NOT MEASUREMENT SENSITIVE

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MILITARY SPECIFICATION

MANUALS, TECHNICAL:

UNIT OR AVIATION UNIT, DIRECT SUPPORT, AVIATION INTERMEDIATE, AND GENERAL SUPPORT MAINTENANCE, REQUIREMENTS FOR

This specification is approved for use by the Department of the Army, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE.

1.1 **Scope.** This specification contains the detailed requirements for the preparation of technical manuals (TM) for the maintenance of all types of equipment. This specification also contains the requirements for system integration manuals. System integration manuals are prepared for a system composed of multiple end items where each end item has its own TM(s). Each element specified herein is included in the TM unless it is not applicable to the particular item of equipment.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be used in improving this document should be addressed to: USAMC Logistics Support Activity, ATTN: AMXLS-AP, Redstone Arsenal, AL 35898-7466 by using the self-addressed DD Form 1426 (Standardization Document Improvement Proposal) appearing at the end of this document or by letter.

AMSC **AREA TMSS**

TERM ABBREVIATION

1.2 **Classification (type of manual covered).** This specification covers the preparation of the following types of manuals:

Type -T	Aviation Unit Maintenance (AVUM) and Aviation Intermediate Maintenance (AVIM) Manual for Troubleshooting
Type -20	Unit Maintenance Manual; or AVUM Manual
Type -30	Direct Support (DS) Maintenance Manual; or AVIM Manual
Type -40	General Support (GS) Maintenance Manual
*Type -12	Operator's and Unit Maintenance Manual; or Operator's and AVUM Manual
*Type -13	Operator's, Unit, and DS Maintenance Manual; or Operator's, AVUM, and AVIM Manual
*Type -14	Operator's, Unit, DS, and GS Maintenance Manual
Type -23	Unit and DS Maintenance Manual; or AVUM and AVIM Manual
Type -24	Unit, DS, and GS Maintenance Manual
Type -34	DS and GS Maintenance Manual

*See paragraph 3.10 for requirements to prepare combined operator's and maintenance manuals; for aircraft manuals, see paragraph 3.6. Combined manuals will contain criteria applicable to each maintenance level (see paragraph 6.5.8) and may contain repair parts and special tools list (RPSTL) as required. Chapters, sections, and paragraphs are structured to provide required data without duplication or overlap but with a clear differentiation of responsibilities. Refer to figure 1 (TM Outline Matrix) for correct sequence of data for all types of manuals covered herein.

1.3 **Examples/figures.** The figures used in this specification are examples only. The text of this specification takes precedence over examples.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 **Specifications, standards, and handbooks.** The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see paragraph 6.2).

SPECIFICATIONS

MIL-M-38784	Manuals, Technical: General Style and Format Requirements
MIL-M-49502	Manuals, Technical: Repair Parts and Special Tools List
MIL-M-63005	Manuals, Technical: Preparation for Shipment of Army Aircraft
MIL-M-63015	Manuals, Technical: Conventional and Chemical Ammunition
MIL-M-63036	Manuals, Technical: Operator's, Preparation of
MIL-M-63043	Manuals Technical: Missile System Equipment Check Procedures
MIL-M-63044	Manuals, Technical: Missile System Equipment Unit-Under-Test (UUT) Procedures
MIL-M-85337	Manuals, Technical: Quality Assurance Program, Requirements for

STANDARDS

MIL-STD-12	Abbreviations for Use on Drawings, Specifications,Standards, and in Technical Documents
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-209	Slinging and Tiedown Provisions for Lifting and Tying Down Military Equipment
MIL-STD-335	Manuals, Technical: Repair Parts and Special Tools Lists (RPSTLs)
MIL-STD-838	Lubrication of Military Equipment
MIL-STD-1388-2	DoD Requirements for Logistics Support Analysis Record

MIL-STD-1686	Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies, and Equipment (Excluding Electrically Initiated Explosive Devices) (Metric)

HANDBOOKS

MIL-HDBK-113	Lubricants, Power Transmission Fluids, Corrosion Preventatives for Use in Ground Equipment Systems, Guide for the Selection of
MIL-HDBK-263	Electrostatic Discharge Control Handbook for Protection of Electrical and Electronic Parts, Assemblies, and Equipment (Excluding Electrically Initiated Explosive Devices) (Metric)
MIL-HDBK-267	Guide for Selection of Lubricants and Hydraulic Fluids for Use in Shipboard Equipment
MIL-HDBK-275	Guide for Selection of Lubricants, Fuels, and Compounds for Use in Flight Vehicles and Components

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.1.2 **Other Government documents, drawings, and publications.** The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

AMC-R 702-32	Critical Safety Item Program
AR 70-12	Fuels and Lubricants Standardization Policy for Equipment Design, Operation, and Logistic Support
AR 95-3	Aviation: General Provisions, Training, Standardization, and Resource Management
AR 190-11	Physical Security of Arms, Ammunition, and Explosives

AR 190-13	The Army Physical Security Program
AR 310-50	Authorized Abbreviations and Brevity Codes
AR 380-5	Department of the Army Information Security Program
AR 380-19	Information Systems Security
AR 385-11	Ionizing Radiation Protection (Licensing, Control, Transportation, Disposal, and Radiation Safety)
AR 385-62	Regulations for Firing Guided Missiles and Heavy Rockets for Training, Target Practice, and Combat
AR 700-22	Worldwide Ammunition Reporting System (WARS)
AR 746-1	Packaging of Army Materiel for Shipment and Storage
AR 750-1	Army Materiel Maintenance Policy and Retail Maintenance Operations
DA PAM 738-750	Functional Users Manual for The Army Maintenance Management System (TAMMS)
DA PAM 738-751	Functional Users Manual for The Army Maintenance Management System - Aviation (TAMMS-A)
DOD 5220.22-M	Industrial Security Regulation
FM 1-511	Army Aircraft Quality Control and Technical Inspection
FM 21-11	First Aid for Soldiers
SB 11-573	Painting and Preservation Supplies Available for Field Use for Electronics Command Equipment
SB 742-1	Ammunition Surveillance Procedures
TB 43-0118	Field Instructions for Painting and Preserving Communications-Electronics Equipment

TB 43-0209	Color, Marking and Camouflage Painting of Military Vehicles, Construction Equipment, and Material Handling Equipment
TM 1-1500-204-23-1 through -23-10	Aviation Unit Maintenance (AVUM) and Aviation Intermediate Maintenance (AVIM) for General Aircraft Maintenance
TM 9-1300-206	Ammunition and Explosives Standards
TM 43-0139	Painting Instructions for Army Materiel
TM 55-1500-335-23	Nondestructive Inspection Methods
TM 55-1500-342-23	Army Aviation Maintenance Engineering Manual for Weight and Balance
TM 55-1500-345-23	Painting and Marking Army Aircraft

(Copies of specifications, standards, drawings, and other Government documents required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 **Non-Government publications.** The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODISS specified in the solicitation (see paragraph 6.2).

ASTM D3951 (DoD adopted)	Packaging, Standard Proactice for Commercial

(DOD activities can obtain copies of ASTM D3951 from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094. Other Government contractors and private concerns must procure copies of ASTM D3951 from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

2.3 **Order of precedence.** In the event of a conflict between the text of this specification and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 **General.** Maintenance manuals prepared in accordance with (IAW) this specification shall describe in accurate and applicable detail the unit, DS, intermediate (aviation), and GS maintenance authorized by the Maintenance Allocation Chart (MAC) (see paragraph 3.2.6).

a. Names of functional groups used in the narrative portion of the manual shall be consistent with those listed in the MAC and RPSTL.

b. National stock numbers (NSN) shall not be used in procedural steps, illustrations, or illustration legends of narrative maintenance manuals.

3.1.1 **Technical content preparation.** Logistics Support Analysis Record (LSAR), the technical data developed by the requirements of MIL-STD-1388-2, DoD Requirements for LSAR shall be used as the baseline to prepare TMs.

3.1.2 **Combined narrative - RPSTL.** The inclusion of a RPSTL in a combined narrative - RPSTL manual shall be indicated by adding "Including Repair Parts and Special Tools List" to the title and "&P" to the publication number.

3.1.3 **Characteristics.** The manual shall be written for the user IAW the target audience description provided by the contracting activity. Technical content of all material included shall be accurate and easy to use.

3.1.4 **Style and format.** Except as specified herein, the style and format for presentation of technical content shall be IAW MIL-M-38784.

3.1.4.1 **Manual page sizes.** TM sizes shall be as specified by MIL-M-63036.

3.1.4.2 **Foldout pages.** Foldout pages, if required, shall be prepared IAW MIL-M-38784.

3.1.4.3 **Type size.** Type size shall be no smaller than 8 point.

3.1.5 **Reproducible copy.** Except when in conflict with specific format guidance herein, the requirements of MIL-M-38784.

3.1.6 **Reporting errors and recommending improvements.**

a. Except for classified manuals, oversize manuals (see paragraph 6.5.13), pocket size manuals, and manuals with fewer than eight pages, the following statement shall precede the Table of Contents title:

"REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this publication. If you find any errors or if you know of a way to improve this publication, please let us know. The recommended change should state clearly that the procedure is written incorrectly, difficult to perform, a safety hazard, or may cause damage to the equipment. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual directly to: (address of proponent). A reply will be furnished to you."

b. One filled-out sample of DA Form 2028-2 (figure 2), plus three blank DA Forms 2028-2, shall be included at the back of all unclassified manuals except for oversize manuals, pocket size manuals, and those with fewer than eight pages. The filled-out sample will include guidelines for completing the form. The three blanks shall be tear-out forms, preprinted to show the applicable manual number, date, and title on the front and the proponent's return address on the reverse.

3.1.6.1 **Reporting errors and recommending improvements for pocket size manuals, oversize manuals, and manuals with fewer than eight pages**. The following shall precede the Table of Contents title:

"REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this publication. If you find any errors or if you know of a way to improve this publication, please let us know. The recommended change should state clearly that the procedure is written incorrectly, is difficult to perform, is a safety hazard, or may cause damage to the equipment. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms), directly to: (address of proponent). A reply will be furnished to you."

3.1.6.2 **Reporting errors and recommending improvements in classified manuals.** For classified manuals only, the following shall precede the Table of Contents title:

"REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this publication. If you find any errors or you know of a way to improve this publication, write and tell us about it. The recommended change should state clearly that the procedure is written incorrectly, is difficult to perform, a safety hazard, or may cause damage to the equipment. Address your correspondence to (insert address of the proponent). When dealing with classified information, make sure that your correspondence is properly marked and is handled in accordance with AR 380-5."

3.1.7 **Equipment/user interface.** With respect to equipment/user interface, the following shall be done:

a. Detailed task steps shall be identified and then properly worded for the target audience.

b. Task steps shall be organized in a logical order and presented so that they sequentially list what the user performs, sees, or detects on the equipment at each step of the procedure.

c. When essential to support the procedures, illustrations shall be used to highlight the task steps, and locator views shall be used to orient the user with the major components of the equipment (see paragraph 3.2.2a) and with the area affected by the procedure. The illustrations shall reflect how the user actually sees the equipment in terms of angle of view in order to help the user to locate and identify the equipment part to be acted upon.

d. Text and illustrations shall be integrated into a clear, comprehensible module of information that will enable the user to relate readily from the printed word supported by graphics to the equipment itself. Whenever possible, text and illustrations shall be arranged to be visible simultaneously. Illustrations that do not immediately follow the text reference or are not on the same page as the text shall be numbered and titled as figures and referred to in the text.

3.1.8 **Abbreviations and other terms.** Special or unique abbreviations, acronyms, and symbols used within the manual and not adequately explained in the text shall be listed and explained in the glossary.

3.1.9 **Warnings, cautions, icons, and notes.** Warnings, cautions, icons, and notes shall be used IAW MIL-M-38784. A warning shall precede the text for a procedure where injury or death may occur to the person doing the procedure, not the person who will use the equipment when it is used. Cautions shall precede the text for a procedure where damage to the equipment could occur. Notes shall precede text and are used to highlight an essential operating or maintenance procedure, condition, or statement. When warnings, cautions, or notes occur for the same text, the warning shall appear first, cautions second, and notes last.

3.1.9.1 **Icons.** Each single warning icon used in the tasks/text shall be defined in the warning summary. (See appendix B of this specification for the approved listing of single hazard icons and definitions.)

3.1.10 **Hazardous materials warnings and icons.** Whenever a warning can be presented as an icon or a combination of icons in lieu of text, this format shall be used. Icons used shall be either on the approved list in appendix B of this specification or shall be added or changed in the appendix as specified and approved by the contracting activity. Each hazard icon used shall be defined in the warning summary at the front of the TM.

3.2 **Type-20 - Unit maintenance or AVUM manual.** This manual shall describe in detail the unit maintenance/AVUM prescribed by the MAC (see paragraph 3.2.6) and by the Source, Maintenance, and Recoverability (SMR) codes listed in the applicable RPSTL. For additional content requirements for Type -20 AVUM and Type -23 AVUM/AVIM maintenance manuals for aircraft see paragraph 3.6.

3.2.1 **Front matter.** The front matter shall contain the following elements as applicable:

a. Cover (see paragraph 3.2.1.1).

b. Warning and First Aid Data Page (see paragraph 3.2.1.2).

c. List of effective pages (see paragraph 3.2.1.3).

d. Change sheet (for changes to looseleaf books) (see paragraph 3.2.1.4).

e. Title Block/Reporting of Errors/Table of Contents (see paragraph 3.2.1.5).

f. How-to-use-this-manual information (when specified) (see paragraph 3.2.1.6).

3.2.1.1 **Cover.** The cover shall be formatted and shall include the applicable data as illustrated in MIL-M-63036. The cover shall also include the following:

a. A front cover index, prepared IAW MIL-M-63036. The front cover index shall reflect only the major divisions/ titles listed in the Table of Contents, as space permits.

b. An equipment illustration, if specified by the contracting activity, see MIL-M-63036.

c. A metric conversion table, on the inside back cover, covering applicable units included in the TM.

3.2.1.2 **Warning and first aid data summary/pages.** Warning and first aid data summary/pages shall be included and shall:

a. Provide the user with a summary of important warnings that appear throughout the manual. The warning summary shall contain first aid data (see figure 3 for example) and shall appear on the inside front cover. The summary shall include each general type of warning and icon used within the TM. The summary shall not be a list of specific warnings that pertain to peculiar procedural steps, but it shall include general subject data such as radiation, chemicals, voltage, gas pressure, laser light, or other hazards that may be encountered by the user. See figure 3 for examples of warnings and icons. When warnings cannot be summarized on the inside front cover, warning pages shall be prepared instead of a warning summary. Warning pages shall include the same data as the warning summary and shall be the first pages following the cover. Warning pages shall be numbered with lowercase letters a, b, c, etc.

b. Include reference to FM 21-11. The text shall describe any first aid data not included in FM 21-11 but needed due to the dangers that may be encountered with the equipment.

c. Include reference to TM 9-1300-206 and related publications for weapons involving the use of ammunition items. First aid instructions needed to ensure safety and applicable for inclusion here, shall be described.

3.2.1.3 **List of effective pages.** The list of effective pages shall be prepared in accordance with MIL-M-38784.

3.2.1.4 **Change sheet.** When a manual is changed, there shall be an explanation on the change sheet covering the major changes to both the equipment and manual and how to identify changed material. This is in addition to the requirements set forth in MIL-M-38784 for identifying change material and the change sheet instruction.

3.2.1.5 **Title Block/Reporting of Errors/Table of Contents.** (See MIL-M-63036.) Each manual shall contain a reporting of errors statement and table of contents immediately below the title block. For combined narrative RPSTL manuals refer to MIL-STD-335 or MIL-M-49502 as applicable and as specified by the contracting activity for format requirements for the RPSTL portion of the table of contents.

3.2.1.6 **How to use this manual.** "How-to-use-this-manual" information shall be located after the table of contents and before the first chapter of the TM. The title "HOW TO USE THIS MANUAL" shall be centered at the top of the page. The information shall familiarize the user with special or unusual features of the manual. The how-to-use information shall also contain an explanation of all symbols (HCP, ESD, etc.) and icons used in the manual. The symbol and icon explanations shall be IAW MIL-M-38784. Coverage shall lead the user through the TM and explain important features of the organization and content. For example, an explanation of the front cover index and its relationship with the boxed-in portion of the table of contents and the bleeder edges of the pages, troubleshooting charts, and maintenance instructions shall be given. How-to-use information shall not repeat the instructions given within the chapters. How-to-use information shall include reference to the associated RPSTL and an explanation on how to use the RPSTL in conjunction with the manual.

3.2.2 **Chapter 1 - Introduction.** This chapter shall consist of the following sections: Section I - General information; Section II - Equipment description and data; and Section III - Principles of operation.

a. Chapter 1 shall begin with an illustration that provides a full external view of the equipment (see figure 4) with major external components labeled. This illustration shall be placed on the left hand page facing the beginning of the chapter.

b. In addition, to familiarize the user with the equipment, this chapter shall include a physical description of the components the user is likely to encounter.

3.2.2.1 **Section I - General information.** Unless otherwise specified by the contracting activity, this section shall consist of the following:

a. Scope (see paragraph 3.2.2.1.1).

b. Maintenance forms, records, and reports (see paragraph 3.2.2.1.2).

c. Destruction of Army materiel to prevent enemy use (see paragraph 3.2.2.1.3).

d. Preparation for storage or shipment (see paragraph 3.2.2.1.4).

e. Quality assurance (QA) (see paragraph 3.2.2.1.5).

f. Official nomenclature, names, and designations (see paragraph 3.2.2.1.6).

g. Quality Deficiency Reports (QDR) (see paragraph 3.2.2.1.7).

h. Warranty information (see paragraph 3.2.2.1.8).

i. Safety, care, and handling (see paragraph 3.2.2.1.9).

j. Corrosion prevention and control (CPC) (see paragraph 3.2.2.1.10)

k. Nuclear hardness (see paragraph 3.2.2.1.11).

l. Critical safety item list (see paragraph 3.2.2.1.12).

m. Security measures for electronic data (see paragraph 3.2.2.1.13).

3.2.2.1.1 **Scope.** The scope paragraph (example below) shall contain a brief statement regarding the following topics, as applicable:

a. Type of manual (maintenance levels covered).

b. Model number(s) and equipment name(s).

c. Purpose of equipment.

EXAMPLE:

1.1 **SCOPE**

1.1.1. Type of Manual. Unit maintenance.

1.1.2. Model Number and Equipment Name. M60A1 RISE/RISE PASSIVE - tank, combat, full-tracked, 105-mm gun.

1.1.3. Purpose of Equipment. To provide maneuverable shell friendly fire and shock to enemy; perform reconnaissance and provide security for friendly units; provide offensive, defensive and delaying action; and destroy, capture, or repel enemy assault.

3.2.2.1.2 **Maintenance forms, records, and reports.**

a. This paragraph shall contain the following statement:

"Department of the Army forms and procedures used for equipment maintenance will be those prescribed by (as applicable) DA PAM 738-750 (Functional Users Manual for The Army Maintenance Management System), DA PAM 738-751 (Functional Users Manual for the Army Maintenance Management System - Aviation (TAMMS-A)), or AR 700-138 (Army Logistics Readiness and Sustainability)."

b. In addition, for conventional and chemical ammunition manuals, the following statement shall be added:

"Accidents involving injury to personnel or damage to materiel will be reported on DA Form 285 (Accident Report) in accordance with AR 385-40. Explosives and ammunition malfunctions will be reported in accordance with AR 75-1."

3.2.2.1.3 **Destruction of Army materiel to prevent enemy use.** This paragraph shall reference the applicable TM(s) covering the destruction of Army materiel to prevent enemy use. The contracting activity will provide the TM number(s) references.

3.2.2.1.4 **Preparation for storage or shipment.** These requirements, including packaging and administrative storage, shall be part of the maintenance instructions (see paragraph 3.2.3), and reference to those instructions shall appear in this paragraph.

3.2.2.1.5 **Quality assurance (QA).** Unless otherwise specified by the contracting activity, this paragraph shall be included and either reference the pertinent QA TM(s) or include applicable general QA information. If QA information is not referenced but is included in the TM, this paragraph shall state that the text of each QA procedure paragraph or step in the TM is preceded and highlighted by the addition of "(QA)", and the abbreviation QA shall be explained either in the title of the paragraph or in the text. For aircraft maintenance manuals, refer to FM 1-511.

3.2.2.1.6 **Official nomenclature, names, and designations.** Official nomenclature (see paragraph 6.5.10) approved item name shall be used throughout the manual. When deviation from official nomenclature is approved by the contracting activity, an applicable cross reference listing shall be included (see figure 5).

3.2.2.1.7 **Equipment Improvement Recommendation (EIR).** This paragraph shall contain the following statement:

"If your (insert equipment short item name) needs improvement, let us know. Send us a SF 368 (Product Quality Deficiency Report). You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Mail it to the address specified in DA PAM 738-750. A reply will be furnished to you."

3.2.2.1.8 **Warranty information.** When the manual covers equipment that is under warranty and a warranty technical bulletin (WTB) is published, the manual shall include only a reference to the applicable WTB. When a WTB is not published, pertinent warranty information shall be provided. An applicable statement such as the following shall be included:

"The (insert name of equipment) is warranted for (insert miles or other timeframe as applicable). The warranty starts on the date found in block 23, DA Form 2408-9 in the logbook. Report all defects to your supervisor, who will take appropriate action."

3.2.2.1.9 **Safety, care, and handling.** This paragraph shall cover general precautions and safety regulations.

a. For ammunition manuals, this paragraph shall include information to comply with AR 385-62. References to ARs for range safety and danger zones during training and combat shall be included. Clear explanations and official definitions of such safety related terms as misfire, hangfire, and cook off, which describe characteristics associated with the specific items(s)

covered by the manual under preparation, shall also be included. A reference to TM 9-1300-206 shall be made for general ammunition care, handling, and safety.

b. For manuals covering equipment with radioactive parts or components, a paragraph shall be included to comply with Nuclear Regulatory Commission provisions, and references to applicable ARs and safety documents on radioactive materials shall be included. If instructions are required in addition to those already included in applicable documents, they shall be provided here. If additional coverage on radioactive materials is needed, but is not included in applicable documents, such instructions shall be provided here. In addition, the following information shall be provided throughout the TM:

(1) Nuclear warning notices shall be placed at the beginning of any instruction covering procedures that will expose personnel to a nuclear radiation hazard.

