AD-A128 706 METHODOLOGY INVESTIGATION OF COMPUTER-AIDED TEST PLANNING (CATPLAN)(U) ARMY TROPIC TEST CENTER APO MIAMI 34004 G K COLEMAN ET AL. DEC 82 USATTC-821201 1/2

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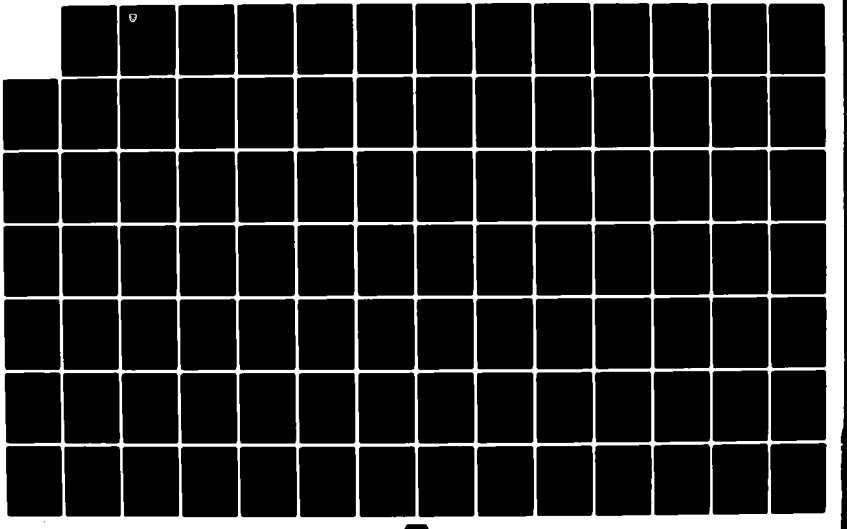

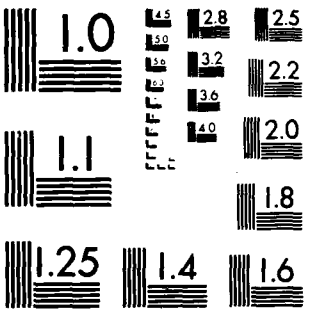

AD_____

TECOM PROJECT NO. 7-CO-PB1-TT1-002

USATTC PROJECT NO. 821201

METHODOLOGY INVESTIGATION

FINAL REPORT

OF

COMPUTER-AIDED TEST PLANNING (CATPLAN)

BY

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UNITED STATES ARMY TROPIC TEST CENTER

APO MIAMI 34004

December 1982

Prepared for: US Army Test and Evaluation Command, Aberdeen Proving Ground, MD 21005

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9. PERFORMING ORGANIZATION NAME AND ADDRESS US Army Tropic Test Center ATTN: STETC-MTD-A APO Miami 34004		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS US Army Test and Evaluation Command ATTN: DRSTE-AD-M Aberdeen Proving Ground, MD 21005		12. REPORT DATE November 1982 13. NUMBER OF PAGES 129
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19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

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Computer Aided Instruction	Memory Devices	
Computer Applications	Methodology Investigation	
Manhours	Standardization	

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

Increases in test workload and decreases in personnel at USATTC created an urgent need to develop a computerized, systematic approach to test plan writing that would allow fewer people to prepare quality test plans quicker. This was a 2-year investigation. Throughout the first year, each professional who wrote a subtest for each of the Center's Detailed Test Plans (DTPs) made an extra effort to build a standard approach and structure into his subtest. The regular test plan boarding process at the Center served as a continuing review board for the developing CATPLAN. Throughout the second year, an initial

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version of the CATPLAN was used by the Center as a starting point for DTPs. The result of this investigation is a computerized format of a typical test plan. The format is available from the IBM 4331 computer and the Wang word processor on double-spaced full size computer print-outs that provide ample space for changes and additions. In addition to the time saved in writing DTPs, about a 40-percent savings overall, CATPLAN serves as a valuable corporate memory mechanism and a welcomed training device. Standard approaches, detailed procedures, specific formats, and exact words eliminate much of the practice of "reinventing the ordinary." New personnel have come up to speed on test planning more quickly and easily than in the past.

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FOREWORD

This system was conceived by Roger L. Williamson, Chief, Analysis Branch, and developed by Gordon K. A. Coleman, Operations Research Analyst, US Army Tropic Test Center (USATTC).

SECTION 1. SUMMARY

1.1 BACKGROUND

a. A primary goal of the Army Research Development, Test, and Evaluation (RDTE) community is to decrease the time that it takes an item to complete the materiel acquisition cycle without sacrificing materiel quality (reference 1). "Emphasis is being placed on the effective, expedited, and efficient accomplishment of developmental and operational testing to support decision-making at various stages during materiel development" (reference 2). At USATTC and other US Army Test and Evaluation Command (TECOM) field activities, final detailed directions for testing an item in the field are contained in a Detailed Test Plan (DTP). Although the DTP is written in a specified format and the content is very similar from one DTP to the next, much time is spent in writing DTPs for new materiel systems tested at USATTC. Increases in test workload and decreases in personnel at USATTC created an urgent need to develop a computerized, systematic approach to test plan writing that would allow fewer people to prepare quality test plans quicker.

b. An additional need for developing such a system springs from fast turnover of military and some civilian personnel. New personnel could come up to test planning speed faster with a structured, computerized planning tool that would apply to all tests. Therefore, a methodology investigation was conducted to develop a Computer-Aided Test Planning (CATPLAN) system that would reduce the time required to develop and write DTPs without reducing their quality, and that would help to train newly assigned professionals. The methodology investigation proposal and directive for this investigation are included in Appendix A.

1.2 OBJECTIVES

a. Devise a classic test plan that can be used as a starting point for all DTPs and that can be integrated into a training system for newly assigned test, engineering, and scientific personnel.

b. Develop computerized procedures for building, retaining, revising, and using the classic test plan to write USATTC DTPs.

1.3 SUMMARY OF PROCEDURES

a. This was a 2-year investigation. Throughout the first year of this investigation, test personnel, scientists, and engineers at USATTC, who were experienced in writing specific subtests of DTPs, reviewed past USATTC DTPs that were judged by them and by technical managers to be good examples of the types of structure and content upon which a classic DTP could be based. Each person who wrote the same subtest for each of the Center's DTPs made an extra effort to build a standard approach and structure into his subtest. The regular test plan boarding process at the Center served as a continuing review board for the developing CATPLAN. Periodic work sessions were held

wherein CATPLAN subtest authors were brought together to share their approaches and to work out the details that must be the same in all subtests. Also during the first year, a CATPLAN was developed and entered into the Center's International Business Machines (IBM) 4331 computer.

b. Throughout the second year, the initial version of the CATPLAN was used by the Center as a starting point for DTPs. The structure of CATPLAN and procedures for its use were reviewed and revised as each new DTP was prepared. At the end of the second year the current version of CATPLAN was boarded in the same manner as a typical DTP.

1.4 SUMMARY OF RESULTS

The results of this investigation are in Appendix B, which contains a copy of the CATPLAN. The format contains not only the CATPLAN text and sample figures and forms for all subtests, but also notes to the CATPLAN user. This format is available from the IBM 4331 computer and the Wang word processor on double-spaced, full-size computer printouts that provide ample space for changes and additions.

1.5 ANALYSIS

a. Analysis of the CATPLAN preparation method and the value of the product are presented here. The procedure for generating CATPLAN was a successful one. Resident experts were able to draw upon examples from past test plans and combine that information with their own expertise to write specific subtests in a general manner. However, not all subtests could be written in a general format that would be complete enough to fit any test item. Receipt Inspection, Safety, and Human Factors subtests are presented in CATPLAN in such a way that allows those DTP subtests to be tailored to many test items by deleting what does not apply, filling in some blanks, and then writing only a few new paragraphs specific to the item. Using that approach, the Receipt Inspection subtest relieves the subtest author from about 60 percent of the work in preparing that subtest for any test item; Safety, about 60 percent relief; Human Factors, about 50 percent relief; Reliability, Availability, and Maintainability (RAM), about 40 percent relief; Logistic Supportability, about 40 percent relief; and Tropic Storage and Performance subtest, the major subtest for most DTPs, about 10-percent relief.

b. In addition to the time saved in writing DTPs, about a 40-percent savings overall, CATPLAN serves as a valuable corporate memory mechanism and a welcomed training device. Standard approaches, detailed procedures, specific formats, and exact words eliminate much of the practice of "reinventing the ordinary." New personnel have come up to speed on test planning more quickly and easily than in the past.

1.6 CONCLUSIONS

a. A computerized, generalized DTP can be developed for efficient use at TECOM field activities.

b. Applying the CATPLAN system at USATTC significantly decreases time, effort, and errors in preparing DTPs.

c. The CATPLAN serves as an effective memory device and training aid for new USATTC personnel.

1.7 RECOMMENDATIONS

a. USATTC continue to use the CATPLAN to prepare DTPs.

b. CATPLAN procedures be updated on a continuing basis.

c. USATTC develop a Test Operations Procedure (TOP) for use of CATPLAN at this Center.

d. TECOM explore the feasibility of using the CATPLAN system at other TECOM field activities.

SECTION 2. DETAILS OF INVESTIGATION

2.1 METHOD

a. At the beginning of this methodology investigation, USATTC had about 1 year's experience with a division-of-labor approach to DTP writing. Under this concept, specific people wrote specific subtests of each DTP produced at the Center. The test officer (T.O.) wrote Section 1, wrote the Receipt Inspection subtest, wrote the Safety subtest, and compiled Section 3 according to the guidance in TECOM Regulation 70-24 (reference 3). The mathematical statistician wrote the Tropic Storage and Performance subtest; the general engineer wrote the RAM and the Logistics Supportability subtests; and the research psychologist wrote the Human Factors subtest. The people who were more experienced at writing a subtest began to develop standard test plans using writing techniques that saved them time and helped them to produce more comprehensive and succinct plans. Most subtest authors kept a file of test plans into which they had put large amounts of time and effort. Slightly different approaches were used for different types of commodities. Therefore, several sets of test plan preparation aids had been developed independently.

b. A series of working meetings was established to develop a single approach and a common technique. The subtest authors, together with the operations research analyst, technical publications writer, and technical managers developed the CATPLAN system and detailed content shown in Appendix B.

c. The requirement was established to interface the IBM 4331 and Wang 25 systems so that text and data that may be composed on various IBM terminals throughout the Center could be read and printed by the Wang word processing system. That interface action is in progress.

2.2 CATPLAN SYSTEM OPERATION

The CATPLAN system was developed to operate as follows:

a. The T.O. provides the names of the test item and the control item, and Appendix A (list of criteria and issues), developed by the operations research analyst, to the Center's Word Processing Branch (WPB). The WPB executes a "global replace" to enter item names and the objectives and criteria into the CATPLAN system in their proper places within subtests as designated in Appendix A of the DTP.

b. The Automatic Data Processing (ADP) Division or the WPB provides printouts of CATPLAN (sample Introduction), CATPLRI (sample Receipt Inspection subtest), CATPERF (sample Tropic Storage and Performance subtest), CATRELM (sample Reliability subtest), CATLOGSL (sample Logistic Supportability subtest), CATPLSE (sample Safety subtest), CATPLHF (sample Human Factors subtest), and CATAPPX (sample Appendixes) to the T.O. The T.O. then distributes printouts to subtest authors. At this stage, standard forms

(e.g., data collection sheets, questionnaires) associated with a particular subtest are printed at the end of that subtest, as shown in Appendix B of this report, for the convenience of the subtest authors.

c. Subtest authors then write their subtests by first filling in some blanks and crossing out portions of CATPLAN that do not apply to the test item. Next, the system specific (creative) portions of the test plan (about 60 percent of the work) are developed and inserted in their proper places. Finally, data collection forms are drafted, or existing forms are modified, to suit data requirements of the specific test.

d. When the IBM/Wang interface is complete, subtest authors will be able to enter deletions, changes, and additions directly into the WPB system. Until that time, such entries are being made by hand on a hard copy printout which is sent to WPB for entry.

e. The CATPLAN system is a living system. As new techniques for conducting tests and writing reports are developed, they will be incorporated into CATPLAN. Center personnel, aided by the USATTC test plan and report boarding process, will expand and refine the CATPLAN shown at Appendix B continuously to make it an increasingly more complete and more useful tool. To the extent that commodity-specific versions of some subtests can be developed and are proven to be worthwhile additions to CATPLAN in terms of efficiency, they will be added to the CATPLAN system.

APPENDIX A. METHODOLOGY INVESTIGATION PROPOSAL AND DIRECTIVE

(COPY)

DEPARTMENT OF THE ARMY
HEADQUARTERS, U.S. ARMY TEST AND EVALUATION COMMAND
ABERDEEN PROVING GROUND, MARYLAND 21005

Mrs. Testerman
283-2176
S: 15 Dec 80

DRSTE-AD-M 24 Nov 1980

SUBJECT: Directive, Computer Aided Test Planning, TRMS No. 7-CO-PB1-TTI-002

Commander
US Army Tropic Test Center
ATTN: STETC-TD-O
APO Miami 34004

1. References:

a. TECOM Regulation 70-12, dated 1 June 1973.

b. AR 700-90, Change 1, 10 March 1977.

2. This letter and attached STE Forms 1188 and 1189 (Inclosure 1) constitute a directive for the subject investigation under the TECOM Methodology Improvement Program BP 5397-5071.

3. The MIP at Inclosure 2 is the basis for headquarters approval of the subject investigation.

4. Special Instructions:

a. All reporting will be in consonance with paragraph 9 of reference 1a. The final report, when applicable, will be submitted to this headquarters, ATTN: DRSTE-AD-M, in consonance with Test Event 53, STE Form 1189.

b. Semi-Annual Project Status Reports RCS-DRCMT-301, Manufacturing Technology (MANTECH) Program, are to be provided to this headquarters by 15 June and 15 December for each year that the investigation is active. The information contained in the RCS-301 Report is entered into a data bank by the Industrial Base Activity (IBEA), Rock Island, Illinois, and used by DARCOM to

monitor the progress of the program. Therefore, the information must be provided in the exact format shown at Inclosure 3. If the investigation is supported with funds for more than 1 fiscal year, it must be reported for each year.

c. Recommendations of new TOPs or revisions to existing TOPs will be included as part of the recommendation section of the final report. Final decision on the scope of the TOP effort will be made by this headquarters as part of the report approval process.

d. The addressee will determine whether any classified information is involved and will assure that proper security measures are taken when appropriate.

e. Upon receipt of this directive, test milestone schedules will be immediately reviewed in light of known other workload and projected available resources in accordance with provisions of paragraph 2-4 to TECOM Regulation 70-8. If rescheduling is necessary, this headquarters, ATTN: DRSTE-TO-O will be notified by 1st Indorsement not later than 15 December 1980. If schedules can be met, a P8 entry will be made directly into the TRMS master file by that date.

f. The Methodology Improvement Division technical point-of-contact is Mr. Grover H. Shelton, ATTN: DRSTE-AD-M, AUTOVON 283-2170/2375. Financial and reporting point-of-contact for subject investigation is Mrs. Lois J. Testerman.

