the notice, a text message stating the use of the equipment with respect to the mission of the unit. This text message consists of two parts, a standard introductory text and a variable text correspond to the actual use of the equipment. The variable text is selected from the text appearing in Tables K-2 through K-4, corresponding to the abbreviated form appearing in the rule. An example of a notice with the full message text is shown in Figure K-3. The message portion is shown in italics for the purpose of the illustration.

```

*** CONSULTATION NOTICE - ERC ADVISED ***
      Branch: qms
      Unit Name: SUPPLY & SERVICE CO
      TOE: 42007J400
      LIN Para: 02
      LIN: Y36844
      Equipment: Water quality control set
The readiness code advised is:
      ERC A ( Rule 5.5.14 )
The code is based on use of the equipment for support of an individual within
unit with an item needed to apply skills to task.
* To PRINT notice: Form-feed paper, enter [Shift + Prtsc].
* To CONTINUE on: Type any alphanumeric key, then return key.

```

Figure K-3. Use Display Illustration.

It will be noted that a standard introductory phrase is used:

"The code is based on the use of the equipment for"

Inclusion of the standard introductory phrase as part of the rule saves space in the system knowledge base, since it appears only once in the special rule, rather than being repeated in each text message.

APPENDIX L
USER'S MANUAL

INTRODUCTION. This appendix contains the user's manual for the Equipment Readiness Code Rule System (ERCRULES). It has been prepared for use and reference in conjunction with operation of the system at field work stations.

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EQUIPMENT READINESS CODE RULE SYSTEM
(ERCRULES)

USER'S MANUAL

JUNE 1988

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PART 1 - INTRODUCTION

1-1. BACKGROUND. The Equipment Readiness Code Rule System (ERCRULES) has been developed to assist TOE documentation personnel with the identification of the core equipment* (includes all pacing items and selected ERC A items) in a unit and the assignment of ERC to the equipment in the unit.

In its present configuration, the system has an illustrative set of core equipments to demonstrate the capability of the system to store and display the information.

1-2. SYSTEM DESCRIPTION. ERCRULES is a microcomputer-based expert system (using the M.1 expert system shell from Teknowledge, Inc.) and an associated knowledge base. The system operates interactively with the user. The user provides the information which allows the system to search its knowledge base for the appropriate core equipment or ERC assignment rule and display the result. Each such session of user interaction with the system is referred to as a "consultation" with the system. The user can readily control the cycling of the system from one consultation to the next.

*The core equipment concept is being replaced by the Mission Essential Task List (METL) concept and the associated Mission Essential Equipment (MEE). The METL/MEE information will be introduced into the system at a later date.

1-3. SYSTEM FUNCTIONS. The system functions in two modes of operation, a Core Consultation Mode and an ERC Consultation Mode.

a. Core Consultation Mode. In this mode, the user indicates the unit mission and mission-task. The system responds by identifying the core item(s) of equipment associated with the mission and mission-task, including the ERC of the core equipment. The ERC assigned may be either ERC-A (essential) or ERC-P (pacing), depending upon the type of equipment involved, as prescribed by AR 220-1.

b. ERC Consultation Mode. In this mode, the user indicates the type and the nature of use of an item of equipment in a unit. The system responds with:

- o ERC assignment (ERC-A, ERC-B, or ERC-C)
- o Number of the rule used to make the ERC assignment
- o Category of equipment use in unit

The ERC assignment is the immediately desired item of information. The rule number is provided for reference. The category of use is a generic support equipment classification assigned by the system.

1-4. SYSTEM ITEMS. The items necessary to use the system are as follows:

System Items

Quantity	Item	Remarks
1	Microcomputer, with 512K memory (min)	On-site item
1	Printer, 80 col paper	On-site item
1	M.1 Shell Disk	TRADOC HQ Managed Item
1	ERCRULES Disk	TRADOC HQ Managed Item
1	ERCRULES Listing	TRADOC HQ Managed Item

PART 2 - SYSTEM LOADING PROCEDURES

2-1. HOST COMPUTER COMPONENTS

a. System Disk Drives. The system can be used on either a dual-floppy or hard-disk computer. If used on a dual-floppy computer, the M.1 Shell Disk is used in Drive A, and the ERCRULES Disk is used in Drive B. If used on a hard-disk computer, the ERCRULES Disk is loaded into the hard-disk subdirectory which contains the M.1 shell. Procedures are provided for loading and operating both computer installations.

b. System Printer. The system printer may be used to make a record of a consultation. In using the printer, two consultation records may be conveniently printed per page. Be sure to advance the paper with the line feed control between each record to provide separation of the texts, and advance the form to the top of the page after each pair, to avoid printing on the paper fold.