(2) Procedures to be followed prior to maintenance actions, or in the event of breakage of radioactive parts or components, including safety, care, and handling instructions, shall also be included.

(3) Radioactive parts or components shall be shown and suitably identified on a parts location diagram or illustration, and suitable warning notices shall be included.

(4) When applicable, equipment data shall include a list of radioactive parts or components and the type and quantity of radioactive material involved.

(5) Instructions for the disposal of radioactive material, such as the requirement to double bag in plastic all broken tritium sources, shall be provided IAW AR 385-11.

c. Electrostatic discharge (ESD). Where applicable, this paragraph shall describe the ESD control standards for the protection of electrical and electronic parts, assemblies, and equipment. The ESD classes (see MIL-STD-1686 and DOD-HDBK-263) shall be identified, and the protective/control measures required shall be included. All ESD sensitive items shall be identified by class and the protective/control measures to be taken shall be given in instructions provided for such maintenance functions/ tasks as removal, disassembly, inspection, repair/replace, assembly, testing, and packaging. Of primary importance in the identification of class 1 items requiring stringent protection are: (1) class 1 chips on a printed circuit board (PCB); (2)

point of reduced or no protection due to absorption by a next higher assembly (NHA); and (3) change in an ESD requirement for a class 1 item resulting from installation of the item into its NHA.

d. Lasers. Laser warning notices shall be placed at the beginning of any procedures that will expose personnel to laser hazards.

3.2.2.1.10 **Corrosion prevention and control (CPC).**

a. This paragraph shall contain a statement similar to the following:

Corrosion Prevention and Control (CPC). CPC of Army materiel is a continuing concern. It is important that any corrosion problems with this item be reported so that the problem can be corrected and improvements made to prevent the problem in future items. While corrosion is typically associated with rusting of metals, it can also include deterioration of other materials, such as rubber and plastic. Unusual cracking, softening, swelling, or breaking of these materials may be a corrosion problem. If a corrosion problem is identified, it can be reported using SF 368 (Product Quality Deficiency Report). Use of key words such as "corrosion," "rust," "deterioration," or "cracking" will ensure that the information is identified as a CPC problem. The form should be submitted to the address specified in DA PAM 738-750.

b. For aircraft manuals, this paragraph shall include a reference to TM 55-1500-342-23.

3.2.2.1.11 **Nuclear hardness.** If equipment covered in the TM has nuclear survivability requirements (i.e., overpressure and burst, thermal radiation, electromagnetic pulse or transient radiation effects on electronics), (1) this paragraph shall so state; (2) applicable warnings shall be incorporated into the text to ensure that hardness of the equipment is not degraded during operation or maintenance; (3) all hardness critical processes/steps shall be marked IAW MIL-M-38784; and (4) the following statement shall be included:

"All hardness critical paragraphs in this manual are marked with the symbol [HCP] as follows:

a. When an entire paragraph, including all subparagraphs, is considered hardness critical, only the major paragraph will be marked by the symbol [HCP], placed between the paragraph number and the title.

b. When only certain processes and steps within a paragrpah are hardness critical, only applicable processes and steps will be marked by placement of the symbol [HCP] between each applicable step number and the text."

3.2.2.1.12 **Critical safety items list.** As applicable, this paragraph shall include a tabular listing of all critical safety items required by AMC-R 702-32. The location of the critical safety procedures or processes within this TM shall be referenced.

3.2.2.1.13 **Security measures for electronic data.** This paragraph shall include instructions for handling, loading, scrubbing, overwriting, or unloading classified electronic data under usual or unusual conditions. Instructions shall meet the requirements of AR 380-5 and AR 380-19 as they pertain to automation security.

3.2.2.2 **Section II - Equipment description and data.** This section shall include references to material in other publications, provided they are available to unit/AVUM personnel. Information shall not be duplicated except for emphasis or clarity. This section shall consist of the following paragraphs:

a. Equipment characteristics, capabilities, and features (see paragraph 3.2.2.2.1).

b. Location and description of major components (see paragraph 3.2.2.2.2) if not included with equipment characteristics paragraph.

c. Differences between models (see paragraph 3.2.2.2.3).

d. Equipment data (see paragraph 3.2.2.2.4).

e. Equipment configuration (see paragraph 3.2.2.2.5).

3.2.2.2.1 **Equipment characteristics, capabilities, and features.** This information (see figure 6 shall consist of an overall description of the equipment, including general capabilities, special features, and other like information (e.g., applications, limitations) which will be helpful in the maintenance of the equipment.

a. The equipment type, its portability or mobility, operational and special environmental features, and remote control features shall be stated.

b. Components and their functions shall not be described unless essential to continuity. For functional data, reference shall be made to principles of operation when required.

c. When equipment covered varies in scope and application or has several applications within an end item (see paragraph 6.5.5), a brief explanation of the multiple usage shall be made and a simple diagram showing all aspects of a typical application shall be included.

d. For ammunition manuals, packing and packaging shall be described, including number of rounds per pack.

3.2.2.2.2 **Location and description of major components.**

a. External and internal views of the equipment shall be used to show general features and all major components. The major components/items in the view shall be explained by the use of keyed text (see figure 7).

(1) When the equipment is designed for use with other equipment, one or more diagrams shall be used to illustrate the normal use of the equipment. Only information pertaining to unit/AVUM shall be included.

(2) Information to be included as equipment data (see paragraph 3.2.2.2.4) shall not appear here.

(3) Location and contents of end item and major component identification plates shall be illustrated. Modification, instruction, and warranty plates, stencils, and location of serial numbers shall be illustrated. (See paragraph 6.5.3 for definition of a component.)

b. Unless otherwise specified by the contracting activity, this information shall be included under equipment characteristics, capabilities, and features. If a separate paragraph is required for location and description of major components, information shall not duplicate information in paragraph 3.2.2.2.1.

3.2.2.2.3 **Differences between models.** Significant differences between equipment models or units of the same model that affect maintenance actions shall be described, and the extent of interchangeability shall be indicated. These differences shall be related explicitly to equipment model, part number, or serial number ranges in such a manner that the manual user can identify the specific equipment configuration (see paragraph 6.5.4) involved. When model differences exist but have no effect on maintenance, this fact shall be stated (see figure 8).

3.2.2.2.4 **Equipment data.** Performance data, including numerical and other specification related data applying to unit/AVUM functions shall be provided. The equipment data shall summarize the specific capabilities and limitations of the equipment and other critical data needed by the manual user for maintenance of the equipment. Vehicle and cargo space dimensions and metric and other equivalents shall be included where applicable (see figure 9).

3.2.2.2.5 **Equipment configuration.** For equipment which can be configured several different ways, information on the various possible configurations shall be provided.

3.2.2.3 **Section III - principles of operation.** This section shall contain functional descriptions of equipment operation.

a. This section shall describe how the integrated systems, end item, and major components work and interface. For systems integration manuals (see paragraph 6.5.20), material covered in end item manuals shall not be presented unless it is necessary to understanding the overall integrated system. Only essential information shall be provided which the manual user must know to troubleshoot the equipment. If applicable, functional block diagrams shall be used to illustrate the interface and functional relationships among major components.

b. Description of components and assemblies which are maintained at higher levels shall be included only where necessary for clarity or continuity.

c. For multisystem equipment, principles of operation shall be organized so the first paragraph of the section contains an explanation of the end item as an integrated whole. Within each end item explanation, there shall be an explanation of the applicable components; and within each component explanation, there shall be an explanation of the applicable assemblies. Further breakdowns below the assembly level shall be included as applicable (see figures 10, 11, and 12).

3.2.3 **Maintenance instructions chapter(s).** The maintenance instructions chapter(s) shall present accurately all needed instructions and additional information to help keep the equipment in good repair. For system integration manuals, only maintenance instructions that must be performed at the system level shall be included. Once troubleshooting has identified a maintenance requirement in one of the end items, those maintenance instructions shall be in the end item manual.

a. Depending on the type and complexity of the equipment, the TM shall contain the following maintenance instructions chapters that apply:

(1) End item maintenance chapter (e.g., M16A1 Rifle).

(2) Component maintenance chapters (e.g., sight and gun carriage).

(3) Assembly maintenance chapters (e.g., feeder assembly, and control assembly). (See paragraph 6.5.1 for definition of assembly.)

(4) Subassembly maintenance chapters (e.g., elevation control and weapon controller grip assembly).

(5) Auxiliary equipment maintenance chapters (e.g., equipment not part of the end item but authorized for use with the end item; i.e., MTOE items).

(6) Software maintenance chapters (e.g., drawings, machine cards, and computer programs).

(7) Ammunition maintenance chapters (e.g., inspection, care, and handling).

b. All applicable maintenance chapters shall meet the following requirements:

(1) Every manual shall have at least one maintenance instructions chapter for overall end item maintenance. For simple equipment, such as a basic rifle, the manual shall have only one maintenance instructions chapter.

(2) Every manual that covers complex end items, where each subsystem is maintained independently of the others, shall have a maintenance instructions chapter for each subsystem, in addition to the overall end item maintenance instructions chapter.

(3) In any manual that covers equipment composed of two or more integrated systems, each of which has maintenance significant components, each such component shall have an individual section within the end item chapter to which it applies.

(4) Troubleshooting procedures shall be referenced by using either a troubleshooting symptom index or a corrective procedures column in an operational checks table (see paragraph 3.2.3.6.2.3). If a troubleshooting symptom index is used, it

shall be placed in the overall end item maintenance chapter or at the beginning of a troubleshooting chapter.

(5) Maintenance instructions chapters normally shall contain the sections listed below, as applicable:

Section I	Repair Parts; Tools; Special Tools; Test, Measurement and Diagnostic Equipment (TMDE); and Support Equipment. **NOTE** As a rule, this section will appear only in the overall maintenance chapter. Where Section I is essentially a reference to the applicable RPSTL, the above data shall be included in Chapter 1 and this section shall be retitled as applicable.
Section II	Service upon receipt. If extensive, these instructions shall be included in a separate chapter; otherwise this section shall appear only in the overall end item maintenance chapter.
Section III	Equipment check procedures (for missile equipment).
OR	
Section III	Equipment/user fitting instructions (for personal use equipment).
Section IV	Preventive maintenance checks and services (PMCS), lubrication instructions, and mandatory replacement parts. All PMCS and lubrication procedures shall be located in the overall or introductory maintenance chapter.
Section V	Troubleshooting.
Section VI	Maintenance procedures.
Section VII	Preparation for storage or shipment.

List appendix (see figure 14). Other tools includes tools which are part of components of shop sets authorized to sections/teams; tools authorized by RPSTL and CTA 50-970; special and fabricated tools; and items of TMDE.

c. If specified by the contracting activity, the above information shall be included for on-site repair tasks at the GS level of maintenance.

3.2.3.1.2 **Special tools, TMDE, and support equipment.** This paragraph shall make reference to the RPSTL and MAC pertaining to unit maintenance or AVUM. When no special tools or equipment are required, this paragraph shall include a statement to that effect. If tools are to be fabricated, instructions shall be provided in an appendix IAW paragraph 3.2.9 and a reference to the appendix shall be included here.

3.2.3.1.3 **Repair parts.** This paragraph shall include a reference to the appendix for mandatory replacement parts. In addition, this paragraph shall include one of the following statements, as applicable:

"Repair parts are listed and illustrated in (TM number of RPSTL) covering unit maintenance (or AVUM) for this equipment."

"Repair parts are listed and illustrated in Appendix () of this manual."

3.2.3.2 **Section II - Service upon receipt.**

a. This section shall provide or reference the procedures required for unit or AVUM level users to ensure that the equipment will be adequately inspected, serviced, and operationally tested before it is subjected to its normal everyday use. These procedures shall cover unpacking, processing, and similar actions. Unpacking instructions shall be provided when reusable containers of special design are designated, either for the end item or components which are authorized for replacement. Instructions shall be included to report the empty container through supply channels or (if a component is being replaced) to package the unserviceable component in the empty container in the same manner that was used to package the new (replacement) component.

b. When applicable, this section shall contain procedures for performing visual inspection of ammunition received from the ammunition supply facility. Procedures provided shall include the following:

(1) Instructions for verification that ammunition received was that requisitioned.

(2) Instructions for a condition check of the shipment (including that of pallets, containers, boxes, and legibility of markings).

(3) Instructions to note the quantity of each lot for recording purposes.

c. For complex equipment (especially electronic communications equipment) which requires extensive service upon receipt, this section shall be further subdivided. As applicable, divisions listed in paragraphs (1) through (7) below shall be used.

(1) Site and shelter requirements (see paragraph 3.2.3.2.1).

(2) Service upon receipt of materiel (see paragraph 3.2.3.2.2).

(3) Installation instructions (see paragraph 3.2.3.2.3).

(4) Preliminary servicing and adjustment of equipment (see paragraph 3.2.3.2.4).

(5) Circuit alignment (see paragraph 3.2.3.2.5).

(6) ESD control standards (see paragraph 3.2.2.1.9c).

(7) Nuclear hardness survivability requirements (see paragraph 3.2.2.1.11).

3.2.3.2.1 **Site and shelter requirements.** This paragraph shall contain the following:

3.2.3.2.1.1 **Siting.** Siting instructions peculiar to the equipment shall be detailed and illustrated. Operational and maintenance features listed below shall be considered.

a. Location, proximity to power sources, and effective ranges.

b. Terrain requirements to avoid screening, reflections, ground clutter, and other poor operational conditions due to terrain.

c. Technical requirements.

d. Shelter locations.

e. Siting conditions. When applicable, instructions on compensating for adverse siting conditions shall be included.

f. Equipment components. When the equipment contains large components (e.g., towers and antennas) that require orientation to a base line during siting, the orienting procedure shall be covered.

g. Equipment mobility. If the equipment is mobile and the type that is oriented during installation, orientation shall be covered.

3.2.3.2.1.2 **Shelter requirements.**

a. When the equipment will be housed in a permanent shelter during use, or in a semipermanent shelter (other than a military truck, van, or transportable shelter), the manual shall state the following:

(1) Amount of floor and wall space required.

(2) A plan for a typical layout.

(3) Total weights that the floor must support and the area in square feet over which the total weight will be distributed.

(4) Environmental conditions (e.g., venting).

b. Architectural and engineering data on beam sizes, lengths, bending moments, and required supports shall not be included.

3.2.3.2.2 **Service upon receipt of materiel.** Service upon receipt procedures shall be provided to cover the following topics:

a. Unpacking (see paragraph 3.2.3.2.2.1).

b. Checking unpacked equipment (see paragraph 3.2.3.2.2.2).

c. Processing unpacked equipment (see paragraph 3.2.3.2.2.3).

3.2.3.2.2.1 **Unpacking.** Unpacking instructions shall be given only if:

a. A special sequence of action is necessary to protect the equipment.

b. Instructions will permit greater efficiency in preparing other equipment for assembly and installation. For example, equipment that is to be mounted and installed in a large rack or cabinet may not need to be unpacked until the rack or cabinet has been unpacked, assembled, installed, and connected.

c. A reusable container of special design is involved. When paragraphs a and b do not apply, minimum instructions shall be provided to avoid damaging the container during the unpacking operation and to reenter the empty container into the supply system IAW AR 746-1.

d. When instructions are required, they shall include manhour requirements, by MOS, and total manhours required for unpacking the equipment. Instructions shall be step-by-step and illustrated.

3.2.3.2.2.2 **Checking unpacked equipment.** This portion shall include any special, equipment-peculiar inspection procedures for checking the unpacked equipment. Instructions shall be included for a condition check of the shipment, to include checks of pallets, containers, boxes, and legibility of markings. In addition, the following statements shall be included verbatim:

a. "Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on SF 364 (Report of Discrepancy)."

b. "Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA PAM 738-750 or DA PAM 738-751 as applicable."

3.2.3.2.2.3 **Processing unpacked equipment.** Complete instructions for processing the unpacked equipment (e.g., removing excess lubricant from a new rifle) shall be included, provided they do not conflict with any warranty provisions. As applicable, the following topics shall be discussed:

a. Listing of all tools, test equipment, support equipment, supplies, and parts required to process the equipment.

b. Any special skills required by processing personnel.

c. Identification of all caustic, corrosive, and/or toxic material used during processing, along with applicable warnings and cautions in connection with the use of these substances.

d. Instructions on safe disposal of waste products generated during processing actions.

e. Manhour requirements, by MOS, and total manhours required for processing the equipment.

3.2.3.2.3 **Installation instructions.** These instructions shall include all information required to install the equipment properly, make the required interconnections, and lubricate and adjust the equipment as required.

3.2.3.2.3.1 **Tools, test equipment, and materials required for installation.** The tools, test equipment, and materials required for installation shall be listed. All items shall be verified as being available to installers either furnished as part of the equipment, prescribed by the MAC, or available in the Army supply system. When essential, the instructions for the use of these tools shall be illustrated. (Essentiality can be determined by such factors as the potential to harm personnel, damage equipment, or some other like result of equal significance.)

3.2.3.2.3.2 **Assembly of equipment.** This paragraph shall contain step-by-step instructions for assembling equipment which has been shipped unassembled. If required for clarity, these procedures shall be illustrated. When the equipment is to be shelf-mounted or rack-mounted, these instructions shall also cover assembly of the rack, if required, and installation of equipment in the rack.

3.2.3.2.3.3 **Installation instructions.**

a. Step-by-step instructions shall be provided for all actions (including placing, mounting, and attaching) for:

(1) Cable and wiring interconnections.

(2) Proper use of special tools.

(3) Other actions required for installation of the equipment covered.

b. Steps in the instructions shall be in the sequence that ensures the most efficient, rapid, and accurate installation possible.

c. Installation instructions shall be illustrated, with all dimensions that must be maintained in placing, mounting, or attaching indicated on the illustration(s).

d. When initial adjustments can be made efficiently during installation, such adjustments shall be included in the installation procedure.

e. These instructions shall not include connection to outside lines.

f. When the equipment is designed and intended for use in more than one type of installation (e.g., field, fixed station, and mobile), instructions shall be included for each type of installation involved.

g. If performance of any step in the installation instructions requires the assistance of personnel from a higher level of maintenance, this shall be stated in a note similar to that below.

NOTE

The following installation procedure must be made with the assistance of (insert level) maintenance personnel (include MOS if applicable).

h. Installation instructions shall be considered complete only when they include instructions for the following:

(1) All required installation options (e.g., ESD control requirements).

(2) Accessory items.

(3) Auxiliary items (those that extend or increase equipment capability).

(4) Grounding of the equipment for both safety and proper operation.

(5) Torque requirements.

(6) Any additional tasks required.

3.2.3.2.3.4 **Cable diagrams.** Cable diagrams shall be provided. If equipment covered is complex, cable diagrams shall be included as foldouts or in a separate appendix. If a separate appendix is required, a reference to this appendix shall be included.

a. Special instructions and cautions shall be provided for any mating connectors that call for a special procedure either to make the proper connection or to prevent damage to the connector.

b. Except for cables, a wiring diagram fully identifying each wire to be connected, by color code or wire number if applicable, shall be provided. This diagram shall show the location of each pertinent terminal, which shall be identified by number or other marking if available, or by position if neither is available.

c. All alternate connection patterns required for various modes of operation shall be shown and explained.

d. Only one diagram shall be used to illustrate interconnection patterns which appear more than once within the same equipment.

3.2.3.2.3.5 **Installation of plug-in items.** Diagrams showing the location of items which are not installed in the equipment when received shall be included or referenced. Step-by-step instructions shall be provided whenever special techniques or connections are required.

3.2.3.2.3.6 **Special applications** (see paragraph 6.5.17). Instructions covering installation data and procedures that are common to all special applications (e.g., items requiring special treatment when in a vehicle) shall be included. Details of installation which are peculiar to the item in which the basic equipment is being installed shall be omitted.

3.2.3.2.3.7 **Van and shelter installations.** The following information shall be provided only to the extent required for unit/AVUM. (When the equipment is permanently installed in vans or shelters, installation instructions shall not be included.)

a. Instructions for the removal and installation of each nonpermanent unit.

b. Diagrams and instructions pertaining to electrical and interconnection wiring, exclusive of wiring peculiar to the equipment on which the installation is being made (e.g., headlight or ignition wiring).

c. Cable run locations, equipment locations, circuit breaker panels, etc.

3.2.3.2.4 **Preliminary servicing and adjustment of equipment.** These instructions shall be step-by-step for all lubrication, checks, and adjustments to be made on newly installed equipment. Steps or actions which may result in injury to personnel or damage to equipment shall be preceded by applicable warnings or cautions. Illustrations showing the location of controls, parts, check points, etc., shall be included or referenced.

a. Instructions shall be provided for those checks and adjustments that must be made before equipment is put into operation. These instructions shall include the following:

(1) Checks for interconnections.

(2) Checks for adequate clearance for rotating or moving devices.

(3) Checks of initial settings of all controls that must be preset before power can be applied.

(4) All other checks needed to determine that power can be applied without damaging the equipment or injuring personnel.

b. Instructions in paragraph 3.2.3.2.4a above shall be followed by all other checks required to ensure proper operation of the equipment. These checks and instructions shall be limited to those which are realistic and practical, and which cover all required items. When applicable, the following shall be covered:

(1) Grounding, including earth ground connections; earth conditioning for conduction, and a check of the grounding circuit for negligible resistance.

(2) Firm seating and connection of all plug-in parts, mating connectors, jacks, and plugs.

(3) Cable and wire harness routing, dressing, and fastening.

(4) Cautions against damaging transistors, diodes, and other electrically sensitive items.

(5) Replacement of all covers, inspection and access doors, and plates.