FOR THE COMMANDER:

/s/SIDNEY WISE
/t/SIDNEY WISE
C, Meth Imprv Div
Analysis Directorate

3 Incl
as

(END COPY)
(Only Inclosure 2 is included)

(COPY)

1. TITLE. Computer Aided Test Planning (CAT-PLAN)

2. CATEGORY. Test Plan Writing/Software

3. INSTALLATION. US Army Tropic Test Center
ATTN: STETC-MTD
APO Miami 34004

4. PRINCIPAL INVESTIGATOR. G. K. A. Coleman
STETC-MTD-A
AUTOVON: 313-285-5412

5. STATEMENT OF THE PROBLEM. Test plans developed at US Army Tropic Test Center (USATTC) have common elements, such as standard wording of objectives, methods, and analyses for specific types of commodities, that appear routinely in subtests such as the Receipt Inspection, Human Factors, Reliability, and Safety. Alternative methods to systematize test plan preparation use either computer technology or word processing technology. Although computer and word processing hardware, sufficiently sophisticated to store and manipulate standard portions of test plans, have been acquired recently at USATTC, software to do this task has not been prepared. Continuous reinvention of test plan elements wastes time and provides greater opportunity for error than would exist with computer- or word processing-generated test plan typing. Greater efficiency in test plan preparation for all types of tests would result from a combined approach of computer/word processing-aided test planning.

6. BACKGROUND. USATTC test officers normally are assigned for less than 3 years. Approximately 10 percent of their time is used in writing test plans and checking final copy. Short suspenses combined with totally tailored test plans can lead to marginally acceptable documents. Use of standardized test plan elements would release a substantial time increment for the more important test plan development tasks of identifying parameters and formulating test procedures.

7. GOALS.

a. To develop new techniques for expeditiously preparing substantial portions of test plans.

b. To prepare a test operations procedure (TOP), with instructions for using computer (IBM 4331) or word processing (Wang System 25) facilities for test planning purposes.

8. DESCRIPTION.

a. The USATTC bank of on-board scientific/engineering and test officer expertise and existing test plans will be surveyed to identify common subtest elements that can be worded in a flexible manner. The most generally applicable components of appropriate subtests will be entered into either the Wang System 25 memory or the IBM 4331 memory, manipulated, and used to develop test plan core elements.

b. A task analysis will be conducted to select the most efficient system to use, i.e., the Wang System 25 or the IBM 4331 computer.

c. USATTC will develop methods and techniques to access, modify, and print out core elements.

d. Although this system will expeditiously prepare the test plan core, system specific test plan elements will require special preparation.

e. Each subtest author will provide active field testing dates and other specific test plan elements as system inputs. Test milestones will be developed and provided by system software.

f. This investigation will result in a new procedure to decrease time and errors in USATTC test plan writing.

g. Health Hazard Assessment. Participants will be within normal duty limits under conditions in which neither informed participation nor volunteer participation is required. Similar activities in the past have not revealed any health hazard. No health hazard has been identified in this MIP.

9. PROGRESS. This is a new investigation.

10. JUSTIFICATION.

a. Problem. Without a standardized test plan preparation system, the procedure of manually preparing repetitious subtest elements will continue. Manually preparing such elements will usually increase test planning time and errors, with the concomitant cost increase for correcting errors and preparing more test plan drafts.

b. Dollar Savings. When available, the proposed techniques will have an impact on every test conducted at USATTC. Estimated savings per test would be approximately 150 man-hours.

c. Workload. In the last 3 years, USATTC has completed an average of 21 tests per year. It is anticipated that the annual test completion rate will increase. Examples of projected/completed tests and expected savings are listed below:

	FY77	FY78	FY79	FY80		FY81	FY82
Test Assigned/ Continued	76	79	94	83 a/	76 b/	83 a/	83 a/
Test Completed	15	21	28	21 c/	13 d/	21 c/	21 c/
Project Savings (Man-hours)	2,250	3,150	4,200	3,150	1,950 d/	3,150 d/	3,150

a/ Estimated number of tests assigned (FY80 to FY82).
b/ Number assigned tests as of 26 February 1980.
c/ Estimated number of tests for completion (FY80 to FY82).
d/ Number completed tests/projected test savings as of 26 February 1980.

d. Recommended TRMS Priority: 1

e. Association with Requirements Documents. Not applicable.

f. Other. This investigation is being conducted to provide computer/word processing test plan writing capability that does not now exist. The long-range goal is to expedite test plan production and to improve test plan content at a decreased man-hour cost. This investigation will provide the system and software necessary to improve the process of test plan preparation substantially.

11. RESOURCES.

a. Financial.

(1) Funding Breakdown:

	Dollars (thousands)			
	FY81		FY82	
	In-House	Out-of-House	In-House	Out-of-House
Personnel Compensation	--	--	--	--
Travel	1	--	--	--
Contractual Support	--	10	--	8
Consultant & Other Services	--	--	--	--
Materials & Supplies	1	--	1	--
Equipment	10	--	3	--
Subtotals	12	10	4	8
FY TOTAL	22		12	

(2) Explanation of Cost Categories:

(a) Personnel Compensation: Not applicable.

(b) Travel: Not applicable.

(c) Contractual Support: Computer programming and console operation.

(d) Consultants: Not applicable.

(e) Materials and Supplies: Not applicable.

(f) Equipment: IBM 4331 display, keyboard and annual maintenance printer.*

b. Anticipated Delays. The investigation cannot be completed until test officers have computer access and the IBM 4331 computer is interfaced with the Wang System 25.

c. Obligation Plan.

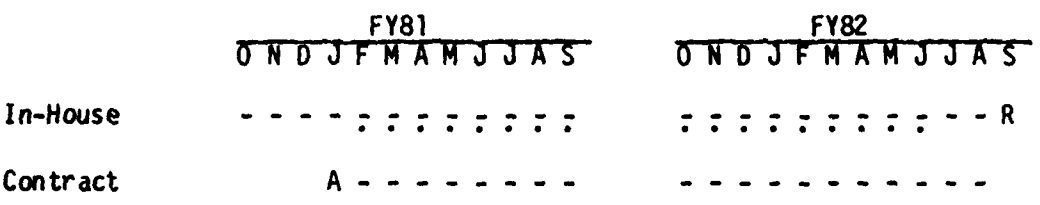
FY81	FQ	1	2	3	4
Rate (K)		12	4	4	2

d. In-House Personnel.

	FY81			
		Man-Hours		Study Hours
	No.	Required	Available	Required
Phy Sci Admin, GS-1301	1	80	80	
Opns Rsch Anal, GS-1515	1	600	600	
Elec Engr, GS-0855	1	160	160	
Math Stat, GS-1529	1	160	160	
Gen Engr, GS-801	1	80	80	
Rsch Psych, GS-180	1	80	80	
Elec Tech, GS-856	1	300	300	
Chemist, GS-1320	1	80	80	
TOTAL		1,540	1,540	2,000

* If the Wang System 25 is selected, Wang CRT equipment will be provided with appropriate options.

12. INVESTIGATION SCHEDULE.



LEGEND:
- - - Active investigation work
. . . Contract monitoring
A Award of contract
R Final report due at HQ, TECOM

13. ASSOCIATION WITH TOP PROGRAM. This proposal will result in a new TOP.

/s/FRANK S. MENDEZ
/t/FRANK S. MENDEZ
Chief, Materiel Test Division

(END COPY)

APPENDIX B. COMPUTER-AIDED TEST PLAN (CATPLAN) PRINTOUT

[NOTE: Notes to authors are presented in brackets throughout this document.]

TECOM PROJECT NO._____

RDTE PROJECT NO. _____

USATTC REPORT NO._____

DETAILED TEST PLAN

[DEVELOPMENT TEST II (PROTOTYPE QUALIFICATION TEST--GOVERNMENT)]
(Tropic Environmental Phase)

OF

[TEST ITEM]

[AUTHORS]

Materiel Test Division

UNITED STATES ARMY TROPIC TEST CENTER

APO MIAMI 34004

[DATE]

Prepared For: [Test Sponsor's Name and Address.]

US Army Test and Evaluation Command, Aberdeen Proving Ground, MD 21005

Distribution limited to US Government agencies only; test and evaluation; [DATE OF PLAN]. Other requests must be referred to [Test Sponsor's Name and Address]

Disposition Instructions

Destroy this plan when no longer needed. Do not return to the originator.

Neutral Language Statement

The word "he," when used in this plan, represents both the masculine and feminine genders, unless otherwise specifically stated.

TABLE OF CONTENTS

[CATPLAN] Name of Test _____

SECTION I. INTRODUCTION

[NOTE: This section contains background information for preparing and evaluating the detailed test plan. Information should be extracted or paraphrased from the source documents (e.g., ROC, IEP/TDP, Test Directive). Provide key words, phrases, statements that show how this section is organized, and how the test should flow and develop.]

1.1 BACKGROUND

[NOTE: See TECOM Reg 70-24, Appendix A, paragraph 1.1, and source documents (e.g., IEP/TDP, ROC).]

a. [Reference ROC and Letter Requirements (LR); discuss basic needs identified. For example:] The Army requires the capability to provide an effective, all weather, day or night, automatic [continue with requirement description]. These basic requirements are stated in the Department of the Army approved Letter of Agreement (LOA) (reference __).

b. [Reference IEP/TDP; identify developer and other responsible agencies. Discuss past testing and significant results. For example:] In response to the requirements identified in the LOA, [the developer] developed the [test item]. The [test item] was tested and evaluated by [list previous test agencies] in [date], but was not type-classified. Test results indicated that [continue with description of results].

c. [Reference test directive; state type of test USATTC will conduct. Indicate that test directive (without inclosures) is included at Appendix B. For Example:] On [date], US Army Test and Evaluation Command (TECOM) issued a test directive (reference __) directing the US Army Tropic Test Center (USATTC) to conduct the Tropic Environmental Phase of [a Development Test (DT) II, Prototype Qualification Test-Government (PQT-G)/etc.] for the [test item]. The test directive (without inclosures) is included at Appendix B.

1.2 DESCRIPTION OF MATERIEL

[NOTE: See TECOM Reg 70-24, Appendix A, paragraph 1.2, and source documents (e.g., IEP/TDP, ROC) May be extracted from IEP/TDP, safety statement, or other source document. Otherwise, describe the test item in terms of functions, technical characteristics, and physical characteristics.

a. Consider the overall system and how each component interacts.

b. Discuss the components' individual functions, and possible design changes as proposed by other agencies.

c. Discuss packing storage, and transporting of the test item components.

d. Provide test system overview, discussing how deployment occurs.]

1.3 TEST OBJECTIVES

[NOTE: See TECOM Reg 70-24, Appendix A, paragraph 1.3, and source documents (e.g., IEP/TDP, ROC). Include only the overall objectives, derived from the IEP/TDP or test directive, that pertain to the scope of the test. The following is a sample:]

a. Determine if the [test item] performs satisfactorily in a humid tropic environment.

b. Provide TECOM with the data needed to determine if the [test item] is ready to enter engineering development.

c. Determine the effects of storage in a humid tropic environment in terms of material degradation and technical performance.

1.4 SCOPE

[NOTE: See TECOM Reg 70-24, Appendix A, paragraph 1.4.]

a. USATTC will conduct a [no. of months DT-__] of [list test items' number/name]. The test will be conducted in the Republic of Panama at test sites representative of the Basic Climatic Design Type, [Constant and] Variable High Humidity Daily Cycle, described in Army Regulation (AR) 70-38 (reference __). Personnel from the 193d Infantry Brigade (Panama) will supplement USATTC test personnel as test participants. The test concept is shown in figure 1.

b. The test will include the following subtests: Receipt Inspection, Tropic Storage and Performance, Reliability, Logistic Supportability, Safety, and Human Factors.

(1) The Receipt Inspection subtest will be conducted to determine if the [test item] and system support packages (SSPs) are complete and in serviceable condition for testing. The physical characteristics of the [test item] will be evaluated to determine if they meet those specified in the requirement documents. A noise pressure level test will be conducted at this time [if required], as will new equipment training (NET) for operators and maintenance personnel. A __-hour burn-in time required for each [test item] will be accomplished during this subtest if it has not been logged previously. USATTC will not begin field testing until either an SSP or SSP waiver is received.

(2) The Tropic Storage and Performance subtest will be conducted at selected inland/coastal sites within the Republic of Panama. As shown in the test concept (figure 1), the [test item] will be stored [on the ground/ pallets/etc.] in/under [a covered shed/the open under a tarpaulin/the open without covering/a tarpaulin under the jungle canopy/a temperature and

[Diagram will be developed by operations research analyst]

Figure 1. Test Concept.

humidity-controlled facility/etc.]. While the sample size of [__] units is not sufficient for statistical inferences on the population of all [specify the type] units, a case study of each particular unit received for tropic testing will be made. To evaluate performace degradation [test officer--continue with the analysis summary . . .].

(3) The Reliability and Logistic Supportability subtests will evaluate the reliability and supportability of the [test item] in a humid tropic environment. Reliability and maintainability data collected throughout the test will be used in the evaluation. Maintenance will be limited to those maintenance actions which are required to support the [test item] during the test. The planned test lengtn of [___months/___hours] of operation, and sample size of [___] units are considered adequate to meet the reliability test objective and to address the reliability criterion. Based on [___] total operating hours, ___-hour missions, and assuming an exponential distribution of time between failures, the decision risks associated with the reliability criterion are as follows: producer's risk, α = _____; consumer's risk, β = ____.

(4) The Safety and Human Factors subtests will assess their respective aspects of operating and maintaining the [test item] in a humid tropic environment. These assessments will be made throughout the test.

c. A safety assessment report required by AR 385-16 (reference ___), including a health hazard assessment, will be provided to USATTC, through Headquarters (HQ), TECOM. USATTC will not begin testing until these documents are received.

d. [NOTE: The environmental quality coordinator will evaluate available documents and provide a statement to be included here. The following is an example:] The test officer and the USATTC environmental quality coordinator have assessed the environmental impact of this test and have determined that it will not affect the environment adversely. Therefore, an environmental assessment/impact statement is not required.

e. [If NET is not included in subparagraph 1.4b(`), include the following:] New equipment training (NET) will be conducted [as stated in the test directive].

SECTION 2. DETAILS OF TEST

[CATPLRI] Name of Test _____

[NOTE: Evaluate the following statements and select, revise, add, or delete, as necessary, according to the specific requirements of this test.]

2.1 RECEIPT INSPECTION

2.1.1 Objectives

a. Perform a physical inspection and inventory of the [test items] and components to insure that they are complete and in serviceable condition for testing (Appendix A, part __, item __).

b. Determine physical characteristics (weights and dimensions) of the [test item] (Appendix A, part __, item __).

c. Determine if the system support package (SSP) is complete (Appendix A, part __, item __).

d. Evaluate the adequacy of the shipping containers (Appendix A, part __, item __).

2.1.2 Criteria

a.

(Appendix A, part 3, item __).

b.

(Appendix A, part 3, item __).

2.1.3 Data Required

a. The following completed checklists/data forms:

(1) Receipt Inspection and Physical Characteristics Checklist (form F-1) completed for each shipping container, [test item], and component.