2-2. LOADING DUAL-FLOPPY COMPUTER

NOTE: In this and other procedures described herein, the term 'Enter' means to type the command shown and then hit the 'Return' key.

- Step 1. Insert M.1 Shell Disk in drive A.
- Step 2. Insert ERCRULES Disk in drive B.
- Step 3. Enter 'B:' (to set default drive - do not include quotes).
- Step 4. Enter command 'ERCFLD_F'.
- *****
- Step 5. Observe ERCRULES banner on screen and message: Loading...'
- Step 6. When loading is complete, observe system message requesting: 'Who is proponent for this unit'.
- Step 7. Enter three-letter code from menu (in lower case) for your school/center.
- Step 8. Observe system message requesting: 'What is the name of the unit'.
- Step 9. Enter a convenient abbreviation of the unit name for the TOE, enclosed in quotes.
- Step 10. Observe system message requesting: 'What is the TOE of the unit'.
- Step 11. Enter the 9-character TOE, again enclosed in quotes.
- Step 12. Observe the system message requesting selection of the mode of operation desired.
- Step 13. This completes the loading process. See following procedures (PART 3) for use of the system in either the CORE CONSULTATION MODE or ERC CONSULTATION MODE.

2-3. LOADING HARD-DISK COMPUTER

- Step 1. If system is not already on, power-up computer and wait for the DOS prompt.
- Step 2. Identify subdirectory on hard-disk containing the M.1 System Shell. If not already installed on the hard disk install M.1 as follows:
- Step 2.a. Enter 'make directory' command: 'md\erc'
- Step 2.b. Enter the 'change directory' command: 'cd\erc'
- Step 2.c. Insert the disk containing the M.1 System Shell in Drive A.
- Step 2.d. Enter copy command: 'copy A: m1.exe c:'.
- Step 2.e. Observe system responses:
 'M1.EXE'
 '1 File(s) copied'.
- Step 3. Enter 'change directory' command to switch to hard disk subdirectory containing the M.1 system shell. (for example. Enter 'cd\erc', if the subdirectory is 'erc').
- Step 4. Insert ERCRULES disk in drive A.
- Step 5. Enter command 'copy A;*.* c:', to transfer the system rules data from the disk to the subdirectory.
- Step 6. Observe system responses:
 'ERCFLD.CFG'
 'ERCRULES.FKB'
 'ERCFLD_F.BAT'
 'ERCFLD_H.BAT'
 '4 File(s) copied'.
- Step 7. Enter command 'ERCFLD_H'.
- Step 8. Continue loading process using Steps 5 to 13 of the LOADING DUAL-FLOPPY COMPUTER.

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PART 3 - SYSTEM OPERATING PROCEDURES

3-1. CORE CONSULTATION PROCEDURE.

- Step 1. Load and activate system per SYSTEM LOADING PROCEDURE.
- Step 2. Select the CORE CONSULTATION mode of operation.
- Step 3. Respond to the system prompt for mission of the unit with a selection from menu, appropriate to TOE under consideration.
- Step 4. Respond to the system prompt for mission-task of the unit, with a selection from menu appropriate to TOE under consideration.
- Step 5. Observe system to indicate a consultation is in progress (in lower right of screen).
- Step 6. In course, system will respond with a 'CONSULTATION NOTICE - CORE EQUIPMENT ADVISED' for the TOE, displaying the core equipment and the ERC associated with each core equipment.
- Step 7. Locate these core items in the appropriate TOE paragraphs and annotate the ERC on the TOE listing.
- Step 8. The notice also includes a prompt to proceed to the next coding activity. Before responding to the prompt, you have the option to printout the core equipment notice on the screen (as a record of the consultation) by following the instructions provided on the screen.
- Step 9. Respond to the prompt to proceed, as instructed on the screen.
- Step 10. Repeat CORE CONSULTATION PROCEDURE for any additional mission-tasks associated with the mission of the unit.