(6) Operation of safety interlocks and switches; ventilating louvers and intake and exhaust ports; and liquid cooling systems including content.

(7) Lubricants and CPC procedures.

(8) Switch and control settings that are preset at installation (installer's adjustments).

(9) Presetting and adjustment of automatic controls.

(10) Terminal connections.

(11) Required terminal or capacitor strapping.

(12) Preliminary test measurements.

(13) Presetting operator's controls (see paragraph 6.5.12) and normal operating checks (refer to operating instructions, when applicable).

(14) Orientation after installation.

(15) Burn-in of parts.

(16) ESD control standards.

3.2.3.2.5 **Circuit alignment.** These instructions shall include all circuit alignment procedures, including any variations required for different installation options and modes of operation.

3.2.3.2.5.1 **External connections.** Instructions shall be provided covering all connections to external lines required for each installation option. Connection instructions shall conform to the requirements for installation wiring and cabling interconnections (see paragraph 3.2.3.2.3.4).

3.2.3.2.5.2 **Switch settings, patch panel connections, and internal control settings.** Instructions shall be provided for all switch settings, patch panel connections, and internal control settings required for each installation option and mode of operation (see paragraph 6.5.9).

3.2.3.3 **Section III - Equipment check procedures or equipment/user fitting instructions.**

a. When specified by the contracting activity, checks for missile and complex system equipment shall be included and shall be prepared IAW MIL-M-63043.

(1) Schematic diagrams and supporting functional explanations shall be limited to the data essential for performance of the check procedures. This is limited to block and functional diagrams supported by functional explanations of inputs, outputs, and specific parametric values that require measuring during the performance of the check procedures.

(2) Either reference shall be made to the maintenance instructions; or the actual instructions shall be included for repairing or replacing all items identified in the check procedures tables. Illustrations shall be included if essential for performance of the repair procedures.

b. This section shall include equipment/user fitting instructions for personal use equipment.

3.2.3.3.1 **Equipment check procedures for missile and complex equipment.** When specified by the contracting activity, equipment check procedures for missile and complex equipment shall be included and shall be prepared IAW MIL-M-63043.

3.2.3.3.1.1 **Functional and schematic diagrams.** Voltage and waveforms shall be provided at designated points for normally functioning equipment. Nominal values shall be used. If space limitations do not allow for waveforms, they shall be provided IAW paragraph 3.2.3.3.1.2 below.

3.2.3.3.1.2 **Waveform diagrams.** If not provided on functional and schematic diagrams, and when required in support of maintenance tasks, these diagrams shall show the waveforms and nominal values at designated points for normally functioning equipment or systems as seen on an oscilloscope.

3.2.3.3.2 **Equipment/user fitting instructions.** When specified by the contracting activity, this section shall include equipment/user fitting instructions for personal use equipment.

3.2.3.4 **Section IV - Preventive maintenance checks and services (PMCS), lubrication instructions, and mandatory replacement parts.** The content of PMCS shall be based upon the principles of Reliability Centered Maintenance (RCM) logic and shall include applicable scheduled corrosion inspections. The checks and services shall be in a tabular form using the format shown in figure 16. Lubrication instructions are mandatory and shall include all lubrication procedures and information on authorized lubricants, lubrication intervals, manhour requirements, and the Army Oil Analysis Program (AOAP) (see figure 16). This section shall include a reference to AR 70-12 for use of standardized fuels and lubricants. PMCS and lubrication procedures shall be arranged in a logical sequence requiring minimum time and motion on the part of the person(s) performing them and shall be so arranged that there will be a minimum of interference between persons performing the checks simultaneously on the same end item. An introduction paragraph shall explain how the procedures are to be used and shall contain an explanation of all columns and codes. The explanation for the "Item Number" column shall detail how the item numbers are used when recording results of PMCS on DA Form 2404 (Equipment Inspection and Maintenance Worksheet). For system integration manuals, the PMCS table shall begin with the system level checks, if applicable, and then shall proceed to reference the end item manuals for their PMCS. The table shall conclude with referencing the operator's manual for the system functional check. Detailed functional checks shall be in the system integration maintenance manual. LSAR Output Report LSA-033 (Preventive Maintenance Checks and Services Summary) shall be used when available, as source data for the final PMCS. All measurements expressed in the text, tables, or on illustrations shall be expressed in both U.S. standard and metric units. The TM shall contain the following PMCS information in the order given:

a. Introduction. See paragraph 3.2.3.4.1.

b. Initial setup. See paragraph 3.2.3.4.2.

c. PMCS table. See paragraph 3.2.3.4.3.

d. Mandatory replacement parts. See paragraph 3.2.3.4.4.

3.2.3.4.1 **Introduction to PMCS table.** The first paragraph in this section shall be the introduction. The introduction shall contain the following paragraphs:

a. **General.** This paragraph shall contain an explanation of the purpose and use of the PMCS table.

b. **PMCS procedures.** This paragraph shall contain an explanation of each column of the table and any general checks/services that are common to the entire piece of equipment.

c. **Special information paragraphs.** These paragraphs shall contain any special information concerning subjects such as cleaning agents, lubrication, and fluid leakage information that is necessary for the user to know before doing PMCS. The special information paragraphs shall also contain the following:

(1) **General statement(s).** General statement(s) applicable to the overall understanding of requirements shall be provided. The statement(s) shall include such information as adherence to lubrication intervals, explanation of interval symbols, maintenance level, exceptional operational requirements, abbreviations, and fittings and parts cleaning. A statement concerning corrosion control shall be used as applicable. The statement shall provide instructions or reference to corrosion control requirements provided in the applicable narrative TM.

(2) **Oil filter statement.** As applicable, a statement similar to the following shall be included:

Oil filters shall be serviced/cleaned/changed as applicable, when:

1. They are known to be contaminated or clogged,
2. Service is recommended by AOAP laboratory analysis, or
3. At prescribed hardtime intervals.

(3) **AOAP sampling interval statement.** A statement similar to the following shall be included:

Engine oil/transmission oil/hydraulic fluids must be sampled at (insert applicable hour/mileage timeframe) as prescribed by (insert TB 43-0106 or DA PAM 738-750).

(4) **AOAP not available/non-enrolled statement.** When a component/equipment is not enrolled in the AOAP, or oil analysis support is not available, a statement similar to the following shall be used:

This (enter name of component/equipment) is not enrolled in the Army Oil Analysis Program. HARDTIME INTERVALS APPLY.

(5) **Warranty hardtime statement.** When applicable, the following statement shall be used:

"For equipment under manufacturer's warranty, hardtime oil service intervals shall be followed. Intervals shall be shortened if lubricants are known to be contaminated or if operation is under adverse conditions (i.e., longer than usual operating hours, extended idling periods, or extreme dust)."

3.2.3.4.2 **Initial setup.** At the beginning of the PMCS table there shall be an initial setup paragraph. See figure 15 for example.

3.2.3.4.3 **PMCS table.** The PMCS table shall include the following:

a. Special instructions.

(1) For equipment that is normally kept in continuous operation, the following note shall be included between the table and its title.

"NOTE

If the equipment must be kept in continuous operation, do only the procedures that can be done without disturbing operation. Make complete checks and services when the equipment is shut down."

(2) When check and service intervals must be shortened because the equipment may be used under unusual conditions, an asterisk shall precede the interval. A footnote shall explain the asterisk and reason for the shortened interval.

(3) When the equipment contains fluids (i.e., lubrication oil or hydraulic fluid), leakage criteria shall be included in the introduction to the PMCS and referred to in the "not fully mission capable if" column.

b. Title. The table shall have a title as follows: "Preventive Maintenance Checks and Services for (insert equipment model number)."

c. Arrangement of procedures. PMCS procedures and lubrication instructions shall be arranged in a logical sequence so that a minimum amount of time and motion is used.

(1) Interval groupings. Check and service procedures shall be grouped according to their intervals. Procedures done first or most frequently shall appear first. Unless otherwise specified by the contracting activity, monthly intervals shall not be used in the PMCS table. Intervals determined by operation, such as hours of operation, shall be expressed in the applicable units.

(2) Reference to other procedures shall not be made except IAW paragraph 3.2.3.4.7.5.

d. Warnings, cautions, and notes. Warnings, cautions, and notes shall appear in the PMCS table as prescribed by MIL-M-38784.

e. PMCS table columnar headings.

3.2.3.4.3.1 **"ITEM NO" column.** Item numbers shall be assigned to procedures in consecutive numerical order.

3.2.3.4.3.2 **"INTERVAL" column.** The interval column shall indicate when the checks, services, and lubrications are to be performed. The intervals shall be represented by complete words.

3.2.3.4.3.3 **"ITEM TO BE CHECKED OR SERVICED" column.** The items listed in this column shall be identified in as few words as will clearly identify the item, usually the common name (e.g., bumper, gas can, mounting bracket, front axle).

3.2.3.4.3.4 **"PROCEDURE" column.** This column shall contain a brief description of the procedure by which each check is to be performed, as well as any information required to accomplish each check or service, including lubrication, appropriate tolerances, adjustment limits, and instrument gauge readings. When practical, essential illustrations shall be integrated with the text/table. If information does not exceed 120 words or 10 lines, it shall be duplicated in the PMCS table, not referenced.

Any required reference to more extensive information must be approved by the contracting activity. When replacement or repair is recommended, this column shall reference the applicable maintenance instruction. Lubrication instructions shall be included as required to present all applications and procedures, lubricants, and lubrication points.

3.2.3.4.3.4.1 **Illustrations.** Illustrations shall be used to show the location of hard to locate lube fittings. A minimal number of views shall be used. Dotted arrow points shall be used to indicate lubrication on both sides of the equipment. When it is necessary to provide more than one illustration to show separate component parts, multiple illustrations shall be used.

3.2.3.4.3.4.2 **Disassembling and handpacking.** If applicable, disassembling and handpacking instructions shall be provided for medium and high speed antifriction bearings which are sensitive to the amount of lubrication applied and do not have bleed holes or relief valves.

3.2.3.4.3.4.3 **Cleaning, disassembling, and reassembling.** Cleaning, disassembling, and reassembling instructions required before or after lubrication shall be provided. If instructions are extensive, the procedure shall be referenced.

3.2.3.4.3.4.4 **Washing and natural drying.** If applicable, instructions shall be given for washing and natural drying of finely machined and dirt-sensitive parts before relubricating. Use of compressed air jets or temperatures above 212 degrees Fahrenheit shall not be prescribed.

3.2.3.4.3.4.5 **Preservative material.** Instructions shall not specify a coating of preservative material, neither before nor after packing parts that are lubricated with grease, nor shall they specify an application of oil, solvent, or additional grease to a "sealed-for-life" or prepacked antifriction bearing.

3.2.3.4.3.5 **"NOT FULLY MISSION CAPABLE IF" column.** This column shall contain a brief statement of the condition (e.g., malfunction, shortage) that would cause the covered equipment to be less than fully ready to perform its assigned mission.

3.2.3.4.4 **Mandatory replacement parts.** This paragraph shall contain a table listing all items that must be replaced during PMCS whether they have failed or not. The table shall reflect the interval at which these items must be replaced whether hardtime maintenance (see paragraph 6.5.6) or on condition maintenance (see paragraph 6.5.11) is the determining factor (see figure 17). This table shall be the last page(s) of the PMCS.

3.2.3.5 **Section V - Troubleshooting.**

a. This section shall contain those checks and corrective actions required to isolate defects which can be corrected by performance of maintenance allocated to the unit or AVUM manual user by the MAC. Troubleshooting procedures shall begin with a fault/symptom and should lead to isolation of single fault; however, if the corrective action indicated for a fault must be performed at a higher maintenance level, the unit mechanic shall be told to "notify (level of maintenance) support" .

b. For Systems Integration (SI) manuals, troubleshooting instructions shall be provided to a point where the fault symptom is located to a specific system/subsystem. At this point, further troubleshooting shall be referenced to the end item manual.

3.2.3.6 **Section VI - Maintenance procedures.**

a. This section shall contain maintenance procedures which are the responsibility of the unit or AVUM manual user as authorized by the MAC and SMR coded items. Headings for procedures/tasks shall be identified by the same functional group titles and codes as those used in the applicable MAC and RPSTL. Procedure format shall be as specified by the contracting activity.

b. When applicable, maintenance instructions shall reference or contain all procedures required for care and handling of ammunition, radioactive components, or ESD sensitive items. If applicable, instructions shall cover preservation (e.g., prevention of deterioration due to rough handling or exposure to adverse weather conditions or other hazards); disposition of defective ammunition/components and stockage of authorized replacement components; and applicable packing material, consumable supplies, and recovery of items needed for maintenance of stocks (e.g., cardboard inner boxes and wooden boxes). As applicable, reference shall be made to the RPSTL appendix for replacement parts and any special tools required, to the expendable and durable items list appendix for expendable and durable items, and ammunition appendix (see paragraph 3.3.11) for applicable information on use, maintenance, and handling of ammunition.

c. Instructions for CPC shall refer to applicable CPC publications or, when peculiar to the equipment, the manual shall contain required/applicable procedures.

d. NSNs shall not be used in procedural steps, illustrations, or illustration legends of maintenance manuals. Part numbers shall not be used in procedural steps, illustrations, or illustration legends, except when essential for identification.

e. AVUM/AVIM manuals shall refer to applicable procedures in TM 1-1500-204-23-1 through -23-10.

3.2.3.6.1 **Arrangement of procedures.**

a. All applicable maintenance procedures shall be arranged in the order in which they appear in the MAC. Each major component shall be fully covered before proceeding to the next major component (see paragraph 3.2.3.6.2).

b. Maintenance procedures (i.e., inspect and repair) shall be combined when applicable for the item involved.

3.2.3.6.2 **Maintenance.** Instructions for maintenance shall be complete and shall provide the proper techniques and all required detailed procedures. Each maintenance procedure shall provide step-by-step instructions in the most logical order for accomplishment of the work. Any unusual or critical steps shall be covered in detail (e.g., handling radioactive materials (see paragraph 3.2.2.1.9b), specifying ESD control requirements (see paragraph 3.2.2.1.9c), and specifying QA checks (see paragraph 3.2.2.1.5)). Applicable maintenance procedures shall be presented in the order shown.

a. Servicing
b. Ground handling
c. Operational check
d. Inspection - installed items
e. Removal
f. Disassembly
g. Cleaning
h. Inspection - acceptance/ rejection criteria
i. Nondestructive testing inspection
j. Repair and Replacement
k. Alignment
l. Painting
m. Lubrication
n. Assembly
o. Test/inspectionn
p. Installation
q. Adjustment
r. Radio interference suppression
s. Placing in service
t. Testing

3.2.3.6.2.1 **Servicing.** (For aircraft manuals, see paragraph 3.6).

a. Instructions shall cover the items listed below, plus any other such items/materials (except for lubricants) required for complete servicing of the equipment involved.

* Fuel	* Oxygen/nitrogen/ other gases
* Oil	
* Hydraulic or other fluids	* Tire pressures

b. Servicing instructions shall be supplemented with a diagram showing the location of regular and emergency servicing points.

c. Reference shall be made to the servicing diagram and list of expendable and durable items for identification of fuel, oil, and other materials used.

d. The precautions to observe in servicing a particular tank or reservoir (e.g., grounding and prevention of fire hazards) shall be stated clearly.

e. Instructions shall be included regarding access to any out-of-the-way or unusual places requiring service.

f. Reference shall be made to data in other parts of the text pertinent to servicing (i.e., tire pressure and capacities of tanks).

3.2.3.6.2.2 **Ground handling.**

a. Ground handling shall be presented in concise form, giving the following:

(1) Description, instructions, and precautions for ground handling of the equipment, including any information needed in extreme cold, heat, humidity, or dust.

(2) Equipment dimensions and clearances and weights of components.

(3) Instructions for folding and unfolding applicable parts (i.e., rotor blades, wings, rudders, and fins).

(4) Description, instructions, and pertinent illustrations as required to clarify text.

(5) Description and instructions for operating any ground equipment involved.

b. Arrangement of information shall be consistent with the following order of topics:

(1) Towing. Method of towing, both forward and backward, supplemented with diagram or illustration indicating location of towing lugs or rings.

(2) Jacking. Method of lifting the equipment by means of jacks, supplemented with a diagram showing location of jacking points and pads; methods to be used for jacking; and instructions for any precautions (i.e., blocking, supporting, storing) required during this operation.

(3) Parking. Parking methods utilizing parking brakes, control locks, and chocks, if applicable.

(4) Mooring. Instructions and reference diagram(s) showing location of securing points for mooring the equipment under adverse environmental conditions.

(5) Covering. Instructions for the installation of equipment covers and tiedown devices shall be included, as applicable. Illustrations showing installation and stowage locations of the covers shall be included, or a separate illustration shall be referenced.

(6) Hoisting. Methods of hoisting the equipment (or equipment sections) by means of hoisting slings, shall be included. Instructions for hoisting shall include a diagram showing hoisting points and attachment of slings IAW MIL-STD-209.

(7) Sling loading. Methods of sling loading equipment, supplemented with diagrams showing sling points, equipment requirements, and attaching points, will be described in concise detail IAW MIL-STD-209. Special precautions to be observed to prevent damage to the equipment or its components shall be stated.

(8) External power. Instructions and precautions for use of external power (e.g., attaching an external power unit to the equipment and applying electrical power) shall be included. Recommended type auxiliary power unit and rating required for starting the equipment shall be stated (see paragraph 6.5.2).

3.2.3.6.2.3 **Operational checks**. Instructions for operational checks shall:

a. Include the techniques and methods required to ensure the satisfactory performance of the item.

b. Reference the operator's instructions for starting, runup, and shutdown procedures as required.

c. When so specified in paragraph 3.2.3b(4), include a corrective procedures column to provide a means of referencing troubleshooting procedures.

3.2.3.6.2.4 **Inspection of installed items.** Instructions shall cover inspection of components, assemblies, or parts installed on the equipment. Inspection will be performed with the item in its installed position/ condition, considering accessibility and visibility of the item being inspected. The purpose of the inspection is to determine if the item is damaged, deteriorated, or incomplete to the extent that it should be replaced or repaired.

3.2.3.6.2.5 **Removal.** Instructions shall be provided in a logical removal sequence, with illustrations as required. When applicable, instructions shall be included for checking and recording gear wear patterns, backlash, ESD protective control measures, tagging shims, and separating and indexing parts for the assembly.

3.2.3.6.2.6 **Disassembly.** Instructions shall cover disassembly of components, assemblies, and subassemblies, as required, to the extent specified by the MAC and SMR coded items.

a. Precision matched or mated components, assemblies, subassemblies, and parts (other than common hardware), including ESD sensitive items, shall be marked, handled, and stored to preclude damage and ensure reassembly and installation in their matched positions.

b. Disassembly instructions shall not include separation of bonded, press-fitted, soldered, welded, or riveted parts, or the removal of electronic circuitry parts, unless such removal is required to clean, inspect, or test separately.

c. Procedural type illustrations shall be used and integrated into the disassembly procedure.

d. Cleaning after disassembly IAW paragraph 3.2.3.6.2.7 shall be included as required.

e. Information shall be furnished pertaining to components which require relubrication after the equipment has been cleaned.

3.2.3.6.2.7 **Cleaning.** Cleaning procedures, methods, special equipment, and required materials shall be specified. Instructions shall be provided for CPC treatment of parts after cleaning, as applicable.

a. All materials used in the cleaning and corrosion prevention of equipment, components, or parts shall be referenced and listed in the expendable and durable items list appendix (see paragraph 3.2.8).

b. Procedures shall include precautions to avoid damage to components and to prevent the entrance of water or other solvents into electrical components, ducts, or other openings.

c. Warnings and cautions shall be provided whenever incompatible chemicals or cleaning compounds are used or mixed. Identify whether the danger (e.g., gas, fumes, caustic, fire) is to personnel or equipment and state the effect.

3.2.3.6.2.8 **Inspection - acceptance/rejection criteria.** Detailed inspection requirements shall be provided, to include acceptance/rejection information sufficient to determine when the new, repaired, and used components, assemblies, and subassemblies conform to the wear limits, fits, and tolerances established. ESD control protective measures and CPC procedures shall be provided.

3.2.3.6.2.9 **Nondestructive testing inspection (NDTI).**

a. For aircraft, TM 55-1500-335-23 shall be the only NDTI document referenced in the NDTI procedures, and technical provisions of this manual shall be adhered to unless specific authorization to deviate from them is obtained from the contracting activity.

b. Individual NDTI procedures shall be specified for each part requiring NDTI. In order to satisfy this requirement, the following shall be included in aircraft manuals:

(1) If penetrant is required, the particular TM 55-1500-335-23 process.

(2) If magnetic particle inspection is required, the specific TM 55-1500-335-23 method, type of magnetization, and amount of current or ampere turns.

c. The rejection criteria shall be specified in all cases. This shall be done by means of a blanket statement, individual criteria for a part, or a combination of both.

d. Unless otherwise specified by the contracting activity, instructions for use of visible dye penetrants shall not be included as part of NDTI instructions (see TM 55-1500-335-23).

e. When several NDTI methods are permitted, the relative order of preference shall be specified.

f. Instructions for removing primer and/or paint shall be included in manuals that require the removal process as part of NDTI procedures. If a part (see paragraph 6.5.14) requires a special process, this procedure must be contained within the NDTI procedure for that part.

g. Cleaning requirements prior to, during, and after NDTI shall be specified. If a part has a built-in bearing, then a procedure to protect the bearing must be included in the NDTI procedure.

3.2.3.6.2.10 **Repair or replacement.** Essential instructions shall be provided for repair or replacement actions to restore an item to a serviceable/ operational condition.

a. The instructions shall provide for the repair of an item or the substitution of a serviceable like type part or item in a manner that allows the proper functioning of the equipment.

b. Items authorized to be manufactured or fabricated will be identified by part number, and reference shall be made to the illustrated list of manufactured items appendix (see paragraph 3.2.9) for criteria and bulk materials/parts required to make the item.

c. ESD standards, ESD sensitive items (including protective and control measures), and CPC procedures shall be identified.