(2) Physical Inspection Checklist (form F-2) completed for each case of damage or suspected deterioration.

(3) Checklist for Detailed Analysis of Materials Problems (form F-3), completed as required.

(4) Safety Checklist (form F-4) completed for each safety inspection performed.

(5) Malfunction and Maintenance Data Form (form F-5) completed for each malfunction and subsequent maintenance action.

(6) Functional Check Data Form (form F-6) completed for the initial functional check.

(7) Human Factors Questionnaire/Checklist (form F-7) completed for each _____.

b. Inventory of the container/crate for each [test item] and SSP (packing list).

c. List of shortages as compared to the packing list.

d. Category of packing level, determined in accordance with Military Standard (MIL-STD)-794D (reference __), for each container/crate.

e. Narrative and photographic records of damages to, or discrepancies in, the packing of [test items], the shipping containers, the [test items], and the SSP.

f. List of hazards noted during receipt inspection.

2.1.4 Data Acquisition Procedure

a. Before opening each shipping container, the test officer will examine it visually for evidence of damage or deterioration sustained during shipment. The data required by the Receipt Inspection and Physical Characteristics Checklist (form F-1) and Physical Inspection Checklist (form F-2) will be recorded, using a separate form for each container and [test item]. Photographs will be taken to document damaged container exteriors.

b. Photographs will be taken at each stage of unpacking to document the type, placement, and condition of blocking, bracing, and cushioning material. These photographs will document operations and provide a visible record of discrepancies/problems encountered. All packing material will be retained for use when returning the test items to the developer.

c. The test officer will inventory each container to insure that all items on the packing list have been received. Shortages, discrepancies, and damages will be recorded on form F-1 and used as a basis for an Equipment Performance Report (EPR), in accordance with the procedures contained in US Army Materiel Development and Readiness Command (DARCOM) Regulation 70-13 (reference __). Other data required by form F-1 will be collected and recorded. Each [test item] will be inspected visually for damage or deterioration using the Physical Inspection Checklist (form F-2). Photographs will be taken of any damage or deterioration found. The Checklist for Detailed Analysis of Materials Problems (form F-3) will be used as a guide to further analyze the cause and consequences of any damage or deterioration found.

d. The SSP will be inspected for damage and inventoried using the packing and SSP lists as references. DARCOM Form 2410-1-R (Completeness and Timeliness of System Support Package) will be completed and forwarded in accordance with DARCOM Regulation 700-13 (reference __) within 5 duty days of beginning the test.

e. The test officer and the USATTC safety officer will inspect all [test items] for safety/health hazards using the Safety Checklist (form F-4) as a guide. Any apparent safety or health hazards will be recorded on form F-4.

f. Damaged [test items] will be photographed and reported to the developer using an EPR. All malfunctions and subsequent maintenance actions will be recorded on the Malfunction and Maintenance Data Form (form F-5).

g. The [specify data] will be measured and recorded [specify how] on [specify recording media and form number] by [specify recording method].

h. [NOTE: If a baseline functional check and NET are required as part of receipt inspection procedures, include the following paragraph in this subtest. If a baseline functional check and NET are not required in this subtest, do not include this paragraph but use the one in the Tropic Storage and Performance subtest.] After the initial inspection, the test officer will conduct a functional check, as described in the operator's manual (reference __), to collect baseline data. The test officer will record the data required by the Functional Check Data Form (form F-6). Additionally, the [test officer, sponsor's representative] will conduct NET for test personnel in operation and maintenance procedures. The NET will include [specify required actions]. After NET, all participants will respond to the Human Factors Questionnaire/Checklist (form F-7).

2.1.5 Analytical Procedure

[NOTE: First, specify general analytical procedures. Then, for each objective and criterion addressed in this subtest:

a. Specify which data (from which subtest) will be analyzed.
b. Specify how the data will be reduced.
c. Specify how the data will be compared against each criterion.
d. Specify the statistical procedure to be used, including the significance/confidence/risk coefficients when appropriate.
e. Specify the assumptions required by the analytic model.
f. If necessary, elaborate on the thought process that will lead to the determination that the criterion/objective will/will not be met.
g. State exactly on what basis the criterion/objective will be met.]

a. The physical characteristics data recorded during this subtest will be presented in tabular form in the final test report. Additionally, a list of damages to, or discrepancies in, [test item] components and containers will be included.

b. If all [test items] are received in serviceable condition, the shipping containers will be considered adequate.

c. Based on their evaluation of whether or not the [test items] can be used safely in the condition in which they were received, the test officer and the safety officer will determine if testing should begin.

d. The _____ data from form F-1 will be reduced and summarized in tabular form in the test report. Data will be analyzed by the [specify the type of statistical test--Student's t-test, ANOVA] at the [confidence/ significance/risk] level of _____. [Specify assumptions, as required].

e. Criterion 2.1.2__ will be met if all of the following conditions occur:

(1) No significant problems exist when installing the [test item] on the [specify the deployment location--unit, vehicle, etc.] while operating in the _____ mode.

(2) The test officer and safety officer determine that no damage has occurred to the [test items] that is serious enough to affect or compromise system performance.

f. Criterion 2.1.2__ will be met if the test officer determines, by the [_____-test], that [test item] parameters of _____ and _____ do not exceed/fail to measure _____.

g. Criterion 2.1.2__ will be met if the packaging design provides level A unit protection during shipment, handling, and storage of the [test item]; and if unit packing, intermediate packing, and shipping container markings conform to MIL-STD-794D requirements.

h. Criterion 2.1.2__ and objective 2.1.1__ will be met if the [specified feature size] for any [test item feature] is [____ inch (_____cm)] and uses the same [features] as found on presently issued equipment.

i. Criterion 2.1.2__ will be met if [specify components] are physically present on the [test item] and are compatible with [presently issued] equipment.

j. Performance, reliability, logistic supportability, safety, and human factors data collected during this subtest will be evaluated in their respective subtests.

2.1.6 Support Requirements and Data Collection Forms/Checklists to be Used in Section 3

a. [NOTE: Determine support requirements for this subtest. Then, insure they are included in this list. You may add or delete as necessary. Specify how many support items/personnel will be required, and from where they will originate. The test officer will consolidate this list with those from other subtests to prepare Appendix C.]

APPENDIX C. SUPPORT REQUIREMENTS

Materiel	Quantity	Source
Tools for opening shipping containers and packages, such as hammer, band cutters, cutting pliers, or screwdrivers		
Materials handling equipment		
Photographic equipment--color video camera, still camera (color/black and white)		
Weighing scale		
Linear measuring scale		
Laboratory facilities		
Environmental storage cage		
Storage racks		
Rags		
Security fence		

Instrumentation	Quantity	Source
Ohm meter		
AC/DC voltmeters		
Oscillograph		
Stopwatch		
Frequency meter		

External Support

[NOTE: Coordinate at least 1 month before required date]

Empire firing range
Test participants
Atmospheric Sciences Laboratory
Meteorological Team (Panama)

Personnel

Photographic specialists
Ammunition handlers
EOD personnel
Security personnel

b. [NOTE: The following data collection forms, referred to in this subtest, may be changed, as required, to collect necessary information. These forms will be compiled with those from other subtests and used as Appendix F. Use Privacy Act Statements on all forms requiring personal information (e.g., SSN, sex, date of birth). Statement should read as follows:

> Privacy Act Statement: This information is provided pursuant to Public Law 93-570 (Privacy Act of 1974), 31 December 1974. The information collected on this form will be used in the [name of test] final report. Personal information provided on this form is given on a voluntary basis. However, failure to provide this information may result in ineligibility to participate in this test.]

FORM F-1. SAMPLE RECEIPT INSPECTION AND PHYSICAL CHARACTERISTICS CHECKLIST

PART A. CONTAINERS

Serial number of container: _____

Name of contractor: _____

Number/date of contract: _____

[NOTE: Annotate with appropriate tolerance measurements.]

Height (cm) _____ (in) _____ Length (cm) _____ (in) _____

Width (cm) _____ (in) _____ Weight (kg) _____ (lb) _____

Type: ☐ Plywood ☐ Cardboard ☐ Metal ☐ Other

Markings: ☐ Adequate ☐ Legible ☐ Illegible ☐ None

Are unpacking instructions included? ☐ Yes ☐ No

Is the packing list attached? ☐ Yes ☐ No

Damage: ☐ Spillage ☐ Leakage ☐ Corrosion

☐ Contamination ☐ Crushing ☐ Cracking ☐ Breaking

☐ Other (explain): _____

_____

PART B. [TEST ITEM]

Serial Number: _____

Height (cm) _____ (in) _____ Length (cm) _____ (in) _____

Width (cm) _____ (in) _____ Weight (kg) _____ (lb) _____

Volume (cm^3) _____ (in^3) _____

Form F-1 (concluded)

PART C. OBSERVATIONS

1. Does the [test item] have a [specify required subsystem 1]?

☐ Yes ☐ No

2. Does the [test item] have a [specify required subsystem 2]?

☐ Yes ☐ No

If yes, state which system: _____

3. Other comments: _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Recorder's Signature

FORM F-2. SAMPLE PHYSICAL INSPECTION CHECKLIST

*Inspector:*_____ *Item:*_____ Date:_____

1. Damage.
   a. Location:_____
   b. Extent:_____
   c. Description:_____
   d. Possible cause:_____
   e. Possible effect on performance:_____
2. Leaks.
   a. Location:_____
   b. Extent:_____
   c. Description:_____
   d. Possible cause:_____
   e. Possible effect on performance:_____
3. Corrosion.
   a. Location:_____
   b. Extent:_____
   c. Description:_____
   d. Possible cause:_____
   e. Possible effect on performance:_____
4. Suspected microbiological growth and level of activity.
   a. Location:_____
   b. Extent:_____
   c. Description:_____

Form F-2 (concluded)

d. Possible cause: _____

e. Possible effect on performance: _____

5. Color.

a. Location: _____

b. Extent [Munsell Book of Color (reference __)]: _____

c. Other description: _____

d. Possible cause: _____

6. Evidence of insect activity.

a. Location: _____

b. Extent: _____

c. Description: _____

d. Possible cause: _____

e. Possible effect on performance: _____

7. Other deterioration.

a. Location: _____

b. Extent: _____

c. Description: _____

d. Possible cause: _____

e. Possible effect on performance: _____

8. Additional comments: _____

_____

_____

_____

_____

Recorder's Signature

FORM F-3. SAMPLE CHECKLIST FOR DETAILED ANALYSIS OF MATERIALS PROBLEMS

PART A. CORROSION

1. Identify corrosion mechanism.

2. Describe the corrosion products (color, shape, structure).

3. Identify the chemical nature of the corrosion products.

4. Describe the location and extent of the corrosion.

5. Predict ramifications of continued corrosion on performance of the [test item].

6. Estimate the time required for corrosion to cause [test item] failure.

7. Suggest corrective actions as required.

PART B. FUNGAL ATTACK

1. Describe the location and appearance of the suspected fungal growth.

2. Estimate area coverage.

3. Identify the organism(s) growing on the [test item]. (Microscopic examination of the item surface or material isolated from the surface is the preferred method of identification. Swab sampling and culturing on carrot decoction agar may not provide correct identification of the organism actually growing on the surface and should be used only to confirm the results from direct microscopic examination.)

4. Specify whether the fungus appears to be growing directly on the material or on a surface contaminant.

5. Describe any evidence of material degradation that may be due to the presence of fungus.

6. Assess the potential effects of fungus growth on item performance.

7. Suggest corrective actions as required.

PART C. OTHER DETERIORATION

1. Describe changes in the material.

2. Determine the possible mechanism of deterioration based on the exposure history and material appearance.

3. Assess the potential effects of the material deterioration on the MOPMS performance.

4. Suggest corrective actions as required.

2.1.7 Concerns for Other Subtests

[If there are specific data that need to be collected in other subtests to address objectives and criteria in this subtest (e.g., functional check data, malfunction and maintenance data, safety data, or human factors (NET) data) please list them in the appropriate space below:]

a. Tropic Storage and Performance subtest.

b. Reliability subtest.

c. Logistic Supportability subtest.

d. Safety subtest.

e. Human Factors subtest.

[CATPERF] Name of Test _____

[NOTE: Evaluate the following statements and select, revise, add, or delete, as necessary, according to the specific requirements of this test.]

2.2 TROPIC STORAGE AND PERFORMANCE

2.2.1 Objectives

a. Evaluate the effect of the humid tropic environment on the performance characteristics of the [test item] (Appendix A, part __, item __).

b. Evaluate the effects of ____ months of humid tropic exposure on the [test item] (Appendix A, part __, item __).

c. Compare the [test item] to the [control item] to determine if any design changes have degraded system performance when operating in the humid tropics (Appendix A, part __, item __).

2.2.2 Criteria

a.

(Appendix A, part 3, item __)?

b.

(Appendix A, part 3, item __)?

2.2.3 Data Required

a. The following completed checklists/data forms:

(1) Physical Inspection Checklist (form F-2) completed at the beginning and end of each [exposure/storage] period, and, when possible, data specified by the Checklist for Detailed Analysis of Materials Problems (form F-3).

(2) Safety Checklist (form F-4) completed for each [functional check/performance mission], as described in paragraph 2.5.4.

(3) Malfunction and Maintenance Data Form (form F-5) completed for each malfunction and subsequent maintenance action performed.

(4) Functional Check Data Form (form F-6) completed for each functional check performed.

(5) Human Factors Questionnaire/Checklist (form F-7) completed after each [functional check/performance mission].

(6) Performance Mission Data Form (form F-8) completed for each performance mission conducted.

(7) Sound Pressure Level Data Collection Form (form F-9) completed for each [test item operation, sound pressure level test].

(8) Site Description Data Form (form F-10) completed for each [test site, transmission lane].

b. Meteorological data during each [exposure/storage] period, to include total rainfall (to the nearest mm); mean minimum, mean maximum, and overall mean of air temperature (to the nearest 0.1°C) and relative humidity (to the nearest 0.1%); mean windspeed (to the nearest m/sec); prevailing wind direction (to the nearest degree of azimuth); total atmospheric salt content (to the nearest 0.1 mg of Cl/m^2); and total solar radiation (to the nearest joule/m^2).

c. Photographs of storage sites, [test item] in storage configuration, performance sites, and performance configurations.

d. Photographs documenting any observed materials deterioration of, or damage which occurs to, the [test items].

e. Meteorological data at each test site during each performance mission and at each functional check, to include air temperature (to the nearest °C); rainfall (to the nearest mm); relative humidity (to the nearest %); windspeed (to the nearest m/sec); wind direction (to the nearest degree of azimuth); and solar radiation (to the nearest joule/m^2).

f. A record of any unusual events or problems encountered during functional checks or performance testing, to be entered in the test officer's project log.

[NOTE: Other data elements, as appropriate, may be entered in the test officer's project log or included on selected data forms].