3-2. ERC CONSULTATION PROCEDURE

- Step 1. If not already loaded, load and activate system per SYSTEM LOADING PROCEDURE.
- Step 2. Working from the TOE listing, select the LIN of interest, in turn.
- Step 3. Observe the system prompt for the type of consultation desired.
- Step 4. Select the ERC CONSULTATION mode of operation from the menu.
- Step 5. Observe the system prompt for the TOE paragraph.
- Step 6. Enter the TOE paragraph number in which the LIN appears, enclose the paragraph number in quotes.
- Step 7. Observe the system prompt for the LIN.
- Step 8. Enter the LIN by its 6-character codes, enclose the LIN in quotes.
- Step 9. Observe the system prompt for the classification which best identifies the LIN.
- Step 10. Enter the best LIN classification, by number, at the prompt. If appropriate, enter the number 27 to display the extended list of item types.
- Step 11. If, at this point in the procedure, the system displays a 'CONSULTATION NOTICE - EQUIPMENT NOT RECOGNIZED' decide whether to repeat the session with a different equipment classification of the same LIN, or go on to the next LIN of interest in the TOE.
- Step 12. Respond to the prompt to proceed and then make menu selections corresponding to your decision in Step 11.
- Step 13. In the absence of a notice, observe, in turn, the sequence of prompts for information about the use of the equipment in the unit. Enter a response to each prompt using the number corresponding to your selection.

- Step 14. In course, the system will display a 'CONSULTATION NOTICE - ERC ADVISED'. The notice includes the ERC of the item and the number of the rule used to arrive at the ERC assignment.
- Step 15. Alternately, the system will display a 'CONSULTATION NOTICE - ERC NOT ADVISED'. Decide whether to repeat the session re-identifying the LIN usage, or go on to the next LIN of interest in the TOE.
- Step 16. Respond to the prompt to proceed and then make menu selections corresponding to your decision in Step 15.
- Step 17. Repeat Steps 2 to 16 for each LIN of interest in the TOE. You have the option of generating a printout of the notices as a record of the consultations by following the instructions on the screen.

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PART 4 - CONTINGENCY PROCEDURES

4-1. CONSULTATION ABORT

In the event the system produces an unexpected response, for example, the query 'What is the value of (some expression)', proceed as follows:

- Step 1. Terminate the consultation with the Command (Alt + A), that is, hold down the Alt and A keys simultaneously.
- Step 2. Observe system (at top of screen) to confirm command with query 'Abort consultation [y/n]?'. Enter 'y'.
- Step 3. Resume a new consultation with the Command (Alt + G).

4-2. SESSION ABORT

If it becomes necessary, at any point, to conclude the operation of the system, proceed as follows:

- Step 1. Terminate the session with the Command (Alt + Q).
- Step 2. Observe system (at top of screen) to confirm command with query 'Exit to DOS [y/n]?'. Enter 'y'.
- Step 3. To restart session, reload system as follows:

DUAL-FLOPPY COMPUTER:

Follow LOADING DUAL-FLOPPY COMPUTER procedure, starting at Step 4.

HARD-DISK COMPUTER:

Enter command 'ERCFLD_H'.

Follow LOADING DUAL-FLOPPY COMPUTER procedure, starting at Step 5.

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PART 5 - SYSTEM MANAGEMENT

5-1. GENERAL. The information provided in the proceeding parts of the manual is intended for field users of the system. These procedures presume the use of the system as configured for field use. This part of the manual describes the configuration of the system provided for management (i.e., update and maintenance) of the system.

5-2. SYSTEM CONFIGURATIONS. ERCRULES is provided in two configurations as follows:

- Field Configuration
- System Management Configuration

The configurations are functionally identical, in that they operate using the same set of rules and interact with the use in the same manner. They are different in only one respect, the manner in which the knowledge base is stored. The Field Configuration operates with a "fast loading" knowledge base to permit the system to come on line as quickly as possible. The System Management Configuration operates with a "text format" knowledge base which loads appreciably slower, but is readable with an editor or listing utility.