3.2.3.6.2.11 **Alignment.** Detailed instructions shall be provided for alignment procedures to adjust specified variable elements of an item to bring about optimum or desired performance.

3.2.3.6.2.12 **Painting.** Instructions shall be referenced or provided for required painting, refinishing, and marking of assembled components, assemblies, subassemblies, or end item as applicable. Reference shall be made to TM 55-1500-345-23, TM 1-1500-204-23-1 through -10, SB 11-573, AR 746-1, TB 43-0209, TB 43-0118, TM 43-0139, or others as applicable.

3.2.3.6.2.13 **Lubrication.** Pertinent mandatory lubrication instructions, CPC procedures, and general lubrication instructions shall be contained in the maintenance manual.

a. When applicable and approved by the contracting activity, lubrication instructions shall be included early in the maintenance actions under Servicing.

b. Lubricant types and abbreviations for flight vehicles and components shall be as specified in MIL-HDBK-275; and for ground equipment systems, lubricants, functional fluids, preservatives, and specialty products shall be IAW MIL-HDBK-113. Required abbreviations not covered in the applicable handbook shall be furnished by the contracting activity.

3.2.3.6.2.14 **Assembly**. Step-by-step instructions shall be included for assembling removed or disassembled items which make up the components, assemblies, or subassemblies.

a. Precision matched or mated parts marked during disassembly shall be noted.

b. Instructions shall be included for checking and recording gear wear patterns, backlash, shimming requirements, and the indexing of parts to ensure proper alignment during assembly, when applicable.

c. Torque requirements, values, and sequences shall be indicated as applicable.

d. Instructions such as "reverse the disassembly procedure" shall not be used.

e. ESD standards, ESD sensitive items (including protective and control measures for the items), and CPC procedures shall be identified.

3.2.3.6.2.15 **Test/inspection**. Procedures shall be provided for testing and inspection during or after reassembly to ensure proper reassembly of the item. Correct method of testing, procedures for making tolerance checks, and procedures for inspection of distance measurements (e.g., clearance, end play, and backlash) shall be provided. Measurement criteria and tolerances shall reflect the TMDE available to the user.

3.2.3.6.2.16 **Installation**. Steps and procedures required for installation of the item shall be provided.

a. Procedures for checking alignment and adjustment of the item during the installation sequence shall be included. In addition, these instructions shall include a statement that adjustment, servicing, testing, or an operational check (as applicable) is required.

b. Instructions such as "reverse the removal procedure" shall not be used.

c. Peculiar requirements for lockwiring, installing cotter pins, ESD protective/control measures, CPC instructions, and similar operations shall be included along with applicable references to the expendable and durable items list (see paragraph 3.2.8).

3.2.3.6.2.17 **Adjustment.** This portion shall contain all adjustment instructions required prior to the operation of the part, system (see paragraph 6.5.19), or end item.

3.2.3.6.2.18 **Radio interference suppression.** Replacement of components in the suppression system shall be described and illustrated. Reference shall be made to any pertinent maintenance procedures containing removal and installation instructions. Testing of radio interference suppression components shall be described.

3.2.3.6.2.19 **Placing in service.** Final instructions (not previously covered) that are required for an assembly, component, or end item to be placed in service shall be provided. These shall include instructions for removal of an item from storage and preparation for installation on an end item, if applicable. Final servicing checks, calibration, leak checks, ESD procedure, and operational checks shall be included as applicable.

3.2.3.6.2.20 **Testing.** Instructions shall be provided to test the performance of components, assemblies, and subassemblies prior to installation in the end item.

3.2.3.7 **Section VII - Preparation for storage or shipment.** This section shall include the following special instructions, as required:

a. Security procedures (see AR 190-11 and AR 190-13).

b. Special preservation, packaging, packing, marking, ESD protective/ control measures, and shipping instructions, including use of special design reusable containers (see paragraph 3.2.3.2).

c. Special use of CPC compounds, moisture barriers, and desiccant materials.

d. Instructions or reference to instructions for applying special identifying, shipping, and precautionary markings to shipping containers.

e. Instructions for placing equipment in and removing it from administrative storage will be provided by the contracting activity IAW AR 750-1 and paragraph 3.2.2.1.4.

f. Proper handling, blocking, and bracing of basic load ammunition when being transported in trucks and other tactical vehicles.

g. Basic load storage, quantity distance class, and storage compatibility groupings, storage temperatures, stacking limits, and other pertinent storage requirements (for conventional and chemical ammunition manuals only).

3.2.3.7.1 **Shipment of aircraft.** Data for shipment of aircraft shall be covered in separate -S series manuals prepared IAW MIL-M-63005.

3.2.3.7.2 **Aviation ground support equipment manuals.** Aviation ground support equipment manuals shall reference TM 1-1500-204-23-1 through -10 for general technical information on preparation for storage or shipment.

3.2.4 **Appendices.** Appendices shall be identified alphabetically throughout the document in the order of their reference in the text (e.g., appendix A, appendix B, etc.).

3.2.5 **Appendix () - References.** Information contained in this appendix shall be grouped by type and according to subject, with group headings numbered as paragraphs (e.g., A-1, A-2, etc.).

3.2.6 **Appendix () - Maintenance allocation chart (MAC).** The MAC shall be prepared from the equipment top-down breakdown or functional group sequence to consolidate and identify those groups on the list which involve maintenance functions identified. Logistics Support Analysis (LSA) Output Report LSA-004 (Maintenance Allocation Summary), shall be used, when available, as source data for the final approved MAC.

3.2.6.1 **Maintenance functions.** The MAC shall list the applicable maintenance functions assigned to each maintenance level and shall be published only in equipment TMs containing the lowest level of maintenance identified for the end item. Maintenance functions shall be assigned based on guidance contained in AR 750-1.

3.2.6.2 **MAC entries.**

a. The basic entries in the MAC shall be a list of groups applicable to the end item which require maintenance. The term functional group applies to repairable assemblies, subassemblies, and spares (see paragraph 6.5.16), but not to repair parts (see paragraph 6.5.15). The end item group shall be numbered "00" or its equivalent "AA."

b. Entries shall be item names (see paragraph 6.5.7) and where applicable, type designators; however, entries shall contain positive identification. Lamps, electron tubes, fixed resistors, rotor caps, ignition coils, "throwaway" modules, and repair parts of a like category are not considered to be repairable, subject to maintenance, and shall not be listed in the MAC (see paragraph 3.2.6.2e).

c. All item names shall be the same in the MAC, RPSTL, PMCS, and narrative maintenance instructions. Official reverse word order shall be used in the MAC and RPSTL. Normal word order shall be used in maintenance instructions.

d. The maintenance code entered in the third position of the SMR code in the RPSTL (or parts listing) shall identify the lowest level of maintenance that is authorized to remove and install, replace, and use the spare or repair parts.

e. If the maintenance function is replace only for a repair part, the repair part shall not be listed in the MAC, unless that would result in omission of the NHA group number. In such instances, the part shall be listed so that the NHA functional group number will appear. Such parts shall be included in the applicable RPSTL, automatically authorizing replacement at the lowest maintenance level indicated by the letter in the third position of the SMR code.

f. All items in the MAC shall specify the maintenance level(s) to which a function is authorized.

g. Exception is authorized for ammunition MACs to permit use of maintenance function headings that better describe or identify ammunition peculiar maintenance functions. For detailed ammunition MAC requirements see MIL-M-63015.

3.2.6.3 **MAC sequence of entries.** The sequence of entries in the MAC shall prescribe the sequence of group numbers followed in the RPSTL(s).

NOTE

The MAC, RPSTL, and maintenance instructions in equipment TMs shall be complete and consistent with regard to level of maintenance. In equipment TMs containing replace or repair maintenance instructions, the replace or repair procedures will be arranged to coincide with the sequence followed in the MAC and RPSTL.

3.2.6.4 **MAC introduction.** The introduction to the MAC shall be prepared IAW with figures 18 (sheets 1-4) or 19 (sheets 1-7), as applicable. Figure 19 is an example of the aviation MAC as required for use in aviation maintenance manuals.

3.2.6.5 **MAC format.** The MAC shall appear in the standard format shown in figure 18 (sheet 5) or the aviation format shown in figure 19 (sheet 8), as specified in Appendix A of this specification sheets.

a. For an explanation of data to be listed in columns of this chart, refer to figure 18 (sheets 3 through 4) or 19 (sheets 5 through 7), as applicable.

b. The group number shall be entered in column 1, nomenclature of the spare (component/assembly) shall be entered in column 2, and maintenance function shall be entered in column 3 of the MAC.

c. Column 4 of the standard MAC shall be divided into 4 main headings, one for each level of maintenance (e.g., unit, DS, GS, and depot). Column 4 of the aviation MAC shall be divided into 3 main headings (e.g., AVUM or unit, AVIM or intermediate, and depot).

d. A work time figure must appear in the subcolumn for the maintenance level authorized to perform the maintenance listed in column 3.

(1) Worktime specified for each level of maintenance shall be the average time to restore an item (subassembly (see paragraph 6.5.18), assembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. It shall include troubleshooting time, time to accomplish preliminary (equipment condition) and follow-on tasks, preparation time, and QA/quality control time in addition to the time required to perform the specific maintenance function authorized in the MAC.

(2) When available, this time shall be the established time standard developed through LSA, otherwise it shall be derived from the calculation of a statistically weighted time estimate (t), incorporating the optimistic (a), most likely (m), and pessimistic (b) time estimates for the work to be accomplished using the formula:

$$t = \frac{a + 4m + b}{6}$$

(3) This work time shall be carried to one decimal place (tenths of hours).

e. Reference numbers for all required tools and test equipment shall be listed in column 5 of the MAC. A cross-reference list of these reference numbers and the tools and test equipment, both special and common, they reperesent shall be prepared as section III of the MAC and shall shall be prepared IAW with the format shown on figure 18 (sheet 6), or figure 19 (sheet 9), as applicable. Common tools shall not be included on this list when they are part of an existing set, kit, or outfit authorized to the intended user; however, the authorized set, kit, or outfit which contains the prescribed common tools shall be listed.

f. Reference letters for remarks pertinent to the maintenance functions shall be listed in column 6 of the MAC. A cross-reference list of these reference letters and the remarks they reperesent shall be prepared as section IV to the MAC and shall be prepared IAW with the format shown in figures 18 (sheet 6) or 19 (sheet 9), as applicable.

3.2.7 **Appendix () - Repair parts and special tools list (RPSTL).** If this appendix is required, it shall be prepared IAW MIL-STD-335 or MIL-M-49502 as applicable and as specified. LSAR Output Report LSA-030, Option 2 (Proof RPSTL), shall be used, when available, as source data for the final RPSTL.

3.2.8 **Appendix () - Expendable and durable items list.** This appendix shall have two sections, Section I, Introduction, and Section II, Expendable and Durable Items List (tabular listing). The introduction shall be prepared and include the applicable information as shown on figure 20. This appendix shall not include illustrations. The list shall be formatted and shall include the applicable information under the headings shown on figure 21.

3.2.9 **Appendix () - Illustrated list of manufactured items.** This appendix shall include simplified line drawing illustrations for each item authorized to be manufactured/fabricated (e.g., all M source coded items authorized in the applicable RPSTL). Supporting text, consisting of all instructional criteria needed to manufacture/fabricate the item plus a list of bulk materials (see paragraph 3.2.9.3e(3)) to be used in the manufacture or fabrication of the item, shall be included with each illustration. When applicable, this appendix shall also list the part numbers of the items to be manufactured (see paragraph 3.2.9.2).

3.2.9.1 **Introduction.** The following statements shall be included:

"This appendix includes complete instructions for making items authorized to be manufactured or fabricated."

"A part number index in alphanumeric order is provided for cross-referencing the part number of the item to be manufactured to the figure which covers fabrication criteria."

"All bulk materials needed for manufacture of an item are listed by part number or specification number in a tabular list on the illustration."

3.2.9.2 **Manufactured items part number index.** An index shall be furnished which lists part numbers, in alphanumeric order, of all items illustrated in this appendix. The part number of each manufactured item shall be cross-referenced to the applicable figure.

3.2.9.3 **Manufactured items illustrations - format and content.**

a. Line drawings in clear, simple, complete format (see figure 21) shall be used as illustrations and shall contain sufficient views to portray all features of the item.

b. More than one illustration may appear on one page to save space.

c. Each illustration on a page shall be assigned a separate figure number.

d. Consecutive figure numbers shall be assigned to the illustrations.

e. All instructions (explanatory text and list of bulk materials) needed by maintenance personnel to manufacture the item (see figure 22) shall be included on the illustration(s) as follows:

(1) All dimensional, locational, and processing instructions (e.g., 30" long, top surface, primer coating) needed to manufacture the item shall be included.

(2) A description of the item to be manufactured, including the part number and name, shall be furnished.

(3) A list of bulk materials needed to manufacture the item shall be furnished. The list shall consist of the part or specification number of the raw bulk material to be used in manufacture of the item and shall include any other pertinent data (i.e., standards, specifications, conditions, and dimensions).

(4) When applicable, reference shall be made to the associated RPSTL TM or RPSTL appendix (for combined manuals).

3.2.10 **Appendix () - Torque limits.** This appendix shall be included to provide applicable torque values expressed in metric terms (e.g., lb-ft or lb-in), data as to bolt grade markings and their proper identification, and specific torque sequencing requirements as applicable (see figure 23).

3.2.11 **Appendix () - Tool identification list.** This appendix shall be included, have the title "TOOL IDENTIFICATION LIST", and shall be in columnar format, arranged as follows: Column 1, "(1) ITEM NUMBER"; column 2, "(2) ITEM NAME"; column 3, "(3) NATIONAL STOCK NUMBER"; column 4, "(4) PART NUMBER"; and column 5, "(5) REFERENCE" (see figure 14.)

3.2.12 **Appendix () - Mandatory replacement parts.** When specified by the contracting activity, this appendix shall be included and shall list all mandatory replacement parts referenced in the task setups and procedures. Items in the list shall be identified by item number, part number, NSN, nomenclature, and quantity required.

3.2.13 **Glossary.** If the manual contains a number of terms requiring definition, including abbreviations (see paragraph 3.1.7), a glossary shall be included (see figure 24).

3.2.14 **Alphabetical index.** Each TM shall include an alphabetical index prepared IAW MIL-M-38784.

3.3 **Type -30 - DS or AVIM manual (other than aircraft).** This manual shall describe in detail the DS or AVIM prescribed by the MAC and SMR coded items. The actual number of chapters in a TM depends on the maintenance concept and complexity of the equipment (see figure 1). Required principles of operation shall be included in the applicable maintenance chapter.

3.3.1 **Front matter.** (See paragraph 3.2.1 and adjust to DS or AVIM level.)

3.3.2 **Introduction chapter.** (See paragraph 3.2.2 and adjust to DS or AVIM level.)

3.3.2.1 **Section I - General information.** (See paragraph 3.2.2.1)

3.3.2.1.1 **Maintenance forms, records, and reports.** (See paragraph 3.2.2.1.2.) Where applicable, add reference to SB 742-1 and AR 700-22.

3.3.2.1.2 **Calibration.** Equipment requiring calibration shall be indicated and reference shall be made to the publication containing the applicable calibration procedure.

3.3.2.2 **Section II - Equipment description and data.** (See paragraphs 3.2.2.2 through 3.2.2.2.5.) This section shall include a reference to the equipment data in the operator's manual plus any data required by DS or AVIM personnel but not included in the operator's, unit, or AVUM manuals. Reference shall be made to material in other publications, provided they are available at DS or AVIM levels. Information will not be duplicated except for emphasis or clarity.

3.3.3 **Inspection and test of conventional and chemical ammunition or components containing radioactive materials chapter.** This chapter shall reference separate ammunition manuals or radioactive materials procedures in the text, or shall include the sections in paragraphs 3.3.3.1 through 3.3.3.7.

3.3.3.1 **Section I - General.** This section shall contain a statement to the effect that inspection criteria are provided to ensure that maintenance performed will restore the items to an acceptable quality level (AQL). It shall also reference regulations and technical publications relating to policy responsibility and procedures applicable to ammunition stockpile reliability, ammunition surveillance, radioactive materials procedures, and quality evaluation programs. The types of inspections contained in this section shall, at a minimum, include a premaintenance inspection to be conducted during unpacking, in-process inspections, and final acceptance inspection.

3.3.3.2 **Section II - Classification of materiel defects.** This section shall describe the inspection methods or techniques used to detect defective components/end items being processed. It shall also include "Classification of Materiel Defect" tables for ammunition components and packaging and packing material. The tabulated data shall include a listing of components, categories of defects (e.g., minor, major, critical) attributable to each

component, a listing of defects by category, reference to the paragraph of the manual containing corrective action, the inspection methods used to determine if corrective action was accomplished, and AQL established for each defect.

3.3.3.3 **Section III - Visual inspection.** This section shall contain visual inspection criteria for the packing of the items in conformance with the inspection criteria noted in paragraph 3.3.3.1.

3.3.3.4 **Section IV - Function testing.** This section shall contain detailed procedures and criteria for functional testing. Diagrams and instructions for fabrication of test fixtures shall be included when required. Where ammunition is required for functional testing of weapons, it shall be identified in this section by Department of Defense Ammunition Code (DODAC), NSN, and nomenclature, including dummy rounds.

3.3.3.5 **Section V - Evaluation of defects.** This section shall contain a paragraph covering evaluation of item defects and a paragraph covering evaluation of packing defects. Both paragraphs shall contain guidelines to be used in establishing a uniform system of examination for deterioration or damage. Definitions of minor, major, and critical defects shall be included. References to the lower maintenance level manuals shall be included when applicable.

3.3.3.6 **Section VI - Classification of defects.** This section shall contain a classification of defects (e.g., major or critical). The criteria for classification shall conform to the criteria in the publications noted in paragraph 3.3.3.1.

3.3.3.7 **Section VII - Disposition of lots.**

a. For missiles, the contracting activity will furnish directions relating to disposition of lots.

b. For other than missiles, this section shall contain the following paragraphs verbatim:

"Each 'lot' of materiel shall be inspected and screened 100 percent if one critical defect is observed. Submit malfunction reports as prescribed in AR 75-1. Disposition instructions will be furnished by the U.S. Army Materiel Command."

"A 'lot' of materiel is acceptable for issue and use if the acceptable criteria as indicated in (insert applicable table number) are met."

"For conventional and chemical ammunition, report all 'lots' of materiel rejected under the applicable serviceability table to: Commander, U.S. Army Armament, Munitions and Chemical Command, ATTN: AMSMC-DSM, Rock Island, IL 61299-6000, for disposition instructions. Include a statement describing the capability and workload situation of your organization as to whether you are capable of reworking/ demilitarizing the item."

3.3.4 **Maintenance instructions chapter(s).** See paragraphs 3.2.3 through 3.2.3.7.2 for Sections I through VII and adjust for DS or AVIM.

a. Provide instructions for missile system equipment UUTs IAW MIL-M-63044.

b. For ammunition, see paragraph 3.2.3.6(b).

c. In cases where an assembly (i.e., a truck engine) is part of a larger end item, any DS/AVIM of the assembly installed (e.g., engine in truck) shall be in the end item manual (e.g., truck DS manual). DS/AVIM of the assembly removed from its end item shall be covered in the assembly's DS/AVIM manual (e.g., engine TM).

3.3.4.1 **Section VIII - Pre-embarkation inspection of material in units alerted for overseas movement.** When applicable, pre-embarkation inspection of material in units alerted for overseas movement will be furnished by the contracting activity.

3.3.5 **Appendices.** (See paragraph 3.2.4.)

3.3.6 **Appendix () - References.** (See paragraph 3.2.5.)

3.3.7 **Appendix () - Maintenance Allocation Chart (MAC).** This appendix shall only be included if not already in a lower level maintenance manual. For preparation instructions see paragraph 3.2.6.

3.3.8 **Appendix () - Repair parts and special tools list (RPSTL).** (See paragraph 3.2.7.)

3.3.9 **Appendix () - Expendable and durable items list.** (See paragraph 3.2.8.)

3.3.10 **Appendix () - Illustrated list of manufactured items.** (See paragraphs 3.2.9 through 3.2.9.3 and adjust to DS or AVIM level.)

3.3.11 **Appendix () - Torque limits.** (See paragraph 3.2.10.)

3.3.12 **Appendix () - Ammunition information.** When specified by the contracting activity, a separate ammunition appendix shall be prepared. This appendix shall contain applicable information on ammunition marking, classification, care and handling, preservation, transportation, packing, and other data pertinent to ammunition usage and maintenance. Where applicable, such data shall be presented in tabular format (see figure 25, sheets 1 through 6).

3.3.13 **Appendix () - Tool identification list.** (See paragraph 3.2.11.)

3.3.14 **Appendix () - Mandatory replacement parts.** (See paragraph 3.2.12.)

3.3.15 **Glossary.** (See paragraph 3.2.13.)

3.3.16 **Alphabetical index.** (See paragraph 3.2.14.)

3.4 **Type -40 - GS maintenance manual.** This manual shall describe in detail the GS maintenance prescribed by the MAC and SMR coded items. The actual number of maintenance chapters in a TM depends on the maintenance concept and complexity of the equipment (see figure 1). Required principles of operation shall be included in the applicable maintenance chapter.

3.4.1 **Front matter.** (See paragraph 3.2.1 and adjust to GS level.)

3.4.2 **Introduction chapter.** (See paragraph 3.2.2 and adjust to GS level.)

3.4.2.1 **Section I - General information.** (See paragraph 3.2.2.1.)

3.4.2.1.1 **Maintenance forms, records, and reports.** (See paragraph 3.2.2.1.2.)

3.4.2.1.2 **Calibration.** (See paragraph 3.3.2.1.2.)

3.4.2.2 **Section II - Equipment description and data.** (See paragraph 3.2.2.2.) This section shall include a paragraph referencing the equipment data in the operator's manual. Any data required by the GS level but not included in the operator's, unit, or DS manuals shall be included. References shall be made to material in other publications, provided they are available at the GS level. Information shall not be duplicated except for emphasis or clarity.