2.2.4 Data Acquisition Procedure

2.2.4.1 General

a. Personnel from the Atmospheric Sciences Laboratory (ASL) Meteorological (Met) Team (Panama) will record the required meteorological data throughout the test using standard meteorological equipment and procedures.

b. The Safety Checklist (form F-4) will be completed by the test officer, the USATTC safety officer, and each test participant, as described in paragraph 2.5.4.

c. Malfunctions and subsequent maintenance actions will be recorded on the Malfunction and Maintenance Data Checklist (form F-5).

d. The Human Factors Questionnaire/Checklist (form F-7) will be completed by the test officer and each test participant after each [functional check/performance mission].

e. All test incidents will be recorded in the test officer's project log and reported using EPRs, in accordance with established procedures.

f. USATTC Instrumentation Laboratory personnel will collect and record the data required by the Sound Pressure Level Data Collection Form (form F-9) following the procedures in MIL-STD-1474A(MI) (reference __).

g. The USATTC soils engineer will collect and record the data required by the Site Description Data Form (form F-10) for each [test site, transmission lane]. TOP 1-1-052 (reference __) will be followed in quantifying the description of vegetation.

h. [NOTE: If a baseline functional check and NET are not required as part of receipt inspection procedures, include the following paragraph in its entirety. If the baseline functional check and NET are required as part of the receipt inspection process, do not include those sentences in this paragraph, which apply to them.] USATTC personnel will perform the initial functional checks, as described in the operator's manual (reference ___), following receipt inspection to collect baseline performance data. Additional functional checks will be performed at the end of each exposure/storage period and during the final inspection. The data required by the Functional Check Data Form (form F-6) will be collected and recorded for each functional check. Additionally, the [test officer, sponsor's representative] will conduct NET for test personnel in operation and maintenance procedures. The NET will include [specify required actions].

i. The [specify type] data and the [specify type] data will be recorded by [automatic data logger/recorder/video camera/hand/visual observation/etc.] on [specify storage/collection media/etc.].

2.2.4.2 Functional check

A functional check will consist of [specify the required actions].

2.2.4.3 Tropic storage

a. After each of the first [number] phases of performance testing, the [test items] will be placed into tropic storage for ___ weeks. The units will be placed on wooden pallets under a covered, open-sided shed at the Fort Clayton General Purpose Test Area (FCGPTA) [or other sites].

b.

2.2.4.4 Performance missions

a.

b.

2.2.5 Analytical Procedure

[NOTE: First, specify general analytical procedures. Then, for each objective and criterion addressed in this subtest:

a. Specify which data (from which subtest) will be analyzed.
b. Specify how the data will be reduced.
c. Specify how the data will be compared against each criterion.
d. Specify the statistical procedure to be used, including the significance/confidence/risk coefficients when appropriate.
e. Specify the assumption required by the analytic model.
f. If necessary, elaborate on the thought process that will lead to the determination that the criterion/objective will/will not be met.
g. State exactly on what basis the criterion/objective will be met.]

a. The meteorological data collected during this subtest will be presented in tabular form in the final test report.

b. Performance data, to include [pertinent variables], will be compared to [available] control values and analyzed for degradation resulting from tropic storage. [Appropriate parametric tests] will be computed on these data under the assumptions of homogeneity of variances and a normal distribution of residuals from the analytical model. If these assumptions are not met, [appropriate non-parametric statistical tests] will be computed. The type I error rate (alpha level) will be set at 0.05.

c. Criterion 2.2.2__ and objective 2.2.1__ will be met if both of the following conditions occur:

(1) The overall mean [obtained performance level] is not significantly less than the [required performance level]. A one-sided Student's t-test will be used to test the hypothesis at the α=.05 level of significance.

(2) No tropic-related degradation occurs which would compromise the [test item's] performance.

d. Criterion 2.2.2__ cannot be met because of the limited storage time available during this tropic test. However, this criterion will not be met if either of the following conditions occur:

(1) Any performance measure of the [test item] degrades after __ months of tropic storage. Mean changes in the performance measures of those items stored in the tropic environment will be compared to mean changes in the

performance measures of those items stored in a control environment using a [Student's t-test, ANOVA] at the α=.05 level of significance.

(2) Any deterioration, fungal growth, or other condition induced by short-term storage in the humid tropics, would be severe enough, in the engineering judgment of this Center, to compromise performance after long-term storage.

e. Criterion 2.2.2__ will be met if the results of the ANOVAs mentioned in subparagraph 2.2.5b, above, do not detect a significant (α=.05) decrease with time in any performance level.

f. Reliability, logistic supportability, safety, and human factors data collected during this subtest will be addressed in their respective subtests (paragraphs 2.3, 2.4, 2.5, and 2.6).

2.2.6 Support Requirements and Data Collection Forms/Checklists to be Used in Section 3

a. [NOTE: Determine support requirements for this subtest. Then, insure they are included in this list. You may add or delete as necessary. Specify how many support items/personnel will be required, and from where they will originate. The test officer will consolidate this list with those from other subtests to prepare Appendix C.]

APPENDIX C. SUPPORT REQUIREMENTS

Materiel	Quantity	Source
Tools for opening shipping containers and packages, such as hammer, band cutters, cutting pliers, or screwdrivers		
Materials handling equipment		
Photographic equipment--color video camera, still camera (color/black and white)		
Weighing scale		
Linear measuring scale		
Laboratory facilities		
Environmental storage cage		
Storage racks		
Rags		
Security fence		
Flashlight with batteries		
Truck, carryall, pick-up or 2 1/2-ton		
Generators (60 Hz, 115V; 400 Hz, 220V)		
Meteorological equipment		

Instrumentation
Ohm meter
AC/DC voltmeters
Oscillograph
Stopwatch
Frequency meter

External Support	Quantity	Source
[NOTE: Coordinate at least 1 month before required date]		
Empire firing range		
Test participants		
Atmospheric Sciences Laboratory Meteorological Team (Panama)		

Personnel

Photographic specialists
Ammunition handlers
EOD personnel
Security personnel

b. [NOTE: The following data collection forms, referred to in this subtest, may be changed, as required, to collect necessary information. These forms will be compiled with those from other subtests and used as Appendix F. Use Privacy Act Statements on all forms requiring personal information (e.g., SSN, sex, date of birth). Statement should read as follows:

> Privacy Act Statement: This information is provided pursuant to Public Law 93-570 (Privacy Act of 1974), 31 December 1974. The information collected on this form will be used in the [name of test] final report. Personal information provided on this form is given on a voluntary basis. However, failure to provide this information may result in ineligibility to participate in this test.]

FORM F-6. SAMPLE FUNCTIONAL CHECK DATA FORM

Date:_____ [test item] ID No:_____ Operator:_____

A. Storage Site:

☐ FCGPTA ☐ FSMBES ☐ Fort Clayton POL Tank Farm

☐ Other_____

B. Functional Check (If malfunction occurs, fill out form F-5, Malfunction and Maintenance Data Form.)

Trial No.	Time	Temp (°C)	RH (%)	Rainfall Rate (mm/hr)	Go/No Go	Response Time (sec)	Remarks

C. Test Officer/NCO Comments:_____

_____

_____

_____

_____

_____

_____

_____

Recorder's Signature

FORM F-8. SAMPLE PERFORMANCE MISSION DATA FORM

Date _____ [test item] ID No. _____ Operator: _____

Mission Site ☐ [Site A] ☐ [Site B] ☐ [Site C]

Time Required to Prepare [test item] _____

Time Required to Check out [test item] _____

Mission Start Time _____ Mission Complete Time _____

Performance Data			Meteorological Data			
Variable 1 (unit)	Variable 2 (unit)	Variable 3 (unit)	Temp (°C)	RH (%)	Rainfall Rate (mm/hr)	Windspeed (m/sec)

Did test participants have trouble performing mission? ☐ Yes ☐ No
Explain: _____

Remarks: _____

_____
Recorder's Signature

FORM F-9. SAMPLE SOUND PRESSURE LEVEL DATA COLLECTION FORM

Data Collector:_____ Date:_____

Aural Detection Event No.:_____ Time:_____

Start Time:_____ Stop Time:_____

Atmospheric Conditions:

Average temperature_____(°C) Barometric Pressure_____(millibars)

Windspeed_____(m/sec) Relative Humidity_____(%)

Aspect Angle_____(degrees)

Part A. Sound Pressure Levels

Condition	Octave Band Center Frequencies (Hz)	[test item] Sound Pressure Level (dB)	Background Noise Level (dB)
[No Load]	63		
	125		
	250		
	500		
	1,000		
	2,000		
	4,000		
	8,000		
[1/2 Rated Load]	63		
	125		
	250		
	500		
	1,000		
	2,000		
	4,000		
	8,000		
[Rated Load]	63		
	125		
	250		
	500		
	1,000		
	2,000		
	4,000		
	8,000		

Form F-9 (cont)

Part B. Operator's Station

Distance From Geometric Center of [test item] (m)	Height Above Ground (m)	Aspect Angle (°)	Noise Sound Pressure Level (dB)	Operating Conditions (% of rated load)

Recorder's Signature

FORM F-10. SAMPLE SITE DESCRIPTION DATA FORM

Soils Data

Test Site	USCS a/	Moisture Content (%)	Dry Weight	Slope Classification (%)					
				<3%	>3-8%	>8-16%	>16-32%	>32-60%	>60%

Vegetation Data

Test Site	Vegetation Height (m)	Canopy Height (m)	Stem Size (cm)	Stem Spacing (m)	Stem Density b/	Classification c/

Recorder's Signature

a/ Unified Soils Classification System according to TM 5-530 (reference __).
b/ Number of stems per 10 square meters.
c/ According to the Holdridge Life Zone Classification System (reference __).

2.2.7 Concerns for Other Subtests

[If there are specific data that need to be collected in other subtests to address objectives and criteria in this subtest (e.g., receipt inspection or physical characteristics data, malfunction and maintenance data, safety data, or human factors (NET) data) please list them in the appropriate space below:]

a. Receipt Inspection subtest.

b. Reliability subtest.

c. Logistic Supportability subtest.

d. Safety subtest.

e. Human Factors subtest.

[CATRELM] Name of Test _____

[NOTE: Evaluate the following statements and select, revise, add, or delete, as necessary, according to the specific requirements of this test.]

2.3 RELIABILITY

2.3.1 Objectives

a. Evaluate the reliability of the [test item] in the humid tropics (Appendix A, part __, item __).

b. Determine the [test item] failure modes during system emplacement and operation (Appendix A, part __, item __).

c. Estimate the reliability of the [test item] system operation in the humid tropics (Appendix A, part __, item __).

2.3.2 Criteria

a.

(Appendix A, part 3, item __).

b.

(Appendix A, part 3, item __).

2.3.3 Data Required

a. The following completed checklists/data forms:

(1) Receipt Inspection and Physical Characteristics Checklist (form F-1) completed during receipt inspection.

(2) Physical Inspection Checklist (form F-2) completed for each physical inspection performed.

(3) Checklist for Detailed Analysis of Materials Problems (form F-3) completed for each materials analysis performed.

(4) Safety Checklist (form F-4) completed for each [functional check/ performance mission].

(5) Malfunction and Maintenance Data Form (form F-5) completed for each malfunction and subsequent maintenance action performed.

(6) Functional Check Data Form (form F-6) completed for each functional check performed.

(7) Human Factors Questionnaire/Checklist (form F-7) completed after each [functional check/performance mission].

(8) Performance Mission Data Form (form F-8) completed for each mission performed.

(9) Reliability Mission Log (form F-11) completed for each mission performed.

b. Copies of completed EPRs.

c. Photographs, sketches, graphs, or materials analysis results to support conclusions or findings regarding the causes and effects associated with [test item] failures.

d. Meteorological data collected during each reliability cycle, to include total rainfall (to the nearest mm); and mean minimum, mean maximum, and overall mean of air temperature (to the nearest °C) and relative humidity (to the nearest %).

2.3.4 Data Acquisition Procedure

a. Reliability data will be collected throughout the test on the checklists/data forms listed in subparagraph 2.3.3a, above. Total [test item] operating time for training, functional checks, and performance missions will count for estimating the system reliability. In addition to the operating times accumulated from the above sources, USATTC personnel will conduct ____ reliability missions on the [test item]. Data required by the Reliability Mission Log (form F-11) will be recorded for each mission. Each reliability mission will consist of [specify actions required by the test item's Operation Mode Summary/Mission Profile].

b. During each reliability mission, personnel from the ASL Met Team (Panama) will record the required meteorological data using standard meteorological equipment and procedures.

c. Reliability data will be obtained primarily from the __-hour missions conducted during the performance cycles described in the Tropic Storage and Performance subtest (paragraph 2.2). USATTC will conduct [specify number] ____-hour missions: [specify number] in the [specify] mode, and [specify number] in the [specify] mode.

d. All test incidents will be recorded in the test officer's project log and reported to the developer using EPRs, in accordance with established procedures. For reporting purposes, a test incident is defined as the occurrence or detection of any actual, intermittent, or incipient malfunction, safety hazard, or degradation (actual or suspected) in the performance of the [test items]. Incidents will be scored initially by USATTC in accordance with the combat and materiel developers' jointly developed and formally approved failure definition and scoring criteria

(FD/SC). If no FD/SC is provided, USATTC will use the "Incident Classification Guide" at Appendix G. The final test report will include the results of the scoring conferences and the RAM Assessement Conference [held in accordance with AR 702-3 (reference _____)], if conference results are published before the final test report is originated.

e. [Test item] malfunctions and subsequent maintenance, if required, will be recorded on the Malfunction and Maintenance Data Form (form F-5). When feasible, and if it will not delay the test, USATTC will analyze the [test item] failures to determine the causes. If possible, failed item components will be returned to the developer for further failure analysis.

2.3.5 Analytical Procedure

[NOTE: First, specify general analytical procedures. Then, for each objective and criterion addressed in this subtest:

a. Specify which data (from which subtest) will be analyzed.
b. Specify how the data will be reduced.
c. Specify how the data will be compared against each criterion.
d. Specify the statistical procedure to be used, including the significance/confidence/risk coefficients when appropriate.
e. Specify the assumption required by the analytic model.
f. If necessary, elaborate on the thought process that will lead to the determination that the criterion/objective will/will not be met.
g. State exactly on what basis the criterion/objective will be met.]

a. Reliability data will be summarized and tabulated in the final test report. As a minimum, the following reliability data will be tabulated:

(1) Failed item identification and total operating hours to failure.

(2) Date and time of failure.

(3) Chargeability of failure and reason for chargeability.

(4) Cross-reference to EPR number.

(5) Total operating time for each mode (AC and DC).