5-3. SYSTEM CONFIGURATION FILES. The files associated with the two system configurations are shown in Table 5-1. As shown in the table, there is a basic correspondence between the files of the two configurations.

Table 5-1. System Configuration Files

File type	File name	
	Field Configuration	System Management Configuration
Batch (floppy disk system)	ERCFLD_F	--
Batch (hard disk system)	ERCFLD_H	ERCMGT.BAT
Knowledge base	ERCRULES.FKB	MODULE-1.TXT MODULE-2.TXT MODULE-3.TXT MODULE-4.TXT MODULE-5.TXT MODULE-6.TXT MODULE-7.TXT
M.I Configuration	ERCFLD.CFG	ERCMGT.CFG
M.I Shell	M1.EXE	M1.EXE

5-4. MANAGEMENT ACTIVITY.

a. System Execution. Given that all the System Management Configuration files, including the M1.EXE shell, are in the same hard disk subdirectory, the system may be executed with the command:

ERCMGT.BAT (or simply ERCMGT)

At the time of execution of ERCRULES management configuration, the individual module files are copied into a single file to create a single knowledge base for system operation. A special file copy procedure is used to ensure that the module files are always copied in consecutive order, independent of their order in the file directory, which may become altered by file editing activity.

b. System Changes. System changes may be required as a result of coding errors from field experience with the system or the need to incorporate coding conditions associated with new equipment or equipment uses. For convenience in editing these changes, the text format knowledge base is made up of the seven individual text modules shown in Table 5-1. Each module (see Appendix I) deals with a separate aspect of the system operation.

c. System Release Record. System changes, in general, are accumulated until an operationally useful collection of changes exists. At such a point, it is appropriate to consider preparing a new fast knowledge base "system release" for field use. Each such release should be identified in two places in the knowledge base. It should be logged in Module 1 (paragraph 1-1c) and inserted in the display clause of the 'sign_on_completed' rule in Module 1 (paragraph 1.2).

d. Fast Knowledge Base Generation. When a new fast knowledge base release is required, the process for its generation is as follows:

- Execute the ERCRULES system management configuration using the ERCMGT.BAT command.
- Hit F9 followed by (Alt + G) to activate ERCRULES.
- Observe system to operate as intended.
- Hit F9 to display the delivery environment screen.
- Hit F10 to select MENUS.
- Hit the right cursor key once, to open the knowledge base window.
- Hit the down cursor key 11 times to select the "save kb in fast-load format" option.
- Hit enter key and wait for file to be created.
- Respond to query "FILENAME for fkb file" at top of screen with:

ERCRULES.FKB

- Exit system with Session Abort procedure (Part 4).

The new fast knowledge base file is now in the subdirectory as ERCRULES.FKB along with the other system files. It may be copied and distributed as desired.

APPENDIX M
SPONSOR'S COMMENTS
STUDY CRITIQUE

(This document may be modified to add more space for responses to questions.)

1. Are there any editorial comments? NO If so, please list on a separate page and attach to the critique sheet.

2. Identify any key issues planned for analysis that are not adequately addressed in the report. Indicate the scope of the additional analysis needed. As IDENTIFIED IN SAG

MINORS, THE METL / MEE issue related to
"CORE" equipment module needs to be addressed
when Information becomes available.

3. How can the methodology used to conduct the study be improved?

See #2

4. What additional information should be included in the study report to more clearly demonstrate the bases for the study findings? _____

None

5. How can the study findings be better presented to support the needs of both action officers and decisionmakers? _____

No changes necessary

6. How can the written material in the report be improved in terms of clarity of presentation, completeness, and style? _____

Good as written

STUDY CRITIQUE (continued)

7. How can figures and tables in the report be made more clear and helpful? _____

Excellent clarity as is.

8. In what way does the report satisfy the expectations that were present when the work was directed? Yes with the

Covered of #2.

In what ways does the report fail to satisfy the expectations?

See #2.