3.4.3 **Inspection and test of conventional and chemical ammunition or components containing radioactive materials chapter.** (See paragraph 3.3.3 and adjust to GS maintenance.)

3.4.4 **Maintenance instructions chapters.** (See paragraphs 3.2.3 through 3.2.3.7.2 for sections I through VII and adjust to GS level.)

a. Provide instructions for missile system equipment UUTs IAW MIL-M-63044.

b. For ammunition, see paragraph 3.2.3.6(b).

c. In cases where an assembly (i.e., as a truck engine) is part of a larger end item, GS/AVIM of the assembly installed (e.g., engine in truck) shall be in the end item manual (e.g., truck DS manual). GS/AVIM of the assembly removed from its end item shall be covered in the assembly GS/AVIM manual (e.g., engine TM).

3.4.4.1 **Section VIII (or as applicable) - Pre-embarkation inspection of materiel in units alerted for overseas movement.** When applicable, the information for this section will be furnished by the contracting activity.

3.4.5 **Appendices.** (See paragraph 3.2.4.)

3.4.6 **Appendix () - References.** (See paragraph 3.2.5.)

3.4.7 **Appendix () - Maintenance Allocation Chart (MAC).** This appendix shall only be included if not already in a lower level maintenance manual. For preparation instructions see paragraph 3.2.6.

3.4.8 **Appendix () - Repair parts and special tools list (RPSTL).** (See paragraph 3.2.7.)

3.4.9 **Appendix () - Expendable and durable items list.** (See paragraph 3.2.8.)

3.4.10 **Appendix () - Illustrated list of manufactured items.** (See paragraphs 3.2.9 through 3.2.9.3 and adjust to GS maintenance.)

3.4.11 **Appendix () - Torque limits.** (See paragraph 3.2.10.)

3.4.12 **Appendix () - Ammunition information.** (See paragraph 3.3.11.)

3.4.13 **Appendix () - Tool identification list.** (See paragraph 3.2.11.)

3.4.14 **Appendix () - Mandatory replacement parts.** (See paragraph 3.2.12.)

3.4.15 **Glossary.** (See paragraph 3.2.13.)

3.4.16 **Alphabetical index.** (See paragraph 3.2.14.)

3.5 **Type -23 - Unit and DS maintenance or AVUM and AVIM manuals (other than aircraft).** (For aircraft, see paragraph 3.6.) Describe in detail the unit and DS maintenance or AVUM and AVIM prescribed by the MAC and SMR coded items. The actual number of chapters in a TM depends on the maintenance concept and complexity of the equipment (see figure 1). Required principles of operation for unit and DS maintenance or AVIM only, shall be included in the applicable maintenance chapter.

3.5.1 **Front matter.** (See paragraph 3.2.1 and adjust to include unit and DS or AVIM.)

3.5.2 **Introduction chapter.** (See paragraph 3.2.2 and adjust to include unit and DS or AVIM.)

3.5.2.1 **Section I - General information.** (See paragraph 3.2.2.1.)

3.5.2.1.1 **Maintenance forms, records, and reports.** (See paragraph 3.2.2.1.2.)

3.5.2.1.2 **Calibration.** (See paragraph 3.3.2.1.2.)

3.5.2.2 **Section II - Equipment description and data.** (See paragraphs 3.2.2.2 through 3.2.2.2.5.) This section shall include a paragraph referencing the equipment data in the operator's manual. Any data required by unit and DS maintenance or AVUM and AVIM but not included in the operator's manual shall be included. References shall be made to material in other publications, provided they are available at the maintenance levels covered. Information shall not be duplicated except for emphasis or clarity.

3.5.3 **Inspection and test of conventional and chemical ammunition or components containing radioactive materials chapter.** (See paragraph 3.3.3.)

3.5.4 **Maintenance instructions chapter(s).** (See paragraphs 3.2.3 through 3.2.3.7.2 for sections I through VII and adjust to include unit and DS or AVUM and AVIM.)

a. Provide instructions for missile system equipment UUTs IAW MIL-M-63044.

b. For ammunition, see paragraph 3.2.3.6(b).

c. In cases where an assembly (i.e., a truck engine) is part of a larger end item, any unit and DS or AVUM and AVIM of the assembly installed (e.g., engine in truck) shall be in the end item manual (e.g., truck DS manual). Unit and DS or AVUM and AVIM of the assembly removed from its end item shall be covered in the assembly unit and DS or AVUM and AVIM manual (e.g., engine TM).

3.5.4.1 As applicable, the information for section VIII pre-embarkation inspection of materiel in units alerted for overseas movement, will be furnished by the contracting activity.

3.5.5 **Appendices.** (See paragraph 3.2.4.)

3.5.6 **Appendix () - References.** (See paragraph 3.2.5.)

3.5.7 **Appendix () - Maintenance allocation chart (MAC).** (See paragraph 3.2.6.)

3.5.8 **Appendix () - Repair parts and special tools list (RPSTL).** (See paragraph 3.2.7)

3.5.9 **Appendix () - Expendable and durable items list.** (See paragraph 3.2.8.)

3.5.10 **Appendix () - Illustrated list of manufactured items.** (See paragraphs 3.2.9 through 3.2.9.3 and adjust to unit and DS or AVUM and AVIM.)

3.5.11 **Appendix () - Torque limits.** (See paragraph 3.2.10.)

3.5.12 **Appendix () - Ammunition information.** (See paragraph 3.3.11.)

3.5.13 **Appendix () - Tool identification list.** (See paragraph 3.2.11.)

3.5.13 **Appendix () - Mandatory replacement parts.** (See paragraph 3.2.12.)

3.5.14 **Glossary.** (See paragraph 3.2.13.)

3.5.15 **Alphabetical index.** (See paragraph 3.2.14.)

3.6 **Type -20 AVUM and Type -23 AVUM and AVIM manuals (aircraft).** These manuals shall describe in detail the scope of maintenance prescribed by the MAC and SMR coded items. The actual number of maintenance chapters in the TM will depend on the maintenance concept and complexity of the equipment (see figure 1).

a. For type -20 manuals, include requirements in paragraphs 3.6.1 through 3.6.16.

b. For type -23 AVUM/AVIM manuals, include all the requirements of the -20 plus all AVIM. When combined maintenance data pertains only to AVIM, the paragraph or instruction title shall be suffixed by the acronym AVIM (i.e., Removal of governor (AVIM)).

3.6.1 **Front matter.** (See paragraph 3.2.1.)

3.6.1.1 **Warning and first aid data page(s).** A warning and first aid data page(s) shall be included and shall be IAW paragraph 3.2.1.2. Definitions of warnings, cautions, and notes shall not appear on these pages.

3.6.1.2 **List of effective pages.** A list of effective pages shall not be included.

3.6.2 **Chapter 1 - Introduction.** (See paragraph 3.2.2 and add requirements in paragraphs 3.6.2.1 through 3.6.2.5.1.)

3.6.2.1 **Section IV - Servicing.** This section shall contain instructions for replenishment of fuel; oil; hydraulic and other fluids; oxygen, nitrogen, and other gases; tire pressures; and all other such items involved in completely servicing the aircraft. Information contained herein shall not duplicate lubrication information found in section V.

a. Reference shall be made to the servicing diagram and expendable and durable items list for identification of fuel, oil, and other materials used. The precautions to observe in servicing a particular tank or reservoir (i.e., grounding and prevention of fire hazards) shall be stated clearly, and instructions shall be included regarding access to any out-of-the-way or unusual places requiring service. Servicing instructions shall be supplemented with a diagram showing locations of regular and emergency servicing points. Items located on each side of the aircraft which require servicing shall be illustrated and identified in the legend as right and left side. NO STEP areas on walkways leading to any tank shall be indicated and applicable precautions shall be included.

b. Reference shall be made to graphs or data in other parts of the text pertinent to servicing (i.e., tire pressure versus gross takeoff weight and capacities of tanks).

3.6.2.1.1 **Cleaning.** Detailed instructions shall be furnished for cleaning and washing the entire aircraft, together with precautions to avoid damage to microswitches and electrical connections and prevent the entrance of water or other solvents into cabin ducts and other such openings. Instructions shall be included on the removal of the battery, relief tube, power plant, armament exhaust deposits, other items, or material as required. Information shall also be furnished pertaining to components which require relubrication after the aircraft has been washed or steam cleaned.

3.6.2.2 **Section V - Lubrication.** This section shall contain the following:

3.6.2.2.1 **Lubrication instructions.** Lubrication schedules shall be prepared as required to present all applications and procedures, lubricants, and lubrication points to completely lubricate aircraft.

3.6.2.2.2 **Lubrication charts.** Lubrication charts shall consist of a main drawing prepared as a 3-dimensional diagram, and such enlarged or detailed views required to identify items which otherwise would be obscured (see figure 26). They shall show all lubrication requirements for all parts of the aircraft requiring periodic lubrication, other than those lubricated by the main engine oil system. The charts shall also indicate type of lubricant, method of application, and frequency. This information shall be presented through the use of a standard symbol. Use of black silhouette figures representing a likeness of the tool used in application (e.g., oil can, grease gun, brush, or hand) shall be the accepted means of presenting application methods on the lubrication chart. Approved abbreviations as specified in MIL-HDBK-275 shall be used to present lubricant types. In the event a lubricant does not have an abbreviation listed in MIL-HDBK-275, the abbreviation will be furnished by the contracting activity. Assigned application symbols, type abbreviations, and frequency shall be placed within the standard lubrication symbols. A key shall also be included on the chart to define each application symbol and lubricant abbreviation used. Consecutively numbered notes shall be used to specify requirements other than normal. A statement "SEE NOTE 1" shall be placed adjacent to the symbol, as applicable.

3.6.2.3 **Section VI - Handling, jacking, mooring, hoisting, and sling loading.** Paragraphs in this section shall include any instructions required for blocking and supporting the aircraft during performance of the operation or procedure involved. This section shall contain the following requirements, as applicable (see paragraphs 3.6.2.3.1 through 3.6.2.3.9).

3.6.2.3.1 **Ground handling.** This paragraph(s) shall contain instructions and precautions for ground handling the aircraft. This shall include instructions for handling the aircraft in extreme cold, heat, high humidity, dusty, or other unusual or extreme conditions. Aircraft dimensions and clearances, instructions for folding and unfolding rotor blades, and instructions for operation of any ground handling equipment involved shall be included. Illustrations shall be used, as applicable to clarify the text.

3.6.2.3.2 **Towing.** This paragraph(s) shall describe direction of towing. If required for clarity, a diagram or illustration indicating location of towing lugs or rings shall be included. Limitations and cautions shall be included.

3.6.2.3.3 **Jacking.** This paragraph(s) shall describe methods of lifting the aircraft by means of jacks. A diagram showing location of jacking points, pads, and methods used for jacking shall be included. Instructions for shoring or other pertinent precautions shall also be included where applicable.

3.6.2.3.4 **Parking.** This paragraph(s) shall describe parking methods, including the use of parking brakes, control locks, and chocks, where applicable.

3.6.2.3.5 **Mooring instructions.** This paragraph(s) shall provide instructions and reference diagrams showing location of securing points for mooring the aircraft under adverse environmental conditions.

3.6.2.3.6 **Aircraft covers.** This paragraph(s) shall contain instructions for installation of aircraft covers and rotor tiedown devices. Location of installed covers and their stowage locations shall be illustrated, either on illustrations in this portion or elsewhere in the TM.

3.6.2.3.7 **Hoisting.** This paragraph(s) shall describe methods used with hoisting slings to lift aircraft or aircraft sections. A diagram showing hoisting points and illustrating how to attach slings shall be included.

3.6.2.3.8 **Sling loading.** Methods of sling loading aircraft, supplemented with diagrams showing sling points, equipment requirements, and attaching points, shall be described in detail. Special precautions to prevent damage to the aircraft or its components shall be included.

3.6.2.3.9 **Application of external power.** Instructions for application of external power (i.e., attaching external power unit to the aircraft and applying electrical power) shall be included. Precautions, if any, shall be described. Recommended type of auxiliary power unit and rating required for starting aircraft shall be stated.

3.6.2.4 **Section VII - Preventive maintenance inspections.**

3.6.2.4.1 **General information and introduction.** The following paragraph shall be included: "**General information.** This section contains complete requirements for special inspections, overhaul and retirement schedule, and standards of serviceability applicable to the aircraft. The inspections prescribed in this section shall be accomplished at specified periods by AVUM activities, with the assistance of AVIM activities when required. Complete daily, intermediate, periodic, or phased inspections are contained in the (insert applicable aircraft inspection checklist TM)."

3.6.2.4.2 **Standards of serviceability.** The following statement shall be included: "Standards of serviceability to be utilized in the day-to-day inspection and maintenance of the aircraft can be found as fits, tolerances, wear limits, and specifications in the aircraft maintenance manuals. Standards of serviceability for transfer to aircraft are contained in TM 1-1500-328-25."

3.6.2.4.3 **Special inspections.**

a. Definition and general information. The following statement shall be included: "This section supplements scheduled inspections as outlined in the applicable aircraft inspection checklists. This section also includes inspection of items which are required to be inspected at intervals not compatible with airframe operating time or airframe inspection intervals. Refer to DA Pam 738-751 for applicable forms, records, and worksheets required for these inspection intervals." Typical examples of this type of inspection are:

(1) Inspections which are solely contingent upon specific conditions or incidents that occur (e.g., hard landings, overspeed, or sudden stoppage), wherein immediate inspection is required to ensure safe flight.

(2) Inspection of components or airframe on a calendar basis (e.g., first aid kits, weight and balance check, and aircraft inventory).

b. Requirements. The requirements of this section shall include items which qualify under the criteria for special inspections, (e.g., hard landings, sudden stoppage, and overspeed). These requirements shall be grouped under area headings only and shall be inserted in a columnar listing on the inspection checksheet format in such a manner as to permit local reproduction of the entire section.

3.6.2.5 **Section VIII - Overhaul and retirement schedule.**

3.6.2.5.1 **Introduction.** The introduction shall contain the following statement: "Overhaul and retirement schedule. This section lists units of operating equipment that are to be overhauled or retired at the period specified. Unless otherwise specified in TM 1-1500-328-25, removal of equipment for overhaul shall be accomplished at the inspection nearest the time when overhaul is due."

3.6.3 **Maintenance instructions chapter(s).** The chapter(s) shall describe in detail the maintenance allocated to AVUM by the MAC. The chapters shall be arranged to align with the MAC.

3.6.3.1 **Section () - Troubleshooting.** (See paragraph 3.2.3.5.) Unless otherwise specified by the contracting activity, this section shall be included along with adequate theory of operations information to support the troubleshooting procedures. When data are extensive, and when so specified by the contracting activity, troubleshooting shall be published as a separate (-T) manual. Troubleshooting information published as a separate manual shall comply with all requirements of the -20 or -23 maintenance manuals for format, order of presentation, etc.

3.6.3.2 **Maintenance procedures.** (See paragraph 3.2.3.6.)

3.6.4 **Appendices.** (See paragraph 3.2.4.)

3.6.5 **Appendix () - References.** (See paragraph 3.2.5.)

3.6.6 **Appendix () - Maintenance allocation chart (MAC).** (See paragraph 3.2.6.)

3.6.7 **Appendix () - Aircraft inventory master guide.** This appendix shall include sufficient information on standard inventory procedures to allow determination of inventoriable items of installed and loose equipment authorized and required by

the specific aircraft in performance of its mission (see figure 27). The general arrangement of the appendix shall be as described in paragraphs 3.6.7.1 through 3.6.7.3.

3.6.7.1 **Introduction**. This section shall include a short explanation of scope and purpose of the appendix. Information pertaining to steps to ensure the list is accurate, exact, and complete (e.g., research of authorized changes (modification work orders and additions/deletions for special mission requirements)) shall be included and the introduction shall refer to DA PAM 738-751 for applicable forms and records.

3.6.7.2 **Security**. This paragraph shall state that aircraft inventory records should be unclassified but that any classification of the contents, if required, shall be IAW the existing security regulation.

3.6.7.3 **Inventoriable items**. The selection of inventoriable items shall be without regard to the agency, governmental or contractual, furnishing the items.

a. Items to be listed follow:

(1) Items essential to the execution of the designated mission of the aircraft (i.e., as electronic, photographic, armament, special mission instruments, and safety and comfort equipment).

(2) Loose equipment delivered with the aircraft and items subject to pilferage or readily converted to personal use.

(3) Modification kits which are issued or distributed to using organizations for installation and which are not immediately placed in work. These shall be recorded on the affected aircraft's DA Form 2408-17 (Aircraft Inventory Record) and identified as loose equipment until modification is completed.

(4) Equipment required for operation in a specific environment.

b. Items to be excluded follow:

(1) Nonaccountable items coded as expendable in the applicable stock lists.

(2) Personal issue or items furnished on unit allowance or other authority.

(3) Items or components considered as basic or integral parts of the airframe or basic aircraft (i.e., engines, propellers, wheels, and standard instruments).

(4) Equipment publications, checklists, and aircraft forms.

3.6.7.4 **Periods of inventory.** This portion shall include coverage of the following information and shall include a statement similar to the following:

Inventoriable items shall be checked against the DA Form 2408-17 (Aircraft Inventory Record) at the following times:

a. Upon receipt.

b. Prior to transfer of the aircraft to another organization.

c. Upon placing aircraft in storage and upon removal from storage. Aircraft need not be inventoried while in storage.

d. Twelve months after last inventory.

3.6.8 **Appendix () - Expendable and durable items list.** (See paragraph 3.2.8.)

3.6.9 **Appendix () - Storage of aircraft.**

3.6.9.1 **Section I - General information.** This portion shall include a statement similar to the following at the beginning of the text.

Components involved in an accident. Any component removed for reason of accident shall not be preserved but shall be shipped in the same condition it was in after the accident.

3.6.9.1.1 **Categories of storage.**

a. The categories of storage and timeframes involved shall be listed as follows:

(1) Flyable storage - no time limit.

(2) Short term (administrative) storage - 1 to 45 days.

(3) Intermediate storage - 46 to 180 days.

b. This paragraph shall include a general discussion of each category of aircraft storage, to include considerations for selection of the applicable category (e.g., ground operation, motoring of engines, and other required maintenance for which personnel and materials are needed) and steps to be taken for care of the aircraft during exceptionally wet weather.

3.6.9.2 **Sections II, III, and IV - Storage procedures.** Each of these sections shall include all essential information and procedures for preparing the complete aircraft for storage and removal from storage, excluding any information on when or why the aircraft is stored. Each section shall make reference to inspection documents and procedures to be conducted prior to, during, and after storage. Sections shall be numbered as follows:

a. Section II - Flyable storage.

b. Section III - Short term storage.

c. Section IV - Intermediate storage.

3.6.10 **Appendix () - Wiring diagrams.** This appendix shall present a description of wiring contained in the aircraft, including all systems or equipment which can be installed or removed later (e.g., mission- related systems/equipment). A statement shall be included that explains that wiring diagrams and essential wiring information are provided for all electrical and electronic systems and circuits.

3.6.10.1 **Wiring data.** Subparagraphs shall be used to include any critical wire and cable data. Applicability of diagrams shall be explained in relation to aircraft configuration. The following information shall be provided:

a. **Wire identification.** Identification of wires by number shall be explained. A list of circuit designators and a wire identification diagram shall be included.

b. **Abbreviations.** A statement shall be included that abbreviations are in IAW MIL-STD-12 and AR 310-50, except when the abbreviation stands for a marking actually found in the aircraft.

c. **Wiring diagrams.** Wiring diagrams for all electrical and electronic systems and circuits shall be included.

NOTE

Additional appendices, including the following, shall be required when specified by the contracting activity. When an appendix does not apply to an item of equipment, the remaining appendices shall be relettered so that no gaps appear in the lettering sequence. Letters I and O shall not be used.

3.6.11 **Appendix () - Weight and balance (AVIM).** This appendix shall refer to TM 55-1500-342-23 for general information and shall include any additional information peculiar to the aircraft which is not otherwise available to the user. The weight and balance appendix shall include three sections.

a. **Section I - General information.** This section shall include a statement such as the following: This appendix contains brief instructive information for use with the forms and charts which provide for continuous control of weight and balance of the aircraft. The data to be inserted on the charts and forms are applicable only to the individual aircraft, the serial number of which appears on the various forms and charts. The weight and balance records are to remain with the aircraft IAW existing directives. The charts and forms referred to herein may differ in nomenclature and arrangement from those shown in previously published copies, since these charts are revised from time to time; however, the general principles of use will not change.

b. **Section II - Instructions for use of the forms and charts.** This portion shall refer to TM 55-1500-342-23 and the aircraft files for preparation of chart E.

c. **Section III - Weighing instructions.** This section shall include a reference to AR 95-3 for periodic aircraft weighing requirements.

(1) Preliminary weighing instructions. This portion shall include any general and/or specific preliminary weighing instructions not covered in TM 55-1500-342-23 and applicable for the particular aircraft covered in the TM.

(2) Weighing equipment. Additional instruction for use of the weighing equipment in the individual aircraft, if not contained in TM 55-1500-342-23, shall be covered in this portion.

3.6.12 **Appendix () - Illustrated list of manufactured items.** (See paragraphs 3.2.9 through 3.2.9.3.)

3.6.13 **Appendix () - Torque limits.** (See paragraph 3.2.10.)

3.6.14 **Tool identification list.** (See paragraph 3.2.11.)

3.6.15 **Appendix () - Mandatory replacement parts.** (See paragraph 3.2.12.)

3.6.16 **Glossary.** (See paragraph 3.2.13.)

3.6.17 **Alphabetical index.** (See paragraph 3.2.14.)

3.7 **Type -T AVUM and AVIM manual for troubleshooting.** The type -T manual shall be used in lieu of including the troubleshooting instructions in the -23 maintenance manual when the troubleshooting coverage exceeds 500 pages. The manual shall include the AVUM and AVIM troubleshooting tasks authorized by a repair task in the MAC and by results of failure modes and effects analysis and criticality analysis. In addition to complying with paragraphs 3.2.3b(4) and 3.2.3.5, the -T manual shall comply with provisions of MIL-HDBK-63038-1 and the following format and content requirements.