(6) Narrative description of failures (including effects on test item performance) and, if possible, the probable causes and recommendations for corrective actions.

b. Meteorological data collected during the reliability cycles will be presented in tabular form in the final test report.

c. For each operation, a point estimate and 90-percent confidence interval estimates (one- and two-sided) for [test item] MTBF, combined and

individual, will be calculated and presented in the final test report. Also, point estimates for each major subsystem of the [test item] will be calculated and presented. An exponential distribution of time between failures will be assumed.

d. Reliability data (e.g., number of malfunctions, causes of malfunctions, functioning time to malfunction, and total functioning times) will be compiled from the data listed in subparagraphs 2.3.5, ____, ____, and ____, above. A point estimate, and [90-] and [80-]percent interval estimates (one- and two-sided), for the MTBFs of the [number] [test items] will be calculated as defined by the FD/SC. Unless otherwise indicated by the failure data, an exponential distribution of time between failures will be assumed. Reliability data for each [test item] will be summarized and presented in appropriate form in the final test report.

e. Reliability data; e.g., total number of failures and test operating time for each [test item], will be summarized and presented in tabular form in the final report.

f. MTBF will be calculated for both the [test item] and the [control item] as a point estimate and as [80-] and [90-]percent interval estimates (one- and two-sided) and presented in the final report. An exponential distribution of time between failures will be assumed.

g. Mission reliability of the [test item] and the [control item] will be calculated as the ratio of the number of successfully completed missions to the number of attempted missions. Both [80-] and [90]-percent (one- and two-sided) interval estimates of mission reliability will be calculated. The mission reliabilities are assumed to be binomially distributed. All missions will be [___ minutes] in duration.

h. Reliability will be computed separately for each test item configuration and for each storage mode, as the ratio of the number of successful [functional checks/performance missions] to the number of attempted [functional checks/performance missions].

i. Criterion 2.3.2__ will be met if the [specify components] are compatible with [presently issued] equipment.

j. Criterion 2.3.2__ will not be met if a durability failure of the [test item] occurs during tropic testing. (A durability failure is defined as a malfunction that precludes further operation of the [test item] and is of such consequence (in terms of cost or time to restore) that the item must be replaced or rebuilt, or that requires a complete [rewiring] of the item or replacement of any of the following parts: (1) frame and chassis; (2) [specify critical or costly components]. Because of the limited performance time during this test, criterion 2.3.2__ cannot be determined to be met with any reasonable degree of statistical confidence.

k. Criterion 2.3.2__ will not be met if [state number] or more failures occur during the [specify number] ___-hour missions conducted in the humid tropics. Because of the limited performance time, criterion 2.3.2__ cannot be determined to be met with any reasonable degree of statistical confidence. If the true MTBF of the [test item] is equal to or greater than the specified value of [specify number] hours, then the probability of [specify number] or more failures occurring during the [specify number] ___-hour missions is less than [specify the probability].

l. Criterion 2.3.2__ will be applied individually to each [test item]. This criterion will be met if no [catastrophic malfunction] occurs and if the total number of malfuctions which can be repaired does not exceed the critical number listed in the [specification document].

m. Criterion 2.3.2__ will be met if the demonstrated [80]-percent lower one-sided confidence limit for the MTBF of the [test item] is greater than the minimum acceptable value of ___-hours.

n. Objective 2.3.1__ will be met if criteria 2.3.2__ and 2.3.2__ are met and if no deficiencies (e.g., pattern failures) are charged to the [test item] in the area of reliability.

o. To address objective 2.3.1__, pertinent data will be provided to the Independent Evaluator.

p. To address objective 2.3.1__, maintainability data, described in the Logistic Supportability subtest (paragraph 2.4), and reliability data, described in subparagraph 2.3.5a, will be evaluated. Objective 2.3.1__ will be met if both of the following conditions occur:

(1)

(2)

q. Safety and human factors data collected during this subtest will be evaluated in their respective subtests (paragraphs 2.5 and 2.6).

2.3.6 Support Requirements and Data Collection Forms/Checklist to be Used in Section 3

a. [NOTE: Determine support requirements for this subtest. Then, insure they are included in this list. You may add or delete as necessary. Specify how many support items/personnel will be required, and from where they will originate. The test officer will consolidate this list with those from other subtests to prepare Appendix C.]

APPENDIX C. SUPPORT REQUIREMENTS

Materiel	Quantity	Source
Tools for opening shipping containers and packages, such as hammer, band cutters, cutting pliers, or screwdrivers		
Materials handling equipment		
Photographic equipment--color video camera, still camera (color/black and white)		
Weighing scale		
Linear measuring scale		
Laboratory facilities		
Environmental storage cage		
Storage racks		
Rags		
Security fence		

Instrumentation

Ohm meter		
AC/DC voltmeters		
Oscillograph		
Stopwatch		
Frequency meter		

External Support	Quantity	Source
[NOTE: Coordinate at least 1 month before required date]		
Empire firing range		
Test participants		
Atmospheric Sciences Laboratory Meteorological Team (Panama)		

Personnel

Photographic specialists
Ammunition handlers
EOD personnel
Security personnel

b. [NOTE: The following data collection forms, referred to in this subtest, may be changed, as required, to collect necessary information. These forms will be compiled with those from other subtests and used as Appendix F. Use Privacy Act Statements on all forms requiring personal information (e.g., SSN, sex, date of birth). Statement should read as follows:

> Privacy Act Statement: This information is provided pursuant to Public Law 93-570 (Privacy Act of 1974), 31 December 1974. The information collected on this form will be used in the [name of test] final report. Personal information provided on this form is given on a voluntary basis. However, failure to provide this information may result in ineligibility to participate in this test.]

FORM F-5. SAMPLE [TEST ITEM] MALFUNCTION AND MAINTENANCE DATA FORM

Report No. _____

1. Date of Malfunction:	2. Malfunction Discovered During: ☐ Inspection ☐ Scheduled Maintenance ☐ Field Operation ☐ Operator/Crew Checks and Services ☐ Other
3. Time of Malfunction:	4. Effect of Malfunction on System Performance: ☐ System Inoperable ☐ Intermittent Operation ☐ Performance Degraded ☐ No Effect
5. Location:	6. Weather Conditions (e.g., clear, windy, heavy rain, light rain):
7. Mission Start Time:	8. Test Site Conditions (e.g., muddy, dry, dusty, high grass, open, jungle):
9. EPR No.:	10. Type of Activity Engaged in When Malfunction or Damage Occurred: ☐ Operation (DC Mode) ☐ Operation (AC Mode) ☐ Transportation ☐ Other

11. Failed Item Identification:

a. Failed System: _____
b. Failed Group: _____
c. Failed Item Name: _____
d. Failed Item P/N: _____
e. Failed Item S/N: _____
f. Replacement Part S/N: _____

Form F-5 (cont)

12. Describe Malfunction and Symptoms of Malfunction: _____

13. Corrective Action:

a. Date of Corrective Action: _____
b. Location: _____
c. Total Number of Hours Required to Complete Corrective Action: _____
d. Total Labor-hours Expended by Each Repairperson:

Number	Repairperson Name	Repairperson MOS	Labor Hours	Maintenance Level
1				
2				
3				

14. Describe Corrective Action Performed (including isolation of malfunction, adjustments, alignments, replacements, and checkout actions).

15. Describe Any Difficulties Experienced with Troubleshooting, Technical Manuals, Removal, or Installation of Parts.

Form F-5 (concluded)

16. If Any Special Tools or Test Equipment (supplied with the [test item]) Were Used, Were They Adequate? ☐ YES ☐ NO

If NO, Please Explain Why They Were Inadequate.

_____

_____

17. Please Describe Any Recommendations You Have for Replacing Any Special Tools with Tools That You Have Used in Your Present or Past Jobs.

_____

_____

_____

_____

18. Test Officer Comments:

_____

_____

_____

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_____

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_____

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_____

_____

_____

_____

Recorder's Signature

FORM F-11. SAMPLE RELIABILITY MISSION LOG

Equipment Nomenclature:_____ Serial Number:_____ Test Site:_____

Date Mission Started:_____ Date Mission Completed:_____ Operators:_____

Time Mission Started:_____ Time Mission Completed:_____

				Operational Status				Maintenance			
Date of Entry	Time of Entry	Equipment Meter Reading	Amount of fuel added	Is Equipment Operating?	Observation of any Abnormal or Unusual Operation*	False Alarm*	Equipment Failure*	Any Adjustments or Services Performed?*	Equipment Performance Report Number	Remarks	Initials of Individual Making Entry
		(hours)	(gallons)	(yes/no)	(Check here and describe under remarks)	(yes/no)	(yes/no)	(Check here and describe under remarks)			

Additional Remarks:_____

_____

_____
Recorder's Signature

* Operator and maintenance personnel must complete the Malfunction and Maintenance Data Form (form F-5).

2.3.7 Concerns for Other Subtests

[If there are specific data that need to be collected in other subtests to address objectives and criteria in this subtest (e.g., functional check data, malfunction and maintenance data, safety data, or human factors (NET) data) please list them in the appropriate space below:]

a. Receipt Inspection subtest.

b. Tropic Storage and Performance subtest.

c. Logistic Supportability subtest.

d. Safety subtest.

e. Human Factors subtest.

[CATLOGSL] Name of Test _____

[NOTES:

1. For a comprehensive, detailed logistic supportability subtest, see DARCOM Regulation 700-15, as supplemented by TECOM.
2. The Logistic Supportability subtest will include the appropriate subelements listed below. Each subelement will use the same format as paragraph 2.4.
   a. Para 2.4.1 End Item Requirements
   b. Para 2.4.2 Supply Support
   c. Para 2.4.3 Technical Data/Equipment Publications
   d. Para 2.4.4 Support and Test Equipment
   e. Para 2.4.5 Manpower and Personnel, Training, and Training Devices
   f. Para 2.4.6 Transportation and Handling
   g. Para 2.4.7 Facilities
3. Evaluate the following statements and select, revise, add or delete, as necessary, according to the specific requirements of this test.]

2.4 LOGISTIC SUPPORTABILITY

2.4.1 Objective

Evaluate the logistic supportability of the [test item] in the humid tropics (Appendix A, part __, item__).

2.4.2 Criteria

a.

(Appendix A, part 2, item __).

b.

(Appendix A, part 3, item 3).

2.4.3 Data Required

a. The following completed data forms/checklists:

(1) Receipt Inspection and Physical Characteristics Checklists (form F-1) completed during receipt inspection.

(2) Physical Inspection Checklist (form F-2) completed for each physical inspection performed.

(3) Checklist for Detailed Analysis of Materials Problems (form F-3) completed for each materials analysis performed.

(4) Safety Checklist (form F-4) completed as described in paragraph 2.5.4 for each safety inspection performed.

(5) Malfunction and Maintenance Data Form (form F-5) completed for each malfunction and subsequent maintenance action performed.

(6) Functional Check Data Form (form F-6) completed for each functional check performed.

(7) Human Factors Questionnaire/Checklist (form F-7) completed after each [functional check/performance mission].

(8) Performance Mission Data Form (form F-8) completed for each performance mission conducted.

(9) Reliability Mission Log (form F-11) completed for each mission.

(10) Vehicle Use Log (form F-12) completed each time the [test item] is transported.

b. Copies of completed EPRs, if originated.

c. Time to complete periodic operator preventive maintenance checks and services, if any are required, to be entered in the test officer's project log.

d. Comments and observations by test personnel concerning the following, recorded in the test officer's project log:

(1) Clarity, accuracy, completeness, and general adequacy of the equipment publications.

(2) Adequacy of [test item] support and test equipment.

(3) Accessibility of [test item] subcomponents and test points.

(4) Problems with the storage, transportation, and use of the [specify the subcomponent fuel/ammo/etc.] used to [fuel/arm/etc.] the [test item].

2.4.4 Data Acquisition Procedure

a. Maintenance data collection during tropic testing will be limited to those maintenance actions required to support the [test item]. All maintenance will be performed by NET-or Military Occupation Speciality (MOS)-qualified personnel, following instructions in the maintenance manuals provided by the developer. Recommended changes and corrections to the manuals will be submitted on DA Form 2028 (Recommended Changes to Publications and Blank Forms), in accordance with established procedures.

b. [Test item] malfunctions, and subsequent corrective maintenance actions, will be recorded on the Malfunction and Maintenance Data Form (form F-5).

c. All scheduled maintenance actions, except periodic operator checks and services, will be recorded on form F-5. Actions performed during periodic operator checks and services will be recorded in the test officer's project log (including the time required to complete such actions). Any difficulties experienced during operator checks and services will be reported by EPRs.

d. Whenever the [test items] are transported, the transportation time and number of kilometers transported, by vehicle type, will be recorded on the Vehicle Use Log (form F-12), along with comments and observations concerning any problems associated with transporting the [test items]. Vehicles used to transport the [test item] will be limited to those available to USATTC at the time of the test.

e. Comments and observations from test personnel concerning any problems with the maintenance or support of the [test item] will be recorded in the test officer's project log. The Safety Checklist (form F-4), described in the Safety subtest (paragraph 2.5.4), and the Human Factors Questionnaire/ Checklist (form F-6), described in the Human Factors subtest (paragraph 2.6.4), will be completed by appropriate personnel to determine if there are any safety or human factors problems in the area of maintenance.

2.4.5 Analytical Procedure

[NOTE: First, specify general analytical procedures. Then, for each objective and criterion addressed in this subtest:

a. Specify which data (from which subtest) will be analyzed.
b. Specify how the data will be reduced.
c. Specify how the data will be compared against each criterion.
d. Specify the statistical procedure to be used, including the significance/confidence/risk coefficients when appropriate.
e. Specify the assumptions required by the analytic model.
f. If necessary, elaborate on the thought process that will lead to the determination that the criterion/objective will/will not be met.
g. State exactly on what basis the criterion/objective will be met.]

a. Maintenance and logistic supportability data will be presented in charts complying with the format described in DARCOM Regulation 700-15, as supplemented by TECOM (reference __).

b. Logistical data collected and presented in the final test report will be used for a subjective assessment of whether or not the logistic supportability of the [test item] is adequate for field support.

c. Point estimates for the maintenance ratio, mean-time-between-unscheduled-maintenance-actions, and mean-time-to-repair (MTTR) at each level of maintenance performed during the test will be calculated for the [test item] and presented in the final test report.

d. The final test report will include narrative descriptions of any shortcomings and deficiencies in the [test items'] design for maintainability, the equipment publications, and the support and test equipment for each maintenance level. A summary and narrative description of any operational, logisitic, or safety problems that test personnel encountered while using, storing, and handling the [test item] will be included in the final test report.

e. Criterion 2.4.2__ will be met if the demonstrated MTTRs at the organizational, direct support, and general support levels are no greater than __, __, and __ hours, respectively.

f. Criterion 2.4.2__ will be met if both of the following conditions occur:

(1) All [specify components] required by the [test item] are available in the Army inventory.

(2) In the test officer's opinion, supported by test data, no serious problems are encountered while transporting the [test item] with any test vehicle.

g. Criterion 2.4.2__ will be met if the maximum downtime for scheduled maintenance during tropic testing is less than or equal to __ minutes.

h. Criterion 2.4.2__ will be met if both of the following conditions occur:

(1) The demonstrated MTTR at the organizational level is no greater than __ hours.