9. How will the findings in this report be helpful to the organization which directed that the work be done? It will add

a needed "consistency" to the assignment of ERC codes.

If they will not be helpful, please explain why not.

N/A

10. Judged overall, how do you rate the study? (circle one)

Poor

Fair

Average

Good

Excellent

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GLOSSARY

1. ABBREVIATIONS, ACRONYMS, AND SHORT TERMS

AI	artificial intelligence
AITC	Artificial Intelligence Training Cell
AR	Army regulation
ARSTAF	Army Staff
BOIP	basis of issue plan
CAA	US Army Concepts Analysis Agency
EEA	essential element(s) of analysis
ERC	equipment readiness code, a three-level code (A (highest), B, or C) which is assigned to an equipment in a unit, to indicate its importance to the conduct of the unit mission.
ERCRULES	Equipment Readiness Code Rule System
hndg	handling
HQ	headquarters
K	thousand
LIN	line item number, the basic Army reference number for an item of equipment
M.1	trade name for expert system shell marketed by Teknowledge, Inc.
METL	mission-essential task list
MISM	major item system map
NBC	nuclear, biological, chemical
ODCSOPS	Office of the Deputy Chief of Staff for Operations and Plans
pers	personnel
POL	petroleum, oils, and lubricants
spt	support
svcs	services

TOE	table(s) of organization and equipment
TRADOC	US Army Training and Doctrine Command
TRADOC HQ	Training and Doctrine Command Headquarters

2. DEFINITIONS

adapt

equipment used to connect, attach, link, or otherwise low supported equipment to operate as intended

advisory system

same as expert system except that the terminology places emphasis on the use of the system rather than its origins

audit trail

a record of the consultation with the rule system for general reference

control

equipment used to direct operation of a supported equipment by orders, manual calculations or automatic means

core

equipment essential to the performance of the equipment unit mission

domain

the nature and extent of the subject matter captured in the knowledge base, that is, the area of expertise of the system

enhance

equipment used in conjunction with the supported equipment to permit operation with greater flexibility, capability or efficiency

exercise

equipment used to activate the supported equipment so as to simulate realistic operation, for test or training purposes

expert system

A computer program that uses knowledge and logical inference procedures to solve problems that normally require human expertise for their solution

goal

final outcome sought by operation of expert system, namely the selection of the ERC for a particular equipment

inference

the logical process by which an expert system works through a set of rules in its knowledge base to reach a conclusion

inference engine (see inference)

computer term designating the program code associated with the inference process in an expert system

individual-level support equipment

support equipment used personally by individuals to assist them with the performance of their duties

initialize

equipment used to align, calibrate, adjust supported equipment prior to operational activity

knowledge base

specific collection of knowledge (facts and heuristics) structured as a set of rules, within an expert system

maintain

equipment used to service supported assets

microcomputer

desk-top computer for individual use

mission

the basic operation(s) the unit is designed to perform

mission-task

a subdivision of the mission into a component mission which requires substantially different core equipment than the other components of the mission

pacing item

an item of equipment essential to conduct of the mission of the unit as identified in AR 220-1

position

equipment used to move the supported equipment to a locale of operation, where the mover remains with equipment during operational activity

protect

equipment used to house or cover, supported against threatening/hostile conditions

power

equipment used to provide electrical power necessary for sustained operational use of the supported equipment

supply

equipment used to move, hold and issue supplies to supported equipment

support equipment

equipment in unit other than the core equipment

sustain

equipment used to provide flow of ammunition and supplies necessary for sustained operational activity of supported equipment

tier 1 equipment

an equipment which directly supports the operation of a core equipment

tier 2 equipment

an equipment which directly supports the operation of a tier 1 equipment

transport

equipment used to move supported equipment to a locale of operation then withdraws from equipment during operational activity

unit

Army unit; as used by the rule system a company-size element

unit-level support equipment

equipment used to support unit operations and facilities

validation

process of demonstrating that a (expert) system produces useful results

verification

processing of demonstrating that a (expert) system is operating as designed

working memory

memory allocated by expert system to hold results of ongoing processing of rules

workstation

individual computer facility, usually with advanced computer architecture and features, for specialized computational and/or graphics applications