3.7.1 **Cover and front matter.** Cover and front matter shall conform to requirements of paragraph 3.6.

3.7.1.2 **Chapter 1 - Introduction.** This chapter shall include the following sections and paragraphs. If specified by the contracting activity, additional paragraphs shall be included.

3.7.2.1 **Section I - General information.** This section shall include paragraphs describing the scope, preparation of maintenance forms, records, and reports, and submission of quality deficiency reports.

3.7.2.1.1 **Scope.** This paragraph shall specify that this manual will be used at the AVUM and AVIM levels. It shall list the model number(s) and equipment nomenclature, shall state the purpose of the manual, and shall include an explanation that the -T manual constitutes an integral part of the -23 maintenance manual and is not intended to be used alone.

3.7.2.1.2 **Maintenance forms, records, and reports.** This paragraph shall be prepared as described in paragraph 3.2.2.1.2.

3.7.2.1.3 **Submitting quality deficiency reports.** This paragraph shall be worded IAW paragraph 3.2.2.1.7, except the term "Equipment Improvement Recommendation" and the abbreviation "EIR" shall be replaced with "Quality Deficiency Report" and "QDR."

3.7.2.2 **Section II - Troubleshooting methods.** This section shall describe the process and procedures, and shall include information on methods of performing troubleshooting.

3.7.2.2.1 **Troubleshooting process.** This paragraph shall describe the general flow of the troubleshooting process.

3.7.2.2.2 **How to perform the troubleshooting procedures.** This paragraph shall describe the general steps which must be performed regardless of the specific task.

3.7.2.2.3 **Troubleshooting electrical subsystems.** This paragraph shall include information peculiar to troubleshooting electrical subsystems and electronics.

3.7.3 **Chapter 2 - Failure symptoms.** This chapter shall include a brief explanation of the failure symptom table, followed by a failure symptom table which lists failure symptoms alphabetically, or if specified by the contracting activity, by subsystem in MAC order. As a minimum, the table shall include a column headed "FAILURE SYMPTOM", a column headed "YES OR NO", and a column headed "ACTION" or "GO TO".

3.7.4 **Chapter 3 through chapter () - [SUBSYSTEM NAME] troubleshooting.** These chapters shall be arranged by subsystem in the order used in the MAC and RPSTL TM. Each chapter shall include two sections. Each section shall contain illustrations (i.e., schematics and block diagrams or locations of controls and indicators) as required to supplement the text. Illustrations not integrated within the text shall be labelled as figures and shall be placed as near the first reference as practical, IAW MIL-M-38784.

3.7.4.1 **Section I - Explanation and theory of operation.** This section shall contain sufficient explanation of the subsystem's operation and description of the theory of operation to enable the user to isolate faults causing unpredicted failures. Include a description of the effects of other subsystems on this subsystem's operation. This section shall be used with, and shall not duplicate, the "equipment description and data" section in the -23 TM. Unless otherwise specified by the contracting activity, extensive wiring diagrams shall be placed in appendix (). Listings and illustrations of electrical component locations, wire lists, and cable run diagrams shall be designated as tables or figures, as applicable, and shall be integrated with the pertinent text. If specified by the contracting activity, lengthy listings and illustrations shall be placed in an appendix.

3.7.4.2 **Section II - Troubleshooting procedures.** Troubleshooting procedures, including maintenance operational checks if applicable, and fault isolation procedures, shall be provided as individual tasks, each designated as a paragraph (e.g., 3.1, 3.2). The format shall be that prescribed for a

maintenance task, including the initial setup for each task, the designation of procedural steps "1", "2", "3", etc., of procedural substeps "a", "b", "c", etc., and the follow-on maintenance at the end of the task. If a task applies to AVIM only, the paragraph or instruction title shall include the suffix "(AVIM)".

3.7.5 **Chapter (). Integrated system troubleshooting.** When specified by the contracting activity, an integrated system troubleshooting chapter shall be included. Troubleshooting procedures which involve more than one subsystem or more than one major symptom, and which cannot be logically placed in one of the subsystem chapters, shall be covered in this chapter. The format of this chapter shall follow the subsystem troubleshooting format. Refer to explanation and theory of operation in the subsystem troubleshooting chapter, if applicable.

3.7.6 **Appendices.** Appendices shall follow the last chapter in the manual, or if specified by the contracting activity, at the end of each volume of the TM. Appendix A, References shall be included and shall list each form and publication referred to within the TM (see paragraph 3.6.4). Unless otherwise specified by the contracting activity, the troubleshooting manual shall contain a wiring diagrams appendix (see paragraph 3.6.10). If specified by the contracting activity, additional appendices, lettered consecutively, shall be included.

3.7.7 **Glossary and index.** A glossary (paragraph 3.2.12) and an index (see paragraph 3.2.13) shall be included after the appendices in each TM and at the end of each volume in multivolume TMs.

3.8 **Type -24 - Unit, DS, and GS maintenance manual.** This manual shall describe in detail the unit, DS, and GS maintenance prescribed by the MAC. The actual number of chapters in a TM depends on the maintenance concept and complexity of the equipment (see figure 1). Required principles of operation for DS and GS maintenance only shall be included in the applicable maintenance chapter.

3.8.1 **Front matter.** (See paragraph 3.2.1 and adjust to include unit, DS, and GS maintenance).

3.8.2 **Introduction chapter.** (See paragraph 3.2.2 and adjust to include unit, DS, and GS maintenance).

3.8.2.1 **Section I - General information.** (See paragraph 3.2.2.1.)

3.8.2.1.1 **Maintenance forms, records, and reports.** (See paragraph 3.2.2.1.2.)

3.8.2.1.2 **Calibration.** (See paragraph 3.3.2.1.2.)

3.8.2.2 **Section II - Equipment description and data.** (See paragraphs 3.2.2.2 through 3.2.2.2.5.) This section shall include a paragraph referencing the equipment data in the operator's manual. Any data required by the unit, DS, or GS levels, but not included in the operator's manual shall be included. Reference shall be made to material in other publications, provided they are available at the maintenance levels covered. Information shall not be duplicated except for emphasis or clarity.

3.8.3 **Inspection and test of conventional and chemical ammunition or components containing radioactive materials chapter.** (See paragraph 3.3.3.)

3.8.4 **Maintenance instructions chapter(s).** (See paragraphs 3.2.3 through 3.2.3.7.2 for sections I through VII and adjust to include unit, DS, and GS maintenance.)

a. Provide instructions for missile system equipment UUTs IAW MIL-M-63044.

b. For ammunition, see paragraph 3.2.3.6(b).

c. In cases where an assembly (i.e., a truck engine) is part of a larger end item, any DS/GS maintenance of the assembly installed (e.g., engine in truck) shall be in the end item manual (e.g., truck DS manual). DS/GS maintenance of the assembly removed from its end item shall be covered in the assembly DS/GS maintenance manual (e.g., engine TM).

3.8.4.1 As applicable, information for section VIII pre-embarkation inspection of materiel in units alerted for overseas movement will be furnished by the contracting activity.

3.8.5 **Appendices.** (See paragraph 3.2.4.)

3.8.6 **Appendix () - References.** (See paragraph 3.2.5.)

3.8.7 **Appendix () - Maintenance allocation chart (MAC).** (See paragraph 3.2.6.)

3.8.8 **Appendix () - Repair parts and special tools list (RPSTL).** (See paragraph 3.2.7)

3.8.9 **Appendix () - Expendable and durable items list.** (See paragraph 3.2.8.)

3.8.10 **Appendix () - Illustrated list of manufactured items.** (See paragraphs 3.2.9 through 3.2.9.3 and adjust to include unit, DS, and GS maintenance.)

3.8.11 **Appendix () - Torque limits.** (See paragraph 3.2.10.)

3.8.12 **Appendix () - Ammunition information.** (See paragraph 3.3.11.)

3.8.13 **Appendix () - Tool identification list.** (See paragraph 3.2.11.)

3.8.14 **Appendix () - Mandatory replacement parts.** (See paragraph 3.2.12.)

3.8.15 **Glossary.** (See paragraph 3.2.13.)

3.8.16 **Alphabetical index.** (See paragraph 3.2.14.)

3.9 **Type -34 - DS and GS maintenance manual.** This manual shall describe in detail the DS and GS maintenance prescribed by the MAC. The actual number of maintenance chapters in a TM depends on the maintenance concept and complexity of the equipment (see figure 1). Required principles of operation shall be included in the applicable maintenance chapter.

3.9.1 **Front matter.** (See paragraph 3.2.1 and adjust to include DS and GS maintenance.)

3.9.2 **Introduction chapter.** (See paragraph 3.2.2 and adjust to include DS and GS maintenance.)

3.9.2.1 **Section I - General information.** (See paragraph 3.2.2.1.)

3.9.2.1.1 **Maintenance forms, records, and reports.** (See paragraph 3.2.2.1.2.)

3.9.2.1.2 **Calibration.** (See paragraph 3.3.2.1.2.)

3.9.2.2 **Section II - Equipment description and data.** (See paragraphs 3.2.2.2 through 3.2.2.2.5.) This section shall include a paragraph referencing the equipment data in the operator's manual. Any data required by the DS or GS levels, but

not included in the operator's or unit manuals shall be included. References shall be made to material in other publications, provided they are available at the maintenance levels covered. Information will not be duplicated except for emphasis and clarity.

3.9.3 **Inspection and test of conventional and chemical ammunition or components containing radioactive materials chapter.** (See paragraph 3.3.3 and adjust to DS and GS maintenance.)

3.9.4 **Maintenance instructions chapter(s).** (See paragraph 3.2.3 through 3.2.3.7.2 for sections I through VII and adjust to a DS and GS maintenance levels.)

a. Provide instructions for missile system equipment UUTs IAW MIL-M-63044.

b. For ammunition, see paragraph 3.2.3.6(b).

c. DS and GS maintenance shall be covered in separate chapters.

3.9.4.1 Section () - Pre-embarkation inspection of materiel in units alerted for overseas movement. If required, information will be furnished by the contracting activity.

3.9.5 **Appendices.** (See paragraph 3.2.4.)

3.9.6 **Appendix () - References.** (See paragraph 3.2.5.)

3.9.7 **Appendix () - Maintenance Allocation Chart (MAC).** This appendix shall only be included if not already in a lower level maintenance manual. For preparation instructions see paragraph 3.2.6.

3.9.8 **Appendix () - Repair parts and special tools list (RPSTL).** (See paragraph 3.2.7.)

3.9.9 **Appendix () - Expendable and durable items list.** (See paragraph 3.2.8.)

3.9.10 **Appendix () - Illustrated list of manufactured items.** (See paragraphs 3.2.9 through 3.2.9.3 and adjust to include DS and GS maintenance levels.)

3.9.11 **Appendix () - Torque limits.** (See paragraph 3.2.10.)

3.9.12 **Appendix () - Ammunition information.** (See paragraph 3.3.11.)

3.9.13 **Appendix () - Tool identification list.** (See paragraph 3.2.11.)

3.9.14 **Appendix () - Mandatory replacement parts.** (See paragraph 3.2.12.)

3.9.15 **Glossary.** (See paragraph 3.2.13.)

3.9.16 **Alphabetical index.** (See paragraph 3.2.14.)

3.10 **Type -12, -13, and -14 - Operator's and maintenance manuals.** These manuals shall describe in detail the scope of operation and maintenance prescribed by the MAC. The actual number of chapters in a TM depends on the maintenance concept and complexity of the equipment (see figure 1). Required principles of operation shall be included in the applicable operation or maintenance chapter(s).

3.10.1 **Type -12 - Operator's and unit or operator's and AVUM manual (other than aircraft).**

a. Chapter data requirements for AVUM shall be as stated in paragraphs 3.10.1.2 through 3.10.1.7. When listed chapter data requirements are not applicable, the remaining chapters shall be renumbered so that no gaps appear in the chapter number sequence.

b. Appendix data requirements for AVUM shall be as stated in paragraphs 3.10.1.8 through 3.10.1.18. When appendix data requirements are deleted or not applicable, appendices shall be relettered as applicable so that no gaps appear in the appendix letter sequence.

3.10.1.1 **Front matter.** (See paragraph 3.2.1.)

3.10.1.2 **Chapter 1 - Introduction.** This chapter shall be IAW paragraph 3.2.2. Principles of operation data shall meet the requirements of paragraph 3.2.2.3 and shall include information pertaining to the operator.

3.10.1.3 **Chapter 2 - Operating instructions.** (See MIL-M-63036, except the PMCS titles shall be preceded by the word "Operator.")

3.10.1.4 **Chapter 3 - Maintenance instructions.** (See MIL-M-63036 except the title shall be changed to read "Operator Maintenance.")

3.10.1.5 **Chapter 4 - Maintenance of auxiliary equipment,** (when applicable). (See MIL-M-63036.)

3.10.1.6 **Chapter 5 - Ammunition (when applicable).** (See paragraph 3.2.3.6.)

3.10.1.7 **Chapter 6 - Unit or AVUM.** (For unit and AVUM (other than aircraft), see paragraph 3.2.3. For AVUM (aircraft), see paragraph 3.6.) (Section number sequence shall be by the top-down-generation sequence listed in the MAC for the applicable group codes (see paragraph 3.2.4.)

3.10.1.9 **Appendix () - References.** (See paragraph 3.2.5.)

3.10.1.10 **Appendix () - Maintenance Allocation chart.** (See paragraph 3.2.6.)

3.10.1.11 **Appendix () - Repair parts and special tools list (RPSTL).** (See paragraph 3.2.7.)

3.10.1.12 **Appendix () - Components of end item and basic issue items.** (For other than aircraft, see MIL-M-63036.) This appendix is not a requirement for aircraft maintenance manuals.

3.10.1.13 **Appendix () - Additional authorization list (AAL) items.** (For other than aircraft, see MIL-M-63036.) This appendix is not a requirement for aircraft maintenance manuals.

3.10.1.14 **Appendix () - Expendable and durable items list.** (See paragraph 3.2.8.) For aircraft manuals, reletter as appendix C.

3.10.1.15 **Appendix () - Illustrated list of manufactured items.** (See paragraphs 3.2.9 through 3.2.9.3.)

3.10.1.16 **Appendix () - Torque limits.** (See paragraph 3.2.10.)

3.10.1.17 **Appendix () - Tool identification list.** (See paragraph 3.2.11.)

3.10.1.18 **Appendix () - Mandatory replacement parts.** (See paragraph 3.2.12.)

3.10.1.19 **Glossary.** (See paragraph 3.2.13.)

3.10.1.20 **Alphabetical index.** (See paragraph 3.2.14.)

3.10.2 **Type -13 - Operator's, unit, and DS or AVUM and AVIM manual (other than aircraft).** All requirements in paragraph 3.10.1 (-12 manual) shall apply. In addition, the type -13 shall include the following chapter requirement: Chapter 7 - DS maintenance or AVIM (see paragraph 3.3.4).

3.10.3 **Type -14 - Operator's, unit, DS, and GS maintenance manual.** All requirements in paragraphs 3.10.1 (-12) and 3.10.2 (-13) shall apply. In addition, the type -14 shall include the following chapter: Chapter 8 - GS maintenance (see paragraph 3.4.4).

SECTION 4. QUALITY ASSURANCE PROVISIONS

4.1 **Responsibility for inspection.** Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 **Responsibility for compliance.** All items shall meet all requirements of sections 3 and 5, as specified in the content/format selection summary (appendix A of this specification) and statement of work. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements; however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.2 **Quality assurance provisions.** QA in the preparation of TMs shall be the responsibility of the contractor and shall be implemented IAW MIL-M-85337 as detailed herein.

4.3 **Contractor inspection.** Material furnished IAW this specification shall be inspected by the supplier for conformance to the applicable requirements herein.

4.4 **Government inspection.** Material furnished IAW this specification shall be subject to inspection, verification, and approval or disapproval by the Government as specified by the terms of the contract. Inspection/verification will be performed by the Government prior to acceptance.

4.5 **In-process reviews.** When specified by the contracting activity, these reviews shall be performed by the representatives of the contracting activity during preparation of the equipment publication, primarily as guidance to the contractor and to ensure that the publications are written in conformance with contract and specification requirements. Unless otherwise specified by the contracting activity, the reviews may be conducted at the contractor's facility at any time during the development of the publication, but prior to completion of the publication. These IPRs are not a part of validation or verification and shall not be used to take the place of validation or verification.

4.6 **Validation and verification requirements.**

4.6.1 **Validation.** The review draft copy (RDC) of the TM shall be validated by the contractor IAW the validation schedule. A 100 percent validation of the operating and maintenance procedures shall be performed for technical accuracy and adequacy of content. This requirement shall include a complete review of MAC functions and levels to ensure all allocations are properly included for performance at the designated level of maintenance specified by the TM type designation (e.g., -10, -20, -34). This review shall include a complete survey of applicable SMR coded items to ensure that all items coded for assembly, manufacture/fabrication, replacement, or repair are included in the maintenance manual at the level designated by the SMR code. Particular care must be taken to ensure that the "complete repair" code (fourth position of the SMR code) is properly analyzed. This code indicates whether or not an item is to be repaired and identifies the lowest maintenance level with the capability to perform complete repair, yet does not preclude some degree of repair which may be accomplished at a lower level of maintenance. These lower level repair parts must be identified and incorporated into the maintenance procedures in the proper level TM as specified by the individual item SMR code. The target audience RGL cited in the contract shall be validated in conformance with the requirements of MIL-M-38784. Validation of RPSTL shall be performed as specified in MIL-STD-335 or MIL-M-49502 as applicable and as specified by the contracting activity.

a. Validation includes, but is not limited to, the actual performance by contractor personnel of operating and maintenance procedures. It includes review of instructions and associated checklists for checkout, scheduled removal and installation, and technical accuracy and adequacy.

b. All alignment, disassembly, cleaning, inspection, testing, repair, replacement, assembly, troubleshooting, PMCS, calibration, lubrication, and similar maintenance procedures shall be validated. All other data such as schematics, diagrams, wiring data, and descriptive data, shall be checked to ensure accuracy.

c. Simulation in lieu of actual procedure performance on equipment shall be used only to avoid destructive testing and only when approved by the contracting activity by its acceptance of the validation schedule.

d. The contractor shall perform all troubleshooting and other maintenance tasks on the equipment with no other information than that contained in the RDC. Successful performance of each task will validate the technical adequacy and the clarity of that task in the RDC.

e. Transitions from, references to, and sequences of tasks/task segments, shall be validated by the contractor in the final RDC product as a whole.

f. All tasks shall be validated by performance except as noted in paragraph 4.6.1c. This includes common tasks (e.g., opening hatches, removing covers) that are included in the manual.

g. Those tasks which are not technically accurate shall be corrected until they meet validation requirements. The contractor will have applicable personnel observing the performance to determine what kind of correction is required. Minor corrections can be made on the spot and the performance continued, but no guidance or interpretation can be provided the performer except that found in the RDC. Numerous corrections that completely disrupt the performance shall be considered major corrections. In the case of major corrections of this or any type, the entire task performance shall be repeated with a corrected RDC at another time.

h. Tasks in the RDC may be validated at any time. There is no requirement that they be done together or in any particular sequence. The only requirement is that the task selected for validation be performed completely, so that the task can be inspected for technical adequacy. No task segment which stops short of achieving the task goal shall be considered as validated.

i. The contracting activity reserves the right to witness the validation process.

4.6.1.1 **Performance**. The RDC shall be reviewed for:

a. Conformance to applicable requirements of the governing documents. This review shall include editorial review of the manuscript.

b. Technical accuracy and adequacy of the content. This review shall include the actual performance or simulation of the operating and maintenance instructions on the equipment/system for which the RDC was written. This validation shall include, but not be limited to, a review for:

(1) Maintenance instructions and applicable PMCS entries for all functions assigned in the MAC.

(2) Repair parts, special tools, and test equipment required to perform functions specified in the MAC.

(3) Essentiality and adequacy of illustrations cited in the text.

(4) Existence and adequacy of references cited in the text.

(5) Instructions for manufacturing items source coded "M," for assembling items source coded "A," for replacing items coded for replacement, and for repairing items coded as reparable or recoverable.

4.6.1.1.1 **Revalidation**. All material changed or corrected as a result of contractor/Government testing and validation/ verification shall be revalidated to meet the requirements of this specification.

4.6.1.1.2 **Separation of responsibility**. The Government reserves the right to require that contractor personnel performing operating and maintenance instructions on the equipment during validation be independent from the contractor's manuscript preparation activity.

4.6.1.2 **Records**. The contractor shall maintain records showing dates of validation reviews, manuscript material reviewed by task or action, findings with applicable remarks, and action taken. The contracting activity reserves the right to examine these records at the contractor's facility.

4.6.1.3 **Government furnished information.** The contractor is not responsible for the adequacy and accuracy of Government furnished information provided for inclusion in their manuscript. The contractor shall include a validation that all such Government furnished information is properly and correctly reflected in the manuscript. The contractor shall be responsible for notifying the contracting activity of any inaccurate or inadequate data or of any data which are inconsistent with the contents of the manuscript.

4.6.2 **Verification.** Representatives of the contracting activity shall verify the contractor's validation, except for PMCS, which must be verified IAW paragraph 4.6.2a, to include verification of logical sequencing. The contracting activity reserves the right to perform verification by one or more of the methods listed in paragraphs a through c below. The methods listed are in addition to reviewing the publication for conformance to the requirements of the governing documents and inspecting the contractor's validation records. Verification may be accomplished by:

a. Performing 100 percent of the operating and maintenance procedures in the publication by using military operational and support personnel of the type and qualifications of those expected to use and maintain the equipment when deployed. Each procedure must be performed successfully at least once. All performance will be monitored by a Government subject matter expert and a master copy of the publication being verified will be maintained to record all discrepancies. All verified material will be updated and given a final desk review. The desk review will include a check of those portions of the publication not subject to hands-on performance (e.g, index, contents, theory, BII, and AAL). When resources and time constraints limit the feasibility of performing a contractor validation and Government verification as separate entities, these requirements may be combined, subject to the approval of the contracting activity. This option must have agreement of both the materiel developer and user. The schedule followed will be that approved in the verification plan.

b. Reviewing the technical content of the publication by having Government personnel perform the operating and maintenance instructions specified by the contracting activity on the equipment, either at the contractor's plant or at Government facilities.

c. Witnessing the contractors validation at the contractors facility as scheduled by the contractor IAW the validation schedule.