(2) The demonstrated MTTRs at the direct and general support levels are no greater than __ and __ hours, respectively.

i. Criterion 2.4.2__ will be met if the point estimate of the maintenance ratio is less than or equal to _____.

j. Criterion 2.4.2__ will be met if the [test item] operator is required to perform only simple routine surveillance and preventative maintenance, such as cleaning the exterior, replacing batteries, and [specify routine action].

k. Criterion 2.4.2__ will be met if the demonstrated MTTRs at the organizational, direct support, and general support levels are no greater than [__, __, and __hours], respectively.

l. Objective 2.4.1___ will be met, in other words, the [test item] will be judged to be logistically supportable, if [specify each factor]:

(1) Factor 1 =

(2) Factor 2 =

(3) Factor 3 =

(4) Factor 4 =

m. Objective 2.1.1___ will be met for the [test item] if logistical data collected during the test, and presented in the final test report, support a subjective assessment that the SSP is adequate to support the [test item]. DARCOM regulation 700-15, as supplemented by TECOM, will be used as a guide in this assessment.

n. Logistical data collected during this test and presented in the final report will be used as the basis for a subjective assessment of whether or not the SSP is adequate to support the [test item] in the field. DARCOM Regulation 700-13 will be used as a guide in that assessment. Objective 2.4.1__ will be met only if the subjective assessment is that the SSP is adequate for field support of the [test item].

o. The achieved availability of the [test item] and the [control item] will be calculated as the ratio of the total operating time to the sum of the total scheduled and unscheduled maintenance time plus total operating time. Criterion 2.4.2__ cannot be addressed completely because of the limited operating time of the [test item]. If appropriate, a subjective assessment of the acceptability of the [test item] achieved availability will be made, based on available quantitative and qualitative data.

p. The ___data recorded on [form F-__] will be analyzed by the [specify the type of test] to determine the [specify the mean___/other average___/ etc.]. Objective 2.4.1__ will be met if [specify required conditions].

q. Safety and human factors data collected during this subtest will be evaluated in their respective subtests, paragraphs 2.5 and 2.6).

2.4.6 Support Requirements and Data Collection Forms/Checklists to be Used in Section 3

a. [NOTE: Determine support requirements for this subtest. Then, insure they are included in this list. You may add or delete as necessary. Specify how many support items/personnel will be required, and from where they will originate. The test officer will consolidate this list with those from other subtests to prepare Appendix C.]

APPENDIX C. SUPPORT REQUIREMENTS

Materiel	Quantity	Source
Tools for opening shipping containers and packages, such as hammer, band cutters, cutting pliers, or screwdrivers		
Materials handling equipment		
Photographic equipment--color video camera, still camera (color/black and white)		
Weighing scale		
Linear measuring scale		
Laboratory facilities		
Environmental storage cage		
Storage racks		
Rags		
Security fence		

Instrumentation	Quantity	Source
Ohm meter		
AC/DC voltmeters		
Oscillograph		
Stopwatch		
Frequency meter		

External Support	Quantity	Source
[NOTE: Coordinate at least 1 month before required date]		
Empire firing range		
Test participants		
Atmospheric Sciences Laboratory Meteorological Team (Panama)		

Personnel

Photographic specialists
Ammunition handlers
EOD personnel
Security personnel

b. [NOTE: The following data collection forms, referred to in this subtest, may be changed, as required, to collect necessary information. These forms will be compiled with those from other subtests and used as Appendix F. Use Privacy Act Statements on all forms requiring personal information (e.g., SSN, sex, date of birth). Statement should read as follows:

> Privacy Act Statement: This information is provided pursuant to Public Law 93-570 (Privacy Act of 1974), 31 December 1974. The information collected on this form will be used in the [name of test] final report. Personal information provided on this form is given on a voluntary basis. However, failure to provide this information may result in ineligibility to participate in this test.]

FORM F-12. SAMPLE VEHICLE USE LOG

Vehicle ID:_____[test item] ID No:_____ NOTE: Record time to the nearest 0.1 hour, and distance to the nearest 0.5 mile

Date	Test Item Serial No.	Starting Location	Destination	Vehicle Type	Initial Odometer Reading (miles)	Start Time of Trip (hr:min)	End Time of Trip (hr:min)	Final Odometer Reading (miles)	Comments Concerning Any Problems Associated with Transporting the [test item] (Use other side if necessary)	Signature of Individual Making Log Entry

NOTE: Standard units will be converted and presented as metric units in the final test report.

2.4.7 Concerns for Other Subtests

[If there are specific data that need to be collected in other subtests to address objectives and criteria in this subtest (e.g., receipt inspection or physical characteristics data, functional check data, malfunction and maintenance data, safety data, or human factors (NET) data) please list them in the appropriate space below:]

a. Receipt Inspection subtest.

b. Tropic Storage and Performance subtest.

c. Reliability subtest.

d. Safety subtest.

e. Human Factors subtest.

[CATPLSE] Name of Test _____

[NOTE: Evaluate the following statements and select, revise, add, or delete, as necessary, according to the specific requirements of this test.]

2.5 SAFETY

2.5.1 Objectives

a. Identify safety and health hazards which occur during operation and maintenance (Appendix A, part __, item __).

b. Evaluate the adequacy of safety guidance (to include warnings, cautions, and procedures in publications and on equipment) (Appendix A, part __, item __).

c. Assess the adequacy of safety and warning devices (Appendix A, part __, item __).

d. Determine if the safety guidance (to include warnings, cautions, and procedures in relevant manuals, publications, or affixed to the [test item]) is adequate to minimize the serverity of, or exposure to, hazards during [test item] use (Appendix A, part __, item __).

e. Insure that all existing and potential safety and health hazards associated with the [test item] are identified and documented (Appendix A, part __, item __).

f. Determine if the [test item] is safe to operate and maintain in the humid tropics (Appendix A, part __, item __).

2.5.2 Criteria

a.

(Appendix A, part 3, item __).

b.

(Appendix A, part 3, item __).

2.5.3 Data Required

a. The following completed data forms/checklists:

(1) Safety Checklist (form F-4) completed for each [trial/phase/day/safety incident/safety inspection] performed.

(2) Malfunction and Maintenance Data Form (form F-5) completed for each malfunction and subsequent maintenance action.

(3) Human Factors Questionnaire/Checklist (form F-7) completed after each [functional check/performance mission/maintenance action].

(4) Performance Mission Data Form (form F-8) completed for each performance mission conducted.

(5) Sound Pressure Level Data Collection Form (form F-9) completed for each [test item operation, sound pressure level test].

b. Narrative description, measurements, or photographs of conditions that would render the [test item] unsafe to operate or maintain.

c. Entries in the test officer's project log and photographs of any phase of operation where safety or health hazards are observed or encountered.

d. Number, description, and classification, according to MIL-STD-882A (reference ___) and TOP 1-1-012 (reference ___), of any safety or health hazards.

2.5.4 Data Acquisition Procedures

a. The test officer and USATTC safety officer will review and evaluate user publications to develop a safety SOP that will be followed during the test.

b. During receipt inspection, the test officer and the USATTC safety officer will inspect the [test item] for safety/health hazards using the Safety Checklist (form F-4) as a guide to determine if any conditions exist that would render the item unsafe to operate and maintain. The data required by form F-4 will be recorded.

c. After each functional check and performance mission, the test officer and each test participant will complete form F-4. Maintenance personnel also will complete form F-4 to determine if there are any safety/health hazards associated with maintaining the [test item]. Any safety/health hazards discovered during the test also will be recorded on form F-4. Potential hazards will be identified in accordance with MIL-STD-882A, and classified according to TOP 1-1-012 and other pertinent safety guidance.

d. Responses to the Malfunction and Maintenance Data Form (form F-5) and the Human Factors Questionnaire/Checklist (form F-7) administered to test participants who deployed the [test item] also will be used in the safety evaluation.

e. The data recorded on the Sound Pressure Level Data Collection Form (form F-9) will be evaluated to determine if the noise produced by the test item constitutes a safety hazard.

2.5.5 Analytical Procedure

[NOTES: First, specify general analytical procedures. Then, for each objective and criterion addressed in this subtest:

a. Specify which data (from which subtest) will be analyzed.
b. Specify how the data will be reduced.
c. Specify how the data will be compared against each criterion.
d. Specify the statistical procedure to be used, including the significance/confidence/risk coefficients when appropriate.
e. Specify the assumptions required by the analytic model.
f. If necessary, elaborate on the thought process that will lead to the determination that the criterion/objective will/will not be met.
g. State exactly on what basis the criterion/objective will be met.]

a. Completed forms F-4, F-5, F-7, and F-9, along with incidental observations and data, will be examined to determine whether or not the [test item] is safe to operate and maintain. Safety inspection results and data regarding health and safety hazards will be summarized in the final report.

b. Data recorded during this subtest will be presented in tabular form in the final report and will be documented by photographs, where appropriate.

c. Criterion 2.5.2__ will be met if . . . .

d. Criterion 2.5.2__ will be met if . . . .

e. Objective 2.5.1__ will be met if . . . .

f. Objective 2.5.1__ will be met if . . . .

g. Objective 2.5.1__ will be met if . . . .

h. Objective 2.5.1__ will be met if an evaluation of the data collected on the forms F-4, F-5, F-7, and F-9, and the data recorded in the test officer's project log, do not identify any safety hazards associated with storing, transporting, handling, and operating the [test item].

2.5.6 Support Requirements and Data Collection Forms/Checklists to be Used in Section 3

[NOTE: Determine support requirements for this subtest. Then, insure they are included in this list. You may add or delete as necessary. Specify how many support items/personnel will be required, and from where they will originate. The test officer will consolidate this list with those from other subtests to prepare Appendix C.]

APPENDIX C. SUPPORT REQUIREMENTS

Materiel	Quantity	Source
Tools for opening shipping containers and packages, such as hammer, band cutters, cutting pliers, or screwdrivers		
Materials handling equipment		
Photographic equipment--color video camera, still camera (color/black and white)		
Weighing scale		
Linear measuring scale		
Laboratory facilities		
Environmental storage cage		
Storage racks		
Rags		
Security fence		

Instrumentation		
Ohm meter		
AC/DC voltmeters		
Oscillograph		
Stopwatch		
Frequency meter		

External Support	Quantity	Source
[NOTE: Coordinate at least 1 month before required date]		
Empire firing range		
Test participants		
Atmospheric Sciences Laboratory Meteorological Team (Panama)		

Personnel

Photographic specialists
Ammunition handlers
EOD personnel
Security personnel

[NOTE: The following data collection forms, referred to in this subtest, may be changed, as required, to collect necessary information. These forms will be compiled with those from other subtests and used as Appendix F. Use Privacy Act Statements on all forms requiring personal information (e.g., SSN, sex, date of birth). Statement should read as follows:

> Privacy Act Statement: This information is provided pursuant to Public Law 93-570 (Privacy Act of 1974), 31 December 1974. The information collected on this form will be used in the [name of test] final report. Personal information provided on this form is given on a voluntary basis. However, failure to provide this information may result in ineligibility to participate in this test.]

FORM F-4. SAMPLE SAFETY CHECKLIST

Name _____ Rank _____

Test Function/Position _____

The following items or conditions will be observed; the adequacy of design will be rated as follows:

Yes = Adequate No = Inadequate NA = Not Applicable

If you encountered safety problems, please describe them briefly in the space provided.

Safety Item	Yes	No	N/A	Describe Problem
1. Electrical Hazards				
a. Are covers, structural members, and similar electrically neutral parts of electrical systems either grounded or protected so personnel and tools cannot touch them?	☐	☐	☐	
b. Is the main power switch in an easily accessible location?	☐	☐	☐	
c. Does the main power switch cut off all power to the complete system?	☐	☐	☐	
d. Does the design incorporate methods to protect personnel from accidental contact with voltages in excess of 30 volts while operating the system?	☐	☐	☐	
e. Can power be shut off when installing, replacing, or interchanging a complete system, assembly, or part?	☐	☐	☐	

Form F-4 (cont)

Safety Item	Yes	No	N/A	Describe Problem
f. Is the path to ground from the equipment continuous or permanent?	☐	☐	☐	
g. Are all contacts, terminals and like devices with potentials in excess of 500 volts marked clearly: DANGER HIGH VOLTAGE?	☐	☐	☐	
h. Is the ground connection to the chassis or frame secured mechanically?	☐	☐	☐	
i. Are energized components located or enclosed so that suitable protection is provided against contact with uninsulated items?	☐	☐	☐	
j. Are components, conductors, and shielding appropriately located so that overheating, arcing, and shorting is avoided?	☐	☐	☐	
k. Are interlocks provided in compartments having voltages in excess of 70 volts?	☐	☐	☐	
l. Are electrical connectors designed to insure that only the correct plug can be inserted in a receptacle or other mating unit?	☐	☐	☐	
m. Where design considerations require plugs and receptacles of similar configuration, are mating plugs and receptacles suitably coded or marked?	☐	☐	☐	

Form F-4 (cont)

Safety Item	Yes	No	N/A	Describe Problem
n. Is the equipment provided with sufficient caution plates to warn personnel of potential safety hazards?	☐	☐	☐	
o. Are DC input power connections marked clearly for polarity?	☐	☐	☐	
p. Are grounding rods furnished?	☐	☐	☐	
q. Are wires and cables supported and terminated adequately to prevent shock and fire hazard?	☐	☐	☐	
r. Are wires and cables protected properly at points where they pass through metal partitions?	☐	☐	☐	
s. Are controls located away from high voltage points?	☐	☐	☐	
t. Are emergency controls placed in readily accessible positions?	☐	☐	☐	
u. Are suitable alarm or shutdown devices provided to safeguard against operator injury or equipment failure?	☐	☐	☐	
v. Are on-off or fail-safe circuits used wherever possible to minimize failures without operator knowledge?	☐	☐	☐	
w. Are potential electrical hazards treated adequately in the instruction manual?	☐	☐	☐	

Form F-4 (cont)

Safety Item	Yes	No	N/A	Describe Problem
x. Are proper tools and test equipment furnished with the test item?	☐	☐	☐	
2. Mechanical Hazards				
a. Is the weight distributed so that the equipment is easy to handle, move, or position?	☐	☐	☐	
b. Is the equipment designed so that the center of gravity and the configuration of legs and supports makes the equipment unlikely to tip over from unbalance or strong wind?	☐	☐	☐	
c. Are edges of components and access openings either rounded or protected by rubber, fiber, or plastic?	☐	☐	☐	
d. Do all moving parts of machinery have mechanical guards?	☐	☐	☐	
e. When switches or controls initiate hazardous operations (such as ignition), are they interlocked so a related or locking control must be released first?	☐	☐	☐	
f. Are doors and other openings with their catches, hinges, supports, fasteners, and stops designed to minimize the possibility of injury to personnel?	☐	☐	☐	

Form F-4 (cont)

Safety Item	Yes	No	N/A	Describe Problem
g. Is fastening adequate to insure rigidity and satisfactory holding ability?	☐	☐	☐	
h. Are components located and mounted so maintenance personnel have easy access to them without hazards from electrical charges, heat, sharp edges and points, and moving parts?	☐	☐	☐	
i. Is the equipment provided with suitable carrying handles?	☐	☐	☐	
j. Are handles positioned so they cannot catch on other units?	☐	☐	☐	
k. Are safety or relief valves provided for pressurized components of the system?	☐	☐	☐	
l. Are safety or relief valves adjusted to their proper setting?	☐	☐	☐	
m. Are potential mechanical hazards treated adequately in the instruction manual?	☐	☐	☐	
n. Are proper tools and test equipment furnished with the test item?	☐	☐	☐	

Form F-4 (cont)

Safety Item	Yes	No	N/A	Describe Problem
3. Miscellaneous Hazards				
a. Are there portable, hand-operated fire extinguishers supplied with the system?	☐	☐	☐	
b. Are fire extinguishers of the correct type?	☐	☐	☐	
c. Are adjustment devices and commonly replaced parts located away from hot parts?	☐	☐	☐	
d. Does the test item design allow for adequate cooling?	☐	☐	☐	
e. Do instructions specify type of cleaning fluid and precautions to be taken when cleaning the equipment?	☐	☐	☐	
f. Are the requirements for the use of protective clothing noted explicitly?	☐	☐	☐	
g. Is the ambient noise level acceptable for personal safety and efficiency?	☐	☐	☐	
h. Is the equipment provided with sufficient caution plates to warn maintenance personnel of potential safety hazards?	☐	☐	☐	
i. Are warning signs coded and colored in accordance with Army Regulations?	☐	☐	☐	

Form F-4 (concluded)

Safety Item	Yes	No	N/A	Describe Problem
j. Are miscellaneous potential hazards treated adequately in the instruction manual?	☐	☐	☐	
k. Is heat stress to personnel excessive because of exposure to high temperature or wearing protective clothing?	☐	☐	☐	

4. Other Items

2.5.7 Concerns for Other Subtests

[If there are specific data that need to be collected in other subtests to address objectives and criteria in this subtest (e.g., receipt inspection or physical characteristics data, functional check data, malfunction and maintenance data, or human factors (NET) data) please list them in the appropriate space below:]

a. Receipt Inspection subtest.

b. Tropic Storage and Performance subtest.

c. Reliability subtest.

d. Logistic Supportability subtest.

e. Human Factors subtest.