4.6.3 **Correction of errors.** The contractor shall correct all contractor errors found in the manuscript during verification, at no cost to the Government. After Government acceptance of the manuscript, the Government reserves the right to require the contractor to correct all errors found in the manuscript, at no cost to the Government, within the number of days specified in the statement of work portion of the contract.

SECTION 5. PACKAGING

5.1 **Packaging and packing.** Unless otherwise specified by the contracting activity, the packaging and packing of TMs and associated TM products shall conform to ASTM D3951.

5.2 **Marking.** Packs shall be marked IAW MIL-STD-129 and ASTM D3951, as applicable, and shall include the applicable TM number and publications date.

5.3 **Classified material.** All classified material shall be safeguarded, packaged, and marked IAW DOD 5220.22-M.

SECTION 6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 **Intended use.** The manuals prepared IAW this specification provide operating and maintenance instructions for equipment to the levels of maintenance indicated for the specific manuals concerned.

6.2 **Acquisition requirements.** Acquisition documents should specify the following.

a. Title, number, and date of this specification.

b. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see paragraph 2.1.1).

c. Title and number of the TM, furnished by the contracting activity.

d. User Profile (see paragraph 3.1.2).

e. That the MAC will be furnished and/or approved by the contracting activity for use in determining which maintenance and repair functions are to be included (see paragraphs 3.2.6, 3.5.7, 3.6.6, 3.8.7, and 3.10.1.10).

f. Whether IPRs shall be performed (see paragraph 4.5).

g. Specification tailoring by selection of optional requirements on the content/format selection summary (appendix A of this specification).

h. Method of validation (see paragraph 4.6.1).

i. Method of verification (see paragraph 4.6.2).

6.3 **Data requirements.** The following Data Item Descriptions (DID) must be listed, as applicable, on DD Form 1423 (Contract Data Requirements List (CDRL)) when this specification is applied on a contract, in order to obtain the data, except where DOD FAR Supplement 27.475-1 exempts the requirement for a DD Form 1423.

Reference Paragraph	DID Number	DID Title
4.2	DI-M-2194	Quality Assurance Program Plan
4.2	DI-M-2195	Validation Plan
4.2	DI-M-2196	Validation Certification
4.2	DI-M-2197	Technical Manual Evaluation Record
4.2	DI-M-2198	Verification Plan
4.2	DI-M-2199	Verification Planning Data Cards
4.2	DI-M-2200	Verification Sequence Control Chart
4.2	DI-M-2201	Verification Incorporation Certification

The above DIDs were those cleared as of the date of this specification. The current issue of DOD 5010-12-L (Acquisition Management Systems and Data Requirements Control List (AMSDL)), must be researched to ensure that only current, cleared DIDs are cited on the DD Form 1423.

6.4 **TM acquisition.** This specification must be listed on the CDRL in order to acquire the TMs described by this specification, except where DOD FAR Supplement 27.475-1 exempts the requirement for a DD Form 1423.

6.5 **Definitions.**

6.5.1 **Assembly.** A number of parts or subassemblies, or any combination thereof, joined together to perform a specific function and which can be provisioned and replaced as an entity (e.g., power shovel front, fan assembly, and audio frequency amplifier).

NOTE

The distinction between an assembly and subassembly is determined by the individual application. An assembly in one instance may be a subassembly in another where it forms a portion of an assembly.

6.5.2 **Auxiliary Equipment.** Equipment, accessories, or devices which, when used with basic equipment, extend or increase its capability.

6.5.3 **Component.** An assembly or any combination of parts, subassemblies, and assemblies mounted together having a specified function, which can only be installed as a whole.

6.5.4 **Configuration.** A specific arrangement of the components and/or parts that make up the equipment or end item.

6.5.5 **End Item.** A final combination of end products, component parts, and/or materials which is ready for its intended use (e.g., tank, howitzer, mobile machine shop, aircraft, receiver, rifle, or recorder).

6.5.6 **Hard time maintenance.** Scheduled maintenance conducted at predetermined fixed intervals because of age, calendar, or usage (i.e., operating time, flying hours, miles driven, or rounds fired).

6.5.7 **Item name.** A basic name (e.g., transformer) and a noun word or phrase modifier (e.g., pulse, low power).

6.5.8 **Maintenance level.** A category based on the separation of maintenance activities or functions in the U.S. Army according to the required skills and available facilities.

6.5.9 **Mode of operation.** A variation, such as an FM system which transmits in both clear and secure modes, in type of operation, or in a system.

6.5.10 **Official nomenclature.** Nomenclature, consisting of a name and type number assigned to equipment items as indicated in the RPSTL, Army Master Data File (AMDF), Part Number Master Data Record (PNMDR), and NSN Master Data Record (NSNMDR).

6.5.11 **On condition maintenance.** Maintenance performed or an item replacement action, performed based upon condition of the item as determined by an evaluation of each item on a scheduled basis.

6.5.12 **Operator controls.** All switches, knobs, pushbuttons, jack and plug combinations, levers, or other control devices that an equipment operator/crew manipulates to operate the equipment, and the lights, meters, or other indicators on which the operator/crew bases decisions during operational procedures.

6.5.13 **Oversize manual.** Any manual larger than standard size, 8-1/2 x 11 or 11 x 8-1/2.

6.5.14 **Part.** One piece (of equipment), or two or more pieces joined together which are not subject to disassembly without destruction or impairment of designed use.

6.5.15 **Repair part.** Any consumable (e.g., nonreparable) component (assembly or subassembly) required for the maintenance or repair of an end item.

6.5.16 **Spare.** Any reparable component (assembly or subassembly) required for the maintenance or repair of an end item.

6.5.17 **Special applications.** The installation of equipment in an aircraft, tank, truck, ship, train, missile, satellite, other mobile equipment, or fixed plant communication facility.

6.5.18 **Subassembly.** Two or more parts which form a portion of an assembly; or a component replaceable as a whole, but having a part or parts which are individually replaceable (e.g., gun mount stand, window recoil mechanism, floating piston, telephone dial, IF strip, mounting board with mounted parts, power shovel dipper stick).

6.5.19 **System.** A major subdivision of a configuration (e.g., communications system).

6.5.20 **Systems integration (SI) manual(s).** Manuals that are prepared for a system composed of multiple end items where each end item has its own TMs.

6.6 **Subject term (key word) listing.**

Aviation MAC

Illustrated list of manufactured items

Maintenance allocation chart

Manufactured items

Standard MAC

Unit maintenance instructions

6.7 **Changes from previous issue.** Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

This technical manual outline matrix is provided to show correct data for the types of manuals covered by this specification and combined manuals that include operator's data covered by MIL-M-63036 or MIL-STD-361-1 as applicable, or RPSTL data covered by MIL-M-49502 or MIl-STD-361-11, as applicable. For proper sequence off the data, see applicable manual type.

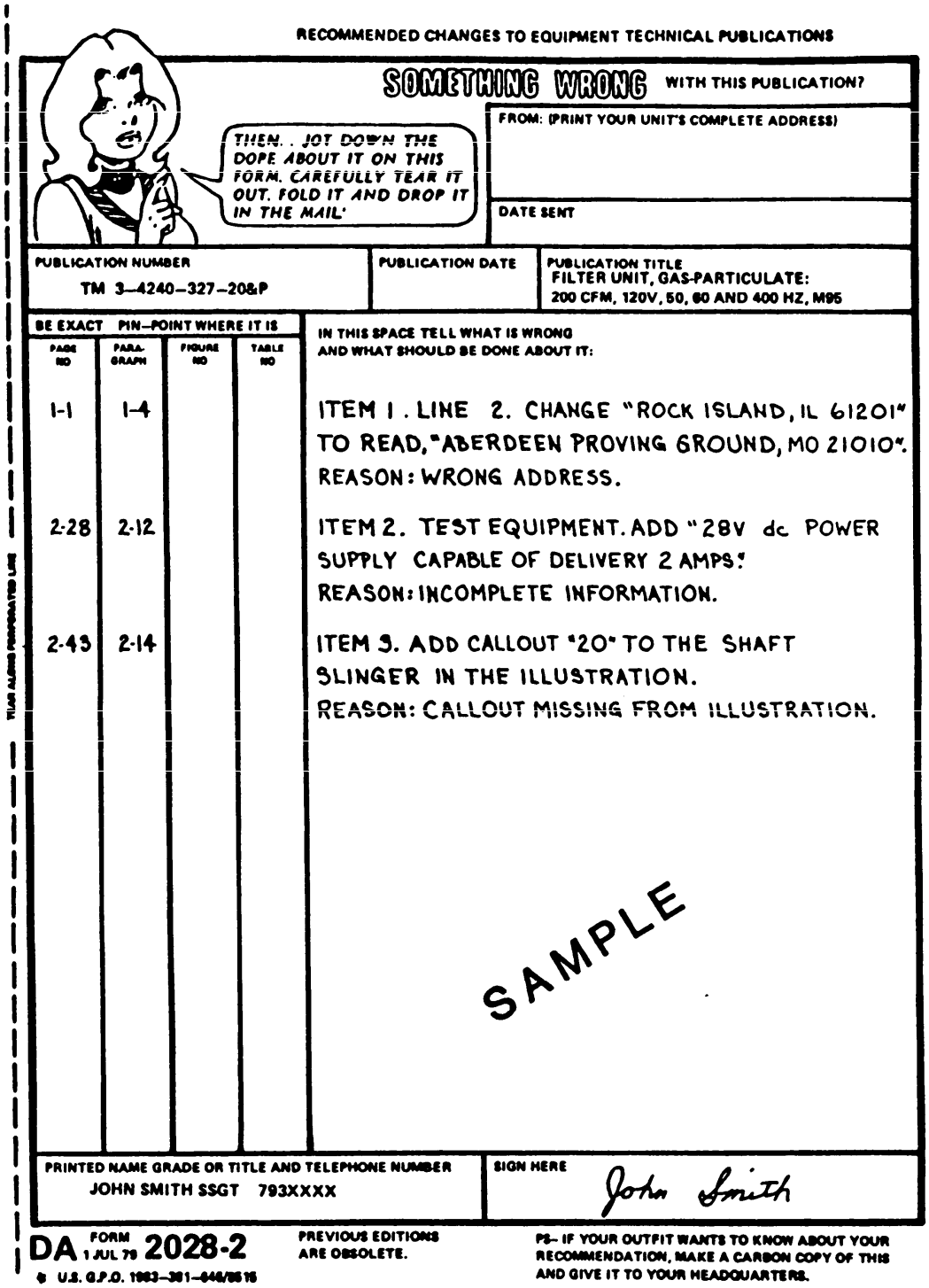
DATA REQUIRED	TYPE OF MANUAL								
	10	13	14	20	23	24	30	34	40
FRONT MATTER (reference 3.2.1)	X	X	X	X	X	X	X	X	X
HOW TO USE THIS MANUAL (reference 3.2.1.6)	X	X	X	X	X	X	X	X	X
INTRODUCTION (reference 3.2.2)	X	X	X	X	X	X	X	X	X
OPERATING INSTRUCTIONS (reference 3.10.1.3)	X	X	X						
OPERATOR MAINTENANCE INSTRUCTIONS (reference 3.10.1.4)	X	X	X						
INSPECTION AND TEST OF AMMUNITION (reference 3.3.3)	X	X	X	X	X	X	X	X	X
UNIT MAINTENANCE INSTRUCTIONS (reference 3.2.3)	X	X	X	X	X	X	X	X	X
DS MAINTENANCE INSTRUCTIONS (reference 3.3)		X	X		X	X	X	X	
GS MAINTENANCE INSTRUCTIONS (reference 3.4)			X			X		X	X
AVIATION UNIT MAINTENANCE INSTRUCTIONS (reference 3.2)	X	X		X	X				
INTERMEDIATE MAINTENANCE INSTRUCTIONS (reference 3.3)		X			X		X		
MAINTENANCE OF AUXILLARY EQUIPMENT (reference 3.2.3)	X	X	X	X	X	X	X	X	X
SOFTWARE MAINTENANCE (reference 3.2.10.1.5)	X	X	X	X	X	X	X	X	X

FIGURE 1. Technical manual outline matrix (Sheet 1 of 2).

DATA REQUIRED	TYPE OF MANUAL								
	10	13	14	20	23	24	30	34	40
*AMMUNITION (reference 3.10)	X	X	X	X	X	X	X	X	X
REFERENCES (reference 3.2.5)	X	X	X	X	X	X	X	X	X
PREVENTIVE MAINTENANCE CHECKS AND SERVICES (reference 3.2.3.4)	X	X	X						
MAINTENANCE ALLOCATION CHART (reference 3.2.6)	X	X	X	X	X	X			
TORQUE LIMITS (reference 3.2.10)	X	X	X	X	X	X	X	X	X
TOOL IDENTIFICATION LIST (reference 3.2.11)	X	X	X	X	X	X	X	X	X
MANDATORY REPLACEMENT PARTS (reference 3.2.12)	X	X	X	X	X	X	X	X	X
MARKING INFORMATION FOR AMMUNITION (reference 3.12)		X	X		X	X	X	X	X
GLOSSARY (reference 3.2.13)	X	X	X	X	X	X	X	X	X
ALPHABETICAL INDEX (reference 3.2.14)	X	X	X	X	X	X	X	X	X

*For 12, 13, and 14 type manuals see paragraph 3.10 for sequence of ammunition data.

FIGURE 1. Technical manual outline matrix (Sheet 2 of 2).



RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

THEN... JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT. FOLD IT AND DROP IT IN THE MAIL.

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 3-4240-327-20&P		FILTER UNIT, GAS-PARTICULATE: 200 CFM, 120V, 50, 60 AND 400 HZ, M95

BE EXACT PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO
1-1	1-4		
2-28	2-12		
2-43	2-14		

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

ITEM 1. LINE 2. CHANGE "ROCK ISLAND, IL 61201" TO READ, "ABERDEEN PROVING GROUND, MO 21010".
REASON: WRONG ADDRESS.

ITEM 2. TEST EQUIPMENT. ADD "28V dc POWER SUPPLY CAPABLE OF DELIVERY 2 AMPS."
REASON: INCOMPLETE INFORMATION.

ITEM 3. ADD CALLOUT "20" TO THE SHAFT SLINGER IN THE ILLUSTRATION.
REASON: CALLOUT MISSING FROM ILLUSTRATION.

SAMPLE

PRINTED NAME GRADE OR TITLE AND TELEPHONE NUMBER
JOHN SMITH SSGT 793XXXX

SIGN HERE John Smith

TEAR ALONG PERFORATED LINE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

PS- IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION, MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

* U.S. G.P.O. 1983-381-646/8515

FIGURE 2. Example of a filled-out DA Form 2028-2. (reference 3.1.6)

HAZARDOUS MATERIALS WARNINGS

Material/Icon	Warning
CHROMIC ACID, O-C-303 	Chromic acid, O-C-303, has toxic fumes, can burn skin and eyes, and is a strong oxidizing agent. It may ignite combustible material or organic substances. When mixing with water, always add acid to water. Protection: chemical splashproof goggles, acidproof gloves, face shield, apron and footwear, and forced ventilation (or respirator). Keep acid off skin, eyes, and clothes. Wash exposed skin areas thoroughly.
DRY CLEANING SOLVENT 	Dry cleaning solvent is flammable and toxic to eyes, skin, and respiratory tract. Skin/eye protection required. Avoid repeated/prolonged contact. Use only in well ventilated areas. Keep away from open flames or other sources of ignition.
INSULATING COMPOUND, MIL-I-46058, TYPE UR 	Insulating compound is flammable and toxic to eyes, skin, and respiratory tract. Skin/eye protection required. Avoid repeated/prolonged contact. Use only in well ventilated areas. Keep away from open flames or other sources of ignition.
ISOPROPYL ALCOHOL, TT-1735, GRADE B (FSCM 81348) 	Isopropyl alcohol is flammable and toxic to eyes, skin, and respiratory tract. Skin/eye protection required. Avoid repeated/prolonged contact. Use only in well ventilated areas. Keep away from open flames or other sources of ignition.

FIGURE 3. Example of a warning summary.
(reference paragraph 3.2.1.2)

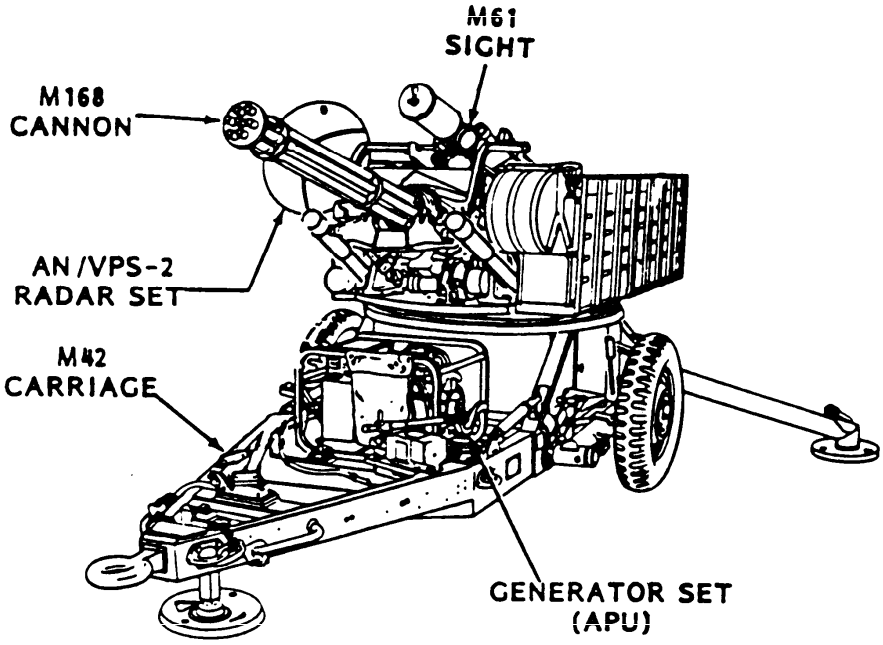


FIGURE 4. Example of a full external view of equipment. (reference 3.2.2)

1.4 NOMENCLATURE CROSS-REFERENCE

Shortened nomenclature is used in this manual to make procedures easier for you to read. A cross-reference between the shortened nomenclature and the official nomenclature is shown in the following table.

Nomenclature Cross-Reference

Manual Nomenclature	Official Nomenclature
Air servicer or instant air system	Guided Missile Gyroscope Air Servicer
Dolly	Transportable Shelter Lift Dolly Set M805E1
Erector-launcher or EL	Semitrailer Mounted Guided Missile Erector-Launcher M790
Launching control group or LCG	Guided Missile Launching Control Group OJ-365 (XO-1)(V)/G
Missile	Surface Attack Guided Missile MGM-31A
Power station or PS	Transportable Guided Missile System Power Station AN/TJQ-9
Programmer-test station or PTS	Transportable Guided Missile Programmer-Test Station AN/TSM-87
Sequential launch adapter or SLA	Part of Guided Missile Launching Control Group OJ-365(XO-1)(v)/G
Truck M656 or truck	8 x 8, 5-Ton Cargo Truck M656

FIGURE 5. Example of a cross-reference listing. **(reference 3.2.2.1.6)**

SECTION II. EQUIPMENT DESCRIPTION AND DATA

1.7. **CHARACTERISTICS, CAPABILITIES, AND FEATURES.** The M1 tank is powered by a 1500 horsepower turbine engine driving an automatic transmission which includes differential steering and brake functions. Transmission output is through identical left and right final drives to the track drive hub and sprocket assemblies. With governed maximum engine speed, a vehicle top speed of 45 miles per hour for the M1 and 41.5 miles per hour for the IPM1 on level hard surface roads is achieved. A suspension system with seven roadwheels per side, which is torsion bar sprung and hydraulically dampened, provides a tank the capability to move over cross-country terrain at speeds up to 30 miles per hour.

Weld-fabricated rolled homogeneous armor combined with hull and turret armor assemblies provide frontal armor protection. The hull front protection is provided by an armor assembly across the entire hull width and is enclosed by high obliquity upper and lower glaces plates. On the hull sides, armor coverage has been extended to include protection for suspension components. The hull rear is protected against small arms fire by armored grille doors. Crew survivability is further enhanced by a compartmentalized storage of hazardous fuel and ammunition. The crew area and engine compartment are protected by an automatic fire extinguishing system.

1.8. **LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.** Refer to the Operator's Manual, TM 9-2350-255-10-1, for the location and description of all major external and internal components.

1.9. **DIFFERENCES BETWEEN MODELS.** The IPM1 tank is equipped with a redesigned transmission oil filter and a new final drive disconnect.

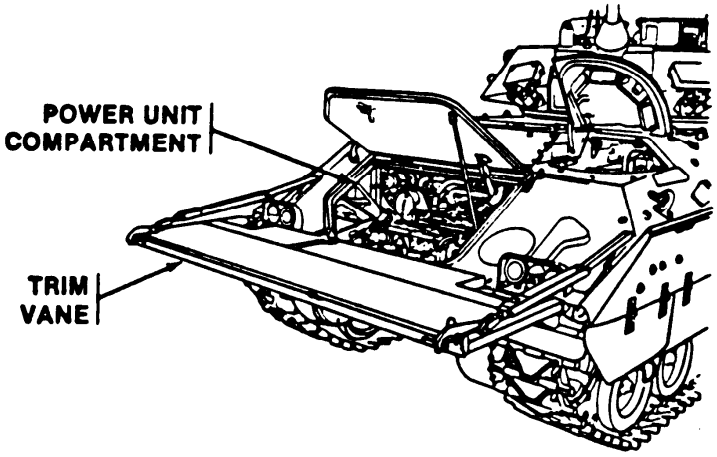
1.10. **EQUIPMENT DATA.** Refer to the Operator's Manual, TM 9-2350-255-10-1, for performance data and capacities information.