[CATPLHF] Name of Test _____

[NOTE: Evaluate the following statements and select, revise, add, or delete, as necessary, according to the specific requirements of this test.]

2.6 *HUMAN FACTORS*

2.6.1 Objectives

a. Determine if properly trained and equipped soldiers can transport, emplace, operate, recover, and maintain the [test item] adequately in a humid tropic environment (Appendix A, part __, item __).

b. Determine if the [test item] system can be used easily by [USATTC personnel or test subject soldiers] who must [operate, maintain, functionally use, perform, identify, carry, launch, or be warned/protected by] the system in the humid tropics (Appendix A, part __, item __).

c. Evaluate the impact of soldier performance time and errors on system effectiveness in the humid tropics (Appendix A, part __, item __).

2.6.2 Criteria

a.

(Appendix A, part 3, item __).

b.

(Appendix A, part 3, item __).

2.6.3 Data Required

a. Narrative results of the NET and human factors aspects of the [test item] pretest inspection conducted during the _____subtest.

b. The following completed checklists/data forms:

(1) Safety Checklists (form F-4) completed for each [trial/phase/hour/mode/inflation/deflation/erection/striking/_____] during the _____ subtest.

(2) Functional Check Data Forms (form F-6) and Performance Mission Data Forms (form F-8) completed for each [trial/phase/hour/mode/inflation/deflation/erection/striking/_____] during the _____ subtest.

(3) Human Factors Questionnaire/Checklists (form F-7) completed for each [trial/ phase/hour/mode/inflation/erection/striking/_____] during the _____ subtest.

c. Anthropometric data (form F-__) for all test participants, at the [beginning/middle/end] of each [phase/trial/part/portion] during the _____ subtest.

d. Time to perform specific tasks under conditions shown below. Specific tasks and conditions are on the data form.

(1) Unloading the [test item] per form F-__ [before, during, after] each [trial, phase, functional use] during the _____ subtest.

(2) Setting up the [test item] per form F-__ [before, during, after] each [trial, phase, functional use] during the _____ subtest.

(3) Operating the [test item] per form F-__ [before, during, after] each [trial, phase, functional use] during the _____ subtest.

(4) Striking the [test item] per form F-__ [before, during, after] each [trial, phase, functional use] during the _____ subtest.

(5) Packing the [test item] per form F-__ [before, during, after] each [trial, phase, functional use] during the _____ subtest.

(6) Loading the [test item] per form F-__ [before, during, after] each [trial, phase, functional use] during the _____ subtest.

e. Microenvironmental data (forms F-__ through F-__) for each [trial, phase, functional use] during the _____ subtest.

f. Detectability distances and times from the ground-to-ground target detection test in the Human Factors Jungle Test Area (HFJTA) (form F-__) for each _____.

g. Course times (to the nearest minute) from the manpack portability course (form F-__) for each _____.

h. Navigation times and distances errors from the land navigation course (form F-__) for each _____.

i. Rifle accuracy scores (form F-__) from the rifle marksmanship test for each _____.

j. Scores from the sound localization test (form F-___) for each _____.

k. Human Factors Error Reports (form F-13) completed as required.

2.6.4 Data Acquisition Procedure

a. During the first [inspection, functional check] in the [Receipt Inspection, Tropic Storage and Performance] subtest, the [test officer,

developer] will conduct NET. The test officer and human factors personnel will evaluate the training methods and aids used during NET. Additionally, the test officer and human factors personnel will examine the system for item design and use characteristics that may need to be corrected before active testing begins. MIL-STD-1472C (reference __), as well as other pertinent documentation, will be used as guides during these evaluations.

b. A task analysis (detailed listing of actions that a soldier must perform to operate or maintain an item) will be performed by the test officer and human factors personnel upon receipt of operator and maintenance manuals. The Human Factors Questionnaire/Checklist (form F-7) will be revised to include detailed tasks specific to the [test item]. USATTC human factors personnel will administer form F-7 to the test participants after each [deployment/trial/functional check/use] during the _____ subtest, and after each [deployment/trial/functional check/use] during the _____ subtest. Form F-7 will be used as a diagnostic tool to discover soldier-related item design, use, or environmental characteristics that degrade system effectiveness in the humid tropics. Persons administering form F-7 will insure that questionnaire responses of "hard," "very hard," or "can't do" are explained fully on the questionnaire. Tasks rated in these categories, consistently by test participants and by the test officer, will be investigated and documented objectively with supplementary measurements to explain the degree of difficulty encountered by the soldier (e.g, force to push or pull, distance to reach, size/location of handles, location of rubbing or chafing of clothing or equipment) or characteristics of the work environment (e.g., amount of light, temperature, relative humidity, vibration, wind conditions) that affect performance. If necessary, special trials will be conducted to document the nature of relevant, serious problems discovered by administering the questionnaire (e.g., determining the probability of detecting the noise or the light emitted from the [test item] at various observer distances in a humid tropic forest).

c. Anthropometric data will be collected during the _____ and _____ subtests using [form F-__]. Measurements will be made in the Human Factors Laboratory using standard anthropometric instrumentation. Personnel falling outside of the range of the 5th percentile female to 95th percentile male soldier population values for relevant characteristics will be noted on [form ___] and in the test officer's project log.

d. During each [functional check, performance trial/mission, reliability mission, test mission, test cycle] of the _____ subtest, [specify the number of] MOS qualified and trained soldiers will be timed in their performance of the following tasks: [unloading, unpacking [test item], setting up [test item] for operational use, operating [test item], dissassembling the [test item], packing [test item], loading [test item], _____, _____, _____, and _____. Exact definitions of when timing starts and stops for each task are on forms [F-__ through F-__] upon which performance, time, and error data will be recorded.

e. Microenvironmental data [temperature, relative humidity, air speed, noise, shock, vibration, light level] (determined by human factors personnel to be required) will be collected by human factors personnel to document ambient and workspace environmental conditions relevant to ease, comfort, and safety of the soldier or as background information for performance trials. Data will be recorded on [forms ____ through ____].

f. Ground-to-ground target detection tests will be conducted [during/following] the _____ subtest according to procedures in TOP 1-1-054 (reference ___), using the site designated for this purpose in the HFJTA at Gamboa. The [test item] will be compared to the [standard item, unaided eye] by having trained military observers search for standard targets (soldiers in OD jungle fatigue uniforms) while using the [test item] and while using the [standard item, unaided eye] according to the design in table HF-1a.

TABLE HF-1a. GROUND-TO-GROUND TARGET DETECTION TESTING ORDER

Item Used by Observer	Target Lane	Observer Number 1	2	3	4	5	6
[Test Item]	1	4	23	30	43	50	69
	2	6	19	26	45	52	71
	3	1	20	27	46	53	72
	4	3	22	29	48	49	68
	5	2	21	28	47	54	67
	6	5	24	25	44	51	70
[Standard Item, Unaided eye]	1	11	16	36	39	55	62
	2	8	17	33	37	60	64
	3	10	14	31	42	57	65
	4	7	15	35	38	58	66
	5	12	13	34	41	56	63
	6	9	18	32	40	59	61

[NOTE: If the test item is a uniform or other piece of clothing or equipment, and the purpose of the test is to determine how easily it can be seen, then use the following paragraph f and table rather than the above.]

f. Ground-to-ground target detection tests will be conducted [during/following] the _____ subtest according to procedures in TOP 1-1-054, using the site designated for this purpose in the HFJTA at Gamboa. The test item will be compared to the [standard item] by having trained targets [wear/carry] the items while trained observers attempt to detect them with the unaided eye according to the design in table HF-16.

TABLE HF-1b. GROUND-TO-GROUND TARGET DETECTION TESTING ORDER

Target Lane	Observer Number 1	2	3	4	5	6
1	4S	23T	30T	43T	50S	69S
2	6S	19S	26T	45T	52T	71S
3	1S	20S	27S	46T	53T	72T
4	3T	22S	29S	48S	49T	68T
5	2T	21T	28S	47S	54S	67T
6	5T	24T	25T	44S	51S	70S
1	11T	16S	36S	39S	55T	62T
2	8T	17T	33S	37S	60S	64T
3	10T	14T	31T	42S	57S	65S
4	7S	15T	35T	38T	58S	66S
5	12S	13S	34T	41T	56T	63S
6	9S	18S	32S	40T	59T	61T

T = Test Item
S = Standard Item

g. Manpack portability tests will be conducted . . . .

h. Land navigation tests will be conducted . . . .

i. Rifle marksmanship tests will be conducted . . . .

j. Sound localization tests will be conducted . . . .

2.6.5 Analytical Procedure

[NOTE: First, specify general analytical procedures. Then, for each objective and criterion addressed in this subtest:

a. Specify which data (from which subtest) will be analyzed.
b. Specify how the data will be reduced.
c. Specify how the data will be compared against each criterion.
d. Specify the statistical procedure to be used, including the significance/confidence/risk coefficients when appropriate.
e. Specify the statistical procedure to be used, including the significance/confidence/risk coefficients when appropriate.

f. If necessary elaborate on the longest process that will lead to the determination that the criterion/objective will/will not be met.
g. State exactly on what basis the criterion/objective will be met.]

a. Adequacy of human factors engineering design and of training, including NET manuals and aids, will be evaluated by the test officer and human factors personnel during the Receipt Inspection subtest. Results of this evaluation and responses to training-related items on the Human Factors Questionnaire/Checklist (form F-7) will be summarized in the results paragraphs of the human factors subtest of the final report. If human factors engineering design or training manuals or aids are rated as inadequate by test personnel or test participants, then the [general human factors criterion 2.6.2__ will not be met] [general human factors objective 2.6.1__) will not be met] [specific training criterion, paragraph 2.6.2__ will not be met].

b. Data from the Human Factors Questionnaire/Checklist (form F-7) will be summarized on a questionnaire and included in an appendix of the final report. Any task reported as "hard," "very Hard," or "can't do" by 10 percent or more of the test personnel, and any task reported as unsafe by the test officer or safety officer, will be listed as human factors results in the final report with an explanation of the nature of the difficulty or unsafe condition. The test officer, safety officer, and human factors personnel will determine if a Human Factors Error Report (form F-13) will be prepared for such difficulties or unsafe conditions. The research psychologist will prepare forms F-13 resulting from subjective questionnaire data and use to address [appropriate criteria and issues].

c. Anthropometric data collected during the _____ and _____ subtests will be be listed in raw form in an appendix of the final report. Relevant summaries will be presented in human factors results paragraph, listed on Human Factor Error Reports when appropriate, and discussed in human factors analysis paragraphs in the final report. Such data will be related to criteria, if a factor in whether or not the issues or criteria are met.

d. Performance time and error data (sample size, mean, standard deviation) will be summarized in the results paragraph of the _____ subtest and discussed in the corresponding analysis paragraph. A one-tailed t-test will be performed at the 0.05 level of significance to determine if the obtained performance time exceeds the level specified in [criterion 2.6.2 __]. [Criterion 2.6.2 __] will not be met if the obtained time is statistically greater than the criterion time.

e. _____, _____, and _____ microenvironmental data from the _____ subtest, which are important in determining if [criterion 2.6.2__] is met, will be listed in an appendix and summarized in the human factors results paragraph in the final report. The data will be listed also on appropriate EPRs and Human Factors Error Reports. The extent to which these data are relevant to addressing an objective or criterion will

be addressed in the analysis paragraph of the human factors subtest. [Criterion 2.6.2__] will be met if the 90-percent level of the _____ data does not exceed the criterion values.

f. For the ground-to-ground target detection tests, detection distance data will be tabulated in a cumulative probability series and presented in graphic form to display the probability of detecting a target by line of sight distance of the target from the observer. Differences in the detectability of different types of targets or differences that various viewing modes (e.g., vision device vs. unaided eye) have on the ability to detect standard targets will be determined by analysis of variance. Dependent variables will be detection distances for moving target tests and detection distances plus time-to-detect for stationary target tests. All analyses will use the 0.05 level of statistical significance.

g. For the manpack portability course . . . .

h. For the land navigation tests . . . .

i. For the rifle fire accuracy test . . . .

j. For the sound localization test . . . .

k. Human Factors Error Reports (form F-13) will be used to explain the following: consistently difficult or time-consuming tasks; adverse environmental conditions that may affect the soldiers ability to use, operate, or maintain the [test item]; item design characteristics that affect system safety or effectiveness; or consistent operator/maintainer errors (performing a step in a dangerous/unsafe or unsatisfactory manner; performing a step out of sequence; failing to perform a step; performing unnecessary steps; not being aware of or warned about unsafe conditions). The following sources of objective and subjective data document such conditions or characteristics: the Human Factors Questionnaire/Checklist (form F-7), to be administered during all subtests; special performance/time trials or investigations conducted to document problems discovered by administering questionnaires or checklists; observations by test personnel; or analyses of entries made in the test officer's project log. Completed Human Factors Error Reports (Form F-13) will be used as basic information to determine whether or not the [test item] is safe and easy to operate and maintain and if human factors- or soldier-related deficiencies or shortcomings exist during humid tropic testing.

2.6.6 Support Requirements and Data Collection Forms/Checklists to be Used in Section 3

[NOTE: Determine support requirements for this subtest. Then, insure they are included in this list. You may add or delete as necessary. Specify how many support items/personnel will be required, and from where they will originate. The test officer will consolidate this list with those from other subtests to prepare Appendix C.]

APPENDIX C. SUPPORT REQUIREMENTS

Materiel	Quantity	Source
Tools for opening shipping containers and packages, such as hammer, band cutters, cutting pliers, or screwdrivers		
Materials handling equipment		
Photographic equipment--color video camera, still camera (color/black and white)		
Weighing scale		
Linear measuring scale		
Laboratory facilities		
Environmental storage cage		
Storage racks		
Rags		
Security fence		

Instrumentation		
Ohm meter		
AC/DC voltmeters		
Oscillograph		
Stopwatch		
Frequency meter		

External Support	Quantity	Source
[NOTE: Coordinate at least 1 month before required date]		
Empire firing range		
Test participants		
Atmospheric Sciences Laboratory Meteorological Team (Panama)		

Personnel

Photographic specialists
Ammunition handlers
EOD personnel
Security personnel

[NOTE: The following data collection forms, referred to in this subtest, may be changed, as required, to collect necessary information. These forms will be compiled with those from other subtests and used as Appendix F. Use Privacy Act Statements on all forms requiring personal information (e.g., SSN, sex, date of birth). Statement should read as follows:]

> Privacy Act Statement: This information is provided pursuant to Public Law 93-570 (Privacy Act of 1974), 31 December 1974. The information collected on this form will be used in the [name of test] final report. Personal information provided on this form is given on a voluntary basis. However, failure to provide this information may result in ineligibility to participate in this test.]

FORM 7. SAMPLE HUMAN FACTORS QUESTIONNAIRE/CHECKLIST: [test item]

Performance Trial No. _____ Date _____ Time _____

Name/Rank _____ MOS/Job _____ Unit _____

First, check how easy or hard it was to do the task. Then, if you checked "Hard," "Very Hard," or "Can't Do," explain the problem with the item in the space under the question.	VERY EASY	EASY	A LITTLE HARD	HARD	VERY HARD	CAN'T DO	NA
PREPARING FOR OPERATION							
1. Mounting steps							
2. Using handholds							
3. Raising/lowering load to/from platform							
4. Reading warning labels							
5. Opening/closing doors							
6. Identifying parts							
7. Connecting parts							

Form F-7 (cont)

First, check how easy or hard it was to do the task. Then, if you checked "Hard," "Very Hard," or "Can't Do," explain the problem with the item in the space under the question.	VERY EASY	EASY	A LITTLE HARD	HARD	VERY HARD	CAN'T DO	NA
8. Inspecting parts							
9. Determining control readiness							
10. Reading gauges							
11. Adjusting gauges							
12. Putting on special clothing							
OPERATING THE ITEM							
13. Reading labels							
14. Checking displays							

Form F-7 (cont)

First, check how easy or hard it was to do the task. Then, if you checked "Hard," "Very Hard," or "Can't Do," explain the problem with the item in the space under the question.	VERY EASY	EASY	A LITTLE HARD	HARD	VERY HARD	CAN'T DO	NA
15. Manipulating controls							
16. Seeing where you are going							
USING THE WEAPON							
17. Positioning weapon for firing							
18. Locating the target							
19. Aiming							
20. Altering aim							
21. Verifying hit or miss							

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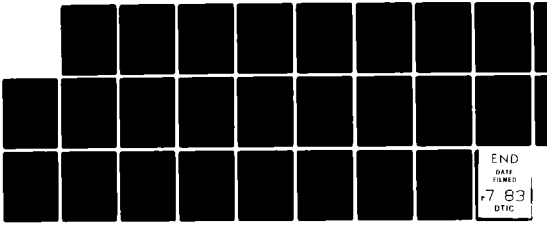

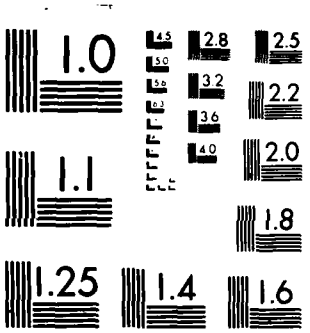

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

Form F-7 (cont)

First, check how easy or hard it was to do the task. Then, if you checked "Hard," "Very Hard," or "Can't Do," explain the problem with the item in the space under the question.	VERY EASY	EASY	A LITTLE HARD	HARD	VERY HARD	CAN'T DO	NA
PERFORMING PREVENTIVE MAINTENANCE							
22. Gaining access to compartments							
23. Obtaining tools							
24. Adjusting components							
25. Conducting checkouts							
26. Removing components							
27. Replacing components							
28. Determining status of expendables							
29. Removing expendables							

Form F-7 (cont)

First, check how easy or hard it was to do the task. Then, if you checked "Hard," "Very Hard," or "Can't Do," explain the problem with the item in the space under the question.	VERY EASY	EASY	A LITTLE HARD	HARD	VERY HARD	CAN'T DO	NA
30. Adding expendables							
PERFORMING CORRECTIVE MAINTENANCE							
31. Knowing that a failure occurred							
32. Identifying faulty component							
33. Using test sets							
34. Obtaining correct tools							
35. Removing component							
36. Disassembling component							

Form F-7 (cont)

First, check how easy or hard it was to do the task. Then, if you checked "Hard," "Very Hard," or "Can't Do," explain the problem with the item in the space under the question.	VERY EASY	EASY	A LITTLE HARD	HARD	VERY HARD	CAN'T DO	NA
37. Inspecting parts							
38. Troubleshooting							
39. Performing repair							
40. Reassembling components							
41. Installing component							
42. Knowing that problem is fixed							
43. Using manuals							

Form F-7 (cont)

First, check how easy or hard it was to do the task. Then, if you checked "Hard," "Very Hard," or "Can't Do," explain the problem with the item in the space under the question.	VERY EASY	EASY	ALITTLE HARD	HARD	VERY HARD	CAN'T DO	NA
TRANSPORTING THE ITEM							
44. Positioning/securing movable/projecting components							
45. Removing expendable liquids							
46. Inserting shock proofing material							
47. Anchoring item in crate							
48. Applying labels							
49. Attaching/removing hooks/cables to/from lifting points							
50. Using materiel handling equipment							

Form F-7 (cont)

First, check how easy or hard it was to do the task. Then, if you checked "Hard," "Very Hard," or "Can't Do," explain the problem with the item in the space under the question.	VERY EASY	EASY	A LITTLE HARD	HARD	VERY HARD	CAN'T DO	NA
51. Lifting/positioning item on vehicle							
52. Securing ties to item							
53. Securing ties to vehicle							
54. Adjusting tension on ties							
55. Checking security of item during transit							
56. Removing item from vehicle							
57. Assembling item							

Form F-7 (cont)

First, check how easy or hard it was to do the task. Then, if you checked "Hard," "Very Hard," or "Can't Do," explain the problem with the item in the space under the question.	VERY EASY	EASY	A LITTLE HARD	HARD	VERY HARD	CAN'T DO	NA
ERECTING/STRIKING THE ITEM							
58. Unpacking components							
59. Identifying components							
60. Checking for damages							
61. Joining components							
62. Aligning components							
63. Lifting components							
64. Reaching components							

Form F-7 (cont)

First, check how easy or hard it was to do the task. Then, if you checked "Hard," "Very Hard," or "Can't Do," explain the problem with the item in the space under the question.	VERY EASY	EASY	A LITTLE HARD	HARD	VERY HARD	CAN'T DO	NA
65. Fastening components							
66. Adjusting securing mechanisms							
67. Disassembling components							
68. Repacking components							

69. Overall, how do you rate the [test item]?

☐ Extremely Good ☐ Very Good ☐ Good ☐ Poor ☐ Very Poor ☐ Extremely Poor

70. Please explain any problems, particularly safety-related problems, not mentioned above.

71. If you could change the [test item] to improve it, what would you do?

FORM F-13. SAMPLE HUMAN FACTORS ERROR REPORT

Evaluator:_____ Rank/Grade:_____

Test Title:_____ Date:_____

Task or Subtest:_____ Error Report No.:_____

1. Description of error: describe exactly what the person did or failed to do that resulted in the error; describe exactly the equipment, component, or tools involved; explain what was supposed to be done or task required.

_____

_____

2. Factors contributing to error: time constraints, stress, weather, hazards, other._____

_____

3. Consequences of error: (describe in detail) _____

_____

4. Seriousness of error: (check one)

	Comments
____ Hazard to personnel or equipment	_____
____ Degradation of system performance	_____
____ Degradation of subsystem performance	_____
____ Degradation of component performance	_____
____ No effect on performance	_____
____ Other (describe)	_____

5. Corrective action taken:_____

_____

6. The chance of this error occurring in a real, operational, or combat situation is considered to be: (check one)

Less likely____ About the same____ More likely____

Why? (explain)_____

7. Suggestions for eliminating or reducing chance of error: (consider change in procedure, training, warning labels, design of hardware)_____

_____

_____

2.6.7 Concerns for Other Subtests

[If there are specific data that need to be collected in other subtests to address objectives and criteria in this subtest (e.g., receipt inspection or physical characteristics data, functional check data, malfunction and maintenance data, or safety data, please list them in the appropriate space below:]

a. Receipt Inspection subtest.

b. Tropic Storage and Performance subtest.

c. Reliability subtest.

d. Logistic Supportability subtest.

e. Safety subtest.

SECTION 3. APPENDIXES

APPENDIX A. CRITICAL ISSUES, OTHER ISSUES, AND TEST CRITERIA

Item	Source	Issues/Criteria	Applicable Subtest	Remarks

PART 1. CRITICAL ISSUES

[Provided by operations research analyst from IEP/TDP.]

PART 2. OTHER ISSUES

[Provided by operations research analyst from IEP/TDP.]

PART 3. TEST CRITERIA

[Provided by operations research analyst from IEP/TDP.]

NOTE: Underlined portions will not be evaluated.

APPENDIX B. TEST EXECUTION DIRECTIVE

(COPY)

[Include a copy of the Test Execution/Planning Directive here.]

(END COPY)

(Inclosures not included)

APPENDIX C. SUPPORT REQUIREMENTS

[NOTE: Compiled from subtest inputs]

Materiel	Quantity	Source
Tools for opening shipping containers and packages, such as hammer, band cutters, cutting pliers, or screwdrivers		
Materials handling equipment		
Photographic equipment--color video camera, still camera (color/black and white)		
Weighing scale		
Linear measuring scale		
Laboratory facilities		
Environmental storage cage		
Storage racks		
Rags		
Security fence		

Instrumentation

Ohm meter
AC/DC voltmeters
Oscillograph
Stopwatch
Frequency meter

External Support

[NOTE: Coordinate at least 1 month before required date]

Empire firing range
Test participants
Atmospheric Sciences Laboratory Meteorological Team (Panama)

Personnel	Quantity	Source
Photographic specialists		
Ammunition handlers		
EOD personnel		
Security personnel		

APPENDIX D. TEST SCHEDULE

[NOTES: 1. Provide realistic schedules, based upon hardware receipt dates.
2. Identify/schedule high-risk subtests early in test.
3. See TECOM Reg 70-24 page A-13.]

X = Hardware Delivery Date

Name of Subtest		Time Increment (months) X	X+1	X+2	X+3	X+4	X+5	X+6	X+7	X+8	X+9	X+10
Receipt Inspection and Physical Characteristics												
Tropic Storage and Performance	Storage											
	Performance											
Reliability												
Logistic Supportability												
Safety												
Human Factors												

APPENDIX E. INFORMAL COORDINATION

[List addressees specified in Test Directive.]

APPENDIX F. TEST DATA FORMS

[Compiled from forms listed at end of subtests.]

APPENDIX G. FAILURE DEFINITION AND SCORING CRITERIA

INCIDENT CLASSIFICATION GUIDE

1. INTRODUCTION: In order to understand and classify test incidents, it must be clearly understood what constitutes an incident.

a. Definition of Incident: The occurrence or detection of any actual, intermittent, or incipient malfunction, safety hazard, or degradation in the required performance of a system.

b. Amplification of Definition: An incident is any event, regardless of its apparent importance or lack thereof, that is out of the ordinary, unexpected, or other than that required for the system/item.

2. NO TEST:

a. Definition of No Test: An incident which produces invalid data because of improper operating or maintenance conditions, accident, test item abuse, improper procedures, or its occurrence during pre- or post-test operations.

b. Amplification of Definition: These are incidents which are not charged as maintenance actions or failures, which include:

(1) Actual or incipient defects which may or may not cause an incident that are detected and/or corrected during initial technical inspection prior to test initiation.

(2) Actual or incipient malfunctions resulting from not following the prescribed operational or maintenance procedures dictated by the equipment manuals or which can be directly attributed to improper replacement of components or omission of prescribed scheduled service or inspection.

(3) Actual or incipient incidents resulting from test item abuse, unrealistic operating conditions, non-valid test or accident which could not occur under field conditions.

(4) Actual or incipient occurrences subsequently traced to a common and predictable failure mode which are positively isolated, corrected, and verified by adequate test under identical conditions.

3. NO FAILURE:

a. Definition of No Failure: An incident which is secondary, not resulting in the breech of any required performance tolerance, or concerns preventative maintenance.

b. Amplification of Definition: These are incidents that are not classified as failures which may result in unscheduled maintenance.

(1) A secondary incident that results from a failure and whose corrective maintenance times will be included with the basic failure.

(2) An intermittent or incipient malfunction which can be deferred for the remainder of the specified life before overhaul, replacement, rebuild, or salvage, without breeching a required performance tolerance.

(3) Actions which are cosmetic in nature and have no functional reason for repair.

(4) Preventative maintenance actions as defined by MIL-STD-721B [reference __]; i.e., "the actions performed in an attempt to retain an item in a specified condition by providing systematic inspection, detection and prevention of incipient failure."

(a) Scheduled preventative maintenance actions are test incidents programmed to occur, such as, inspection, checks, regular prescribed replacement of components, and detection of incipient malfunctions.

(b) Unscheduled preventative maintenance actions are test incidents that are not programmed to occur, but are a result of checks, such as, servicing, adjustments, alignment, and calibration.

4. FAILURE:

a. Definition of Failure: An incident which causes, or would create if not corrected, a critical or catastrophic safety hazard or the breech of any established performance tolerance.

b. Amplification of Definition: These are actual, intermittent, or incipient malfunctions that:

(1) Would require a corrective maintenance action.

(2) Does not degrade performance below some acceptable level which can be deferred for the remainder of the specified life before overhaul, replacement, rebuild, or salvage.

(3) Are detected during the correction of another malfunction, which cannot be classified as a secondary incident; i.e., totally unrelated, each will be charged as a failure.

(4) Is a critical or catastrophic safety hazard to personnel or equipment as defined by MIL-STD-882A, 28 Jun 77.

5. OPERATIONAL MISSION FAILURE:

a. Definition of Operational Mission Failure: Any failure which results in the abort of a combat mission.

b. Amplification of Definition: All operational mission failures are failures that would result in inability to perform a combat mission in a degraded mode of operation, such as:

(1) The inability to commence operation, cessation of operation, or reduction in performance capability to the extent that a mission essential function is either lost or degraded below an acceptable level.

(2) An actual, intermittent, or incipient failure for which corrective action is authorized or prescribed as an operator/crew function and cannot be corrected within specified time limits using only controls, OEM tools, and spare parts incorporated in or carried with the system.

(3) An actual, intermittent, or incipient failure that degrades performance below a level that could not be deferred for one additional combat mission.

APPENDIX H. REFERENCES

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[B. Additional References]

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5. ASTM Standard No. D1682, Breaking Load and Elongation of Textile Fabrics, 1975.

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