FIGURE 6. Example of equipment characteristics, capabilities, and features. (reference 3.2.2.2.1)

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

POWER UNIT COMPARTMENT. The engine and transmission are located in this compartment. The engine powers transmission which drives the vehicle tracks.

TRIM VANE. The trim vane supports the water barrier when lowered to horizontal position, it also serves as a work platform.



FUEL TANKS. Diesel fuel is stored in two separate but interconnected fuel tanks. the lower fuel tank is located under the turret. The upper fuel tank is located on the right sponson next to the turret.

BILGE PUMPS. There are four bilge pumps; two at the rear and two up front. Bilge pumps are located under the floor. When turned on, they remove water that may leak in during swimming or fording operations.

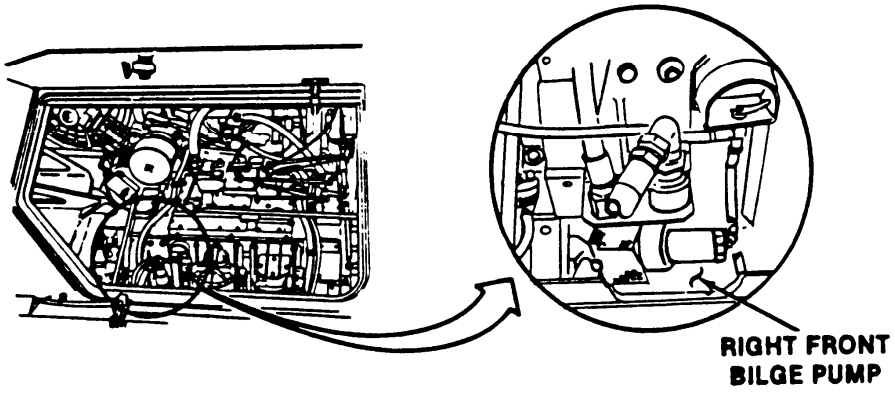
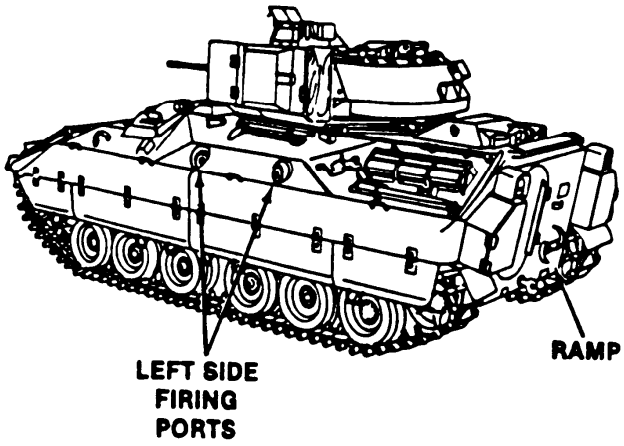


FIGURE 7. Example of location and description of major components (Sheet 1 of 3). (reference 3.2.2.2.2)

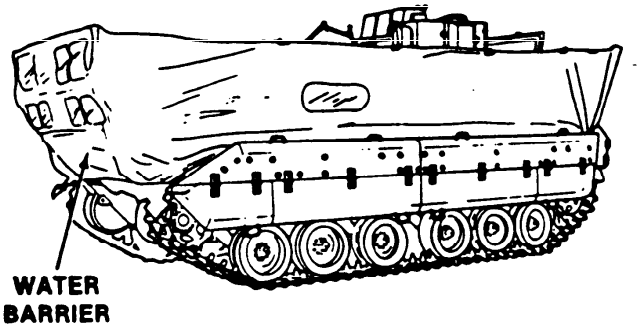
LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (CONT)

RAMP. A ramp is located at the rear of the vehicle to permit rapid entry and exit.

FIRING PORTS - M2, M2A1 ONLY. Six firing ports enable soldiers to fire from inside the vehicle at external targets. Two firing ports are located on each side of the vehicle. Two firing ports are in the ramp.



WATER BARRIER. When erected, the water barrier allows the vehicle to swim.



CREW VENTILATION AND HEATING. Two vent fans provide fresh air for the crew. The personnel heater operates on diesel fuel.

FIGURE 7. Example of location and description of major components (Sheet 2 of 3). (reference 3.2.2.2.2)

NUCLEAR, BIOLOGICAL, AND CHEMICAL (NBC) SYSTEM - M2A1, M3A1 ONLY. The NBC System cleans and filters air and sends clean air to the driver, gunner, and commander through tank masks.

TRACK AND SUSPENSION SYSTEM. The track and suspension system helps propel the vehicle and provides a cushioned ride. the main parts of the track and suspension system are as follows:

Drive sprockets. The drive sprockets deliver power from the power unit to the tracks.

Tracks. The tracks are closed chains of track shoes driven by the drive sprockets.

Road wheels. The road wheels support the hull on the tracks.

Road arms. The road arms connect the road wheels to the torsion bars. The road arms pivot to press the road wheels against the tracks.

Shock absorbers. The shock absorbers work with the torsion bars to reduce bounce on rough ground.

Idler wheels. The idler wheels support the rear track loop ends and keep the tracks tight.

Track adjusters. The track adjusters permit the idler wheels to be moved to tighten or loosen the tracks.

Support rollers. The support rollers keep the top of the track from hitting the road wheels.

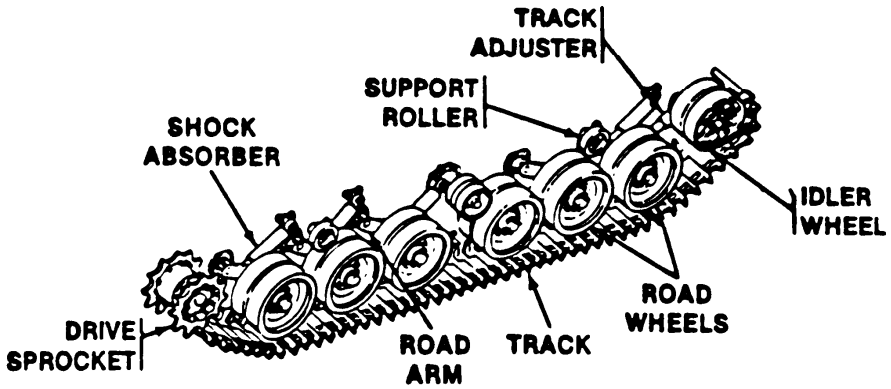


FIGURE 7. Example of location and description of major components (Sheet 3 of 3). (reference 3.2.2.2.2)

1.27. DIFFERENCES BETWEEN MODELS

This paragraphs shows major equipment and operational differences between models of M44A2 series vehicles. It has been organized in tabular form for easy reference by operators.

Table 1.1. Difference Between Models.

Vehicle Characteristics	M35A2	M35A2C	M36A2	M49A2C	M50A2	M50A3	M109A3	M113A3	M275A2	M342A2	M756A2	M764	Description (Para. No.)
Body Features:													
Built-In-A-Frame											X		2.31
Cab Protector									X	X	X		2.30,2.31,2.32
Earth Boring Machine												X	2.32
Floodlights											X		2.31
Nonreducible Height							X	X					1.28
Permanent Sides	X		X	X	X	X	X	X		X		X	--
Rear Winch											X	X	2.31,2.32
Reducible Height	X	X	X	X	X	X			X	X	X	X	1.28
Removable Sides		X									X		2.25,2.31
Operational Capabilities:													
Cargo/Personnel	X	X	X							X	X		2.25,2.30
Transport													2.31,2.49
Dump Operations										X			2.30
Earth Boring/ Polesetting												X	2.32
Equipment Repair							X	X					2.28
Fifth Wheel Operations									X				2.29
Fuel Servicing				X									2.26
Pipeline Construction											X		2.31
Water Servicing					X	X							2.27
Wheelbases:													
142 in. (360.6 cm)									X				
154 in. (391.1 cm)	X	X		X	X	X	X	X		X	X	X	
190 in. (482.6 cm)			X										

FIGURE 8. Examples of differences between models (Sheet 1 of 2). (reference 3.2.2.2.3)

DIFFERENCES BETWEEN MODELS

	M2, M2A1	M3, M3A1
Personnel:	Three crew members Six squad members (Seven squad members)	Three crew members Two squad members
Firing Ports	Six	None
Missiles:	Two ready	Two ready
TOW		10 stowed
TOW/DRAGON	Five stowed, any combination	
LAW	Three stowed	Three stowed
Ammunition:		
25mm	300 ready 600 stowed	300 ready 1200 stowed
7.62mm(M240C)	800 ready 1400 stowed	800 ready 3600 stowed
7.62(M60)	2200 stowed	3200 stowed
5.56mm(M231)	4200 stowed	None
5.56mm(M16A1)	2520 stowed	1680 stowed

FIGURE 8. Examples of differences between models (Sheet 2 of 2). (reference 3.2.2.2.3)

EQUIPMENT DATA

GENERAL

Weight (combat loaded)	
M2	50,259 lb(22,797 kg)
M3	49,945 lb(22,655 kg)
M2A1	50,261 lb(22,798 kg)
M3A1	50,510 lb(22,911 kg)
Weight (less fuel, crew, and OVE)	
M2	42,289 lb(19,182 kg)
M3	41,975 lb(19,040 kg)
M2A1	43,500 lb(19,732 kg)
M3A1	43,600 lb(19,777 kg)
Weight (air transportable)	40,775 lb(18,495 kg)
Ground pressure (combat loaded)	7.7 psi(0.54 kg/cm^2)
Personnel Capacity:	
M2	9
M3	5
M2A1	10
M3A1	5
Fuel tank capacity	175 gal (662 liters)
Engine coolant	22 gal (82.6 liters)

PERFORMANCE

Speed on land	41 mph (66 km/h)
Speed on water	4.5 mph (7.2 km/h)
Cruising range	300 mi (483 km)
Turning radius	pivot to infinite
Slope	60%
Side slope	40%
Trench crossing	8 ft. 4 in. (2.5 m)
Vertical/wall climbing	36 in. (91 cm)
Gross horsepower-to-weight ratio	20.62 hp/ton
Ground clearance	18 in. (45.7 cm)

ENGINE

Make and model	Cummins VTA-903T
Displacement	903 cu in.(14.8 liters)
Type	4 cycle
Fuel	Diesel
Gross horsepower	500 (506 metric)

FIGURE 9. Example of equipment data (Sheet 1 of 2). (reference 3.2.2.2.4)

EQUIPMENT DATA

TRANSMISSION, AUTOMATIC

Make and model	G.E.HMPT-500
Type	Hydromechanical
Steering	Hydrostatic
Brake	Multidisc, oil-cooled

RUNNING GEAR

Suspension	Return roller
Springing media	Torsion bar type
Number of road wheels	6 pairs per side
Road wheel size:	
Diameter	24 in. (61.0 cm)
Width	4 in. (10.2 cm)
Track type	Steel single pin with detachable rubber pads
Shock absorbers	4 per side
Number of track shoes	83, left side 82, right side
Track pitch	6 in. (15.2 cm)
Track width	21 in. (53.3 cm)

ELECTRICAL SYSTEM

Generator:	
Amperes	220 amp
Volts, dc	regulated to 24 V
Batteries	4 each, type 6TN, 100 amp hr, 12 V each

FIRE EXTINGUISHERS

Fixed:	
Engine compartment	7 lb (3.2 kg) Halon
Squad compartment	2 each, 5 lb (2.3 kg) Halon
Portable	2 each, 2.75 lb (1.2 kg) Halon

FIGURE 9. Example of equipment data (Sheet 2 of 2). (reference 3.2.2.2.4)

1.15.3 **Service Brake Function**. The transmission contains brake assemblies at each output. Each brake is made up of several plates.Every other plate rotates with the transmission output coupling. The plates between the rotating plates are anchored and do not rotate. Mechanical linkage from the service pedal to the transmission opens a valve which applies hydraulic pressure to squeeze the rotating and stationary plates together. When the engine is not running, the service brakes will slow the tank. Without the power boost, the service brakes require more pressure on the service brake pedal. A warning light on the driver's master panel will come on if the service brakes are applied for more than two minutes with the engine running.

1.15.4 **Parking Brake Function**. The parking brake system consists of a foot pedal, hydraulic valve, accumulator, actuator equalizer bar, and ratchet release handle. When the parking brake pedal is pushed, hydraulic pressure is sent to the actuator. The actuator is connected to an equalizer bar which is moved away from the actuator by hydraulic pressure. The equalizer bar has two cables connected to it which are pulled equally as the equalizer bar moves away from the actuator. These cables are mechanically linked to the same sets of rotating and stationary plates that are used for services braking. The accumulator maintains enough hydraulic pressure for four or five pushes on the parking brake pedal after the engine has shut down. A warning light on the driver's master panel will come on if the parking brake is on while engine is running.

FIGURE 10. Example of principles of operation for mechanical equipment (Sheet 1 of 2). (reference 3.2.2.3)

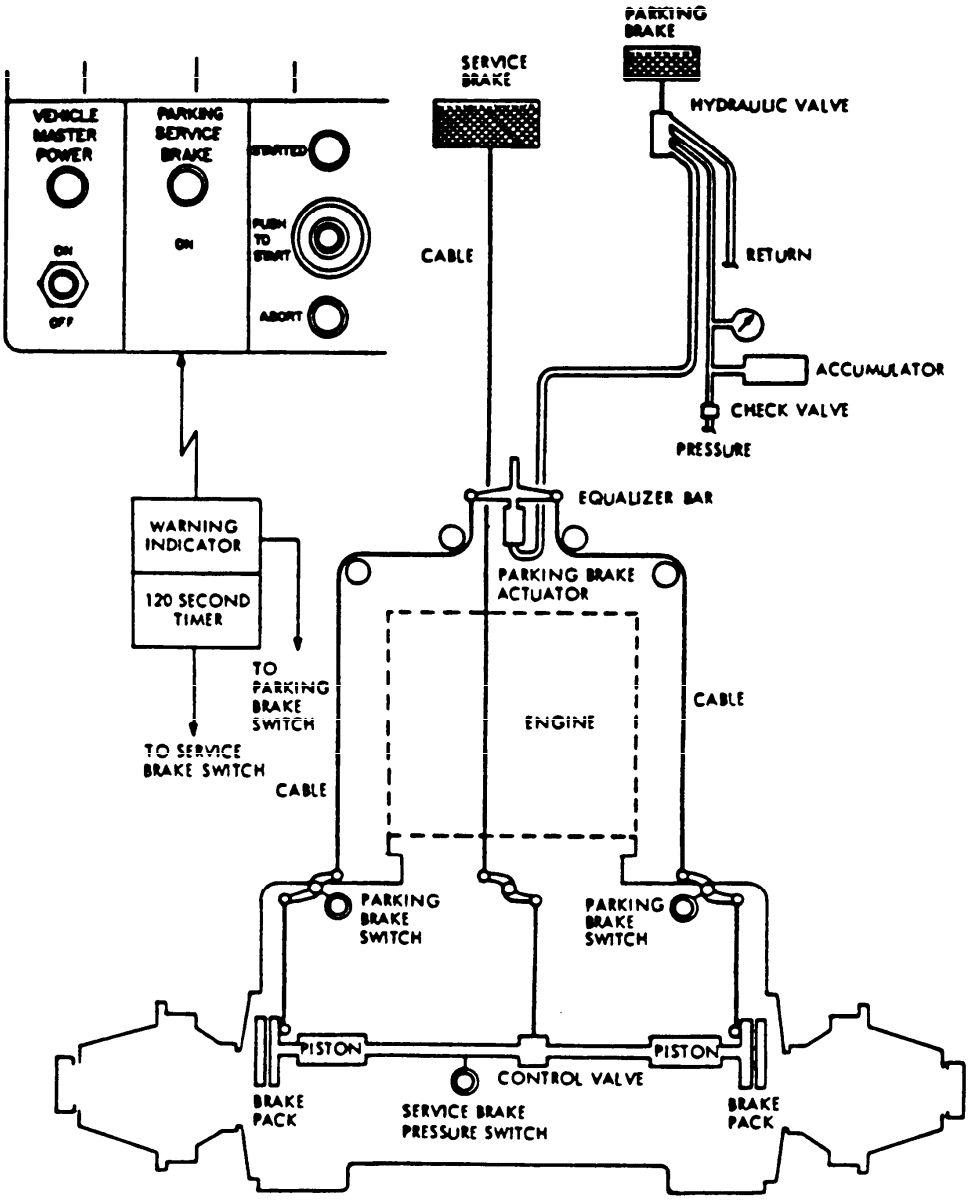


FIGURE 10. Example of principles of operation for mechanical equipment (Sheet 2 of 2). (reference 3.2.2.3)

1.14.4 **Exterior Lights and Domelight Subsystem**. The exterior lights and domelight subsystem consist of two head lights, two taillights, and a driver's domelight. All of the exterior lights are controlled by rotary selector switch S7 on the driver's master panel. Lighting selections are:

BO - turns blackout lights front and rear on.
OFF - turns all exterior lights off.
STOPLIGHT ONLY - turns taillights on only when service brake is pushed.
SERVICE LIGHTS - turns all exterior lights (front and rear) on.

1.14.4.1 The ON/OFF toggle switch S8 on the driver's master panel controls the headlights' high beam. The HI BEAM indicator lights when the switch is on the ON position. The HI BEAM switch and LIGHTS selector switches control relays located in the hull networks box. The relays control operating voltages to the exterior lights.

1.14.4.2 The driver's domelight contains an ON/OFF dimmer control and red/white filter control. Interior lighting is provided to the driver when the control knob on the front of the domelight is rotated clockwise. The driver can adjust the amount of light by turning the control knob clockwise for more light or counterclockwise for less. A lever below the light is turned to select a white or red filtered light.

FIGURE 11. **Example of principles of operation for electrical equipment (Sheet 1 of 2).** **(reference 3.2.2.3)**

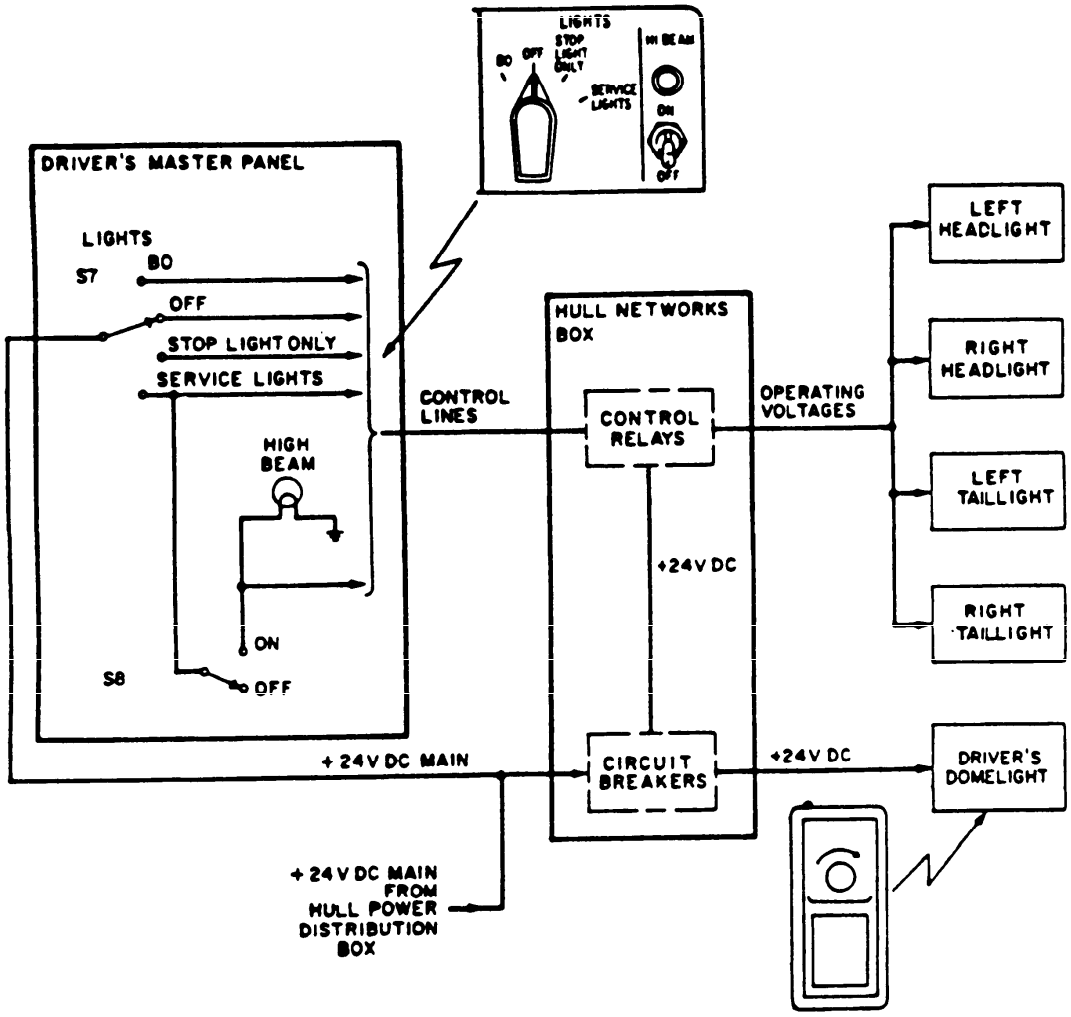


FIGURE 11. Example of principles of operation for electrical equipment (Sheet 2 of 2). (reference 3.2.2.3)

1.12. General. The purpose of the M54A2 launching station is to allow a gunner to acquire, identify, and engage enemy aircraft during daylight, darkness, or periods of limited visibility. The launching station includes eight subsystems which are described in text and supporting block diagrams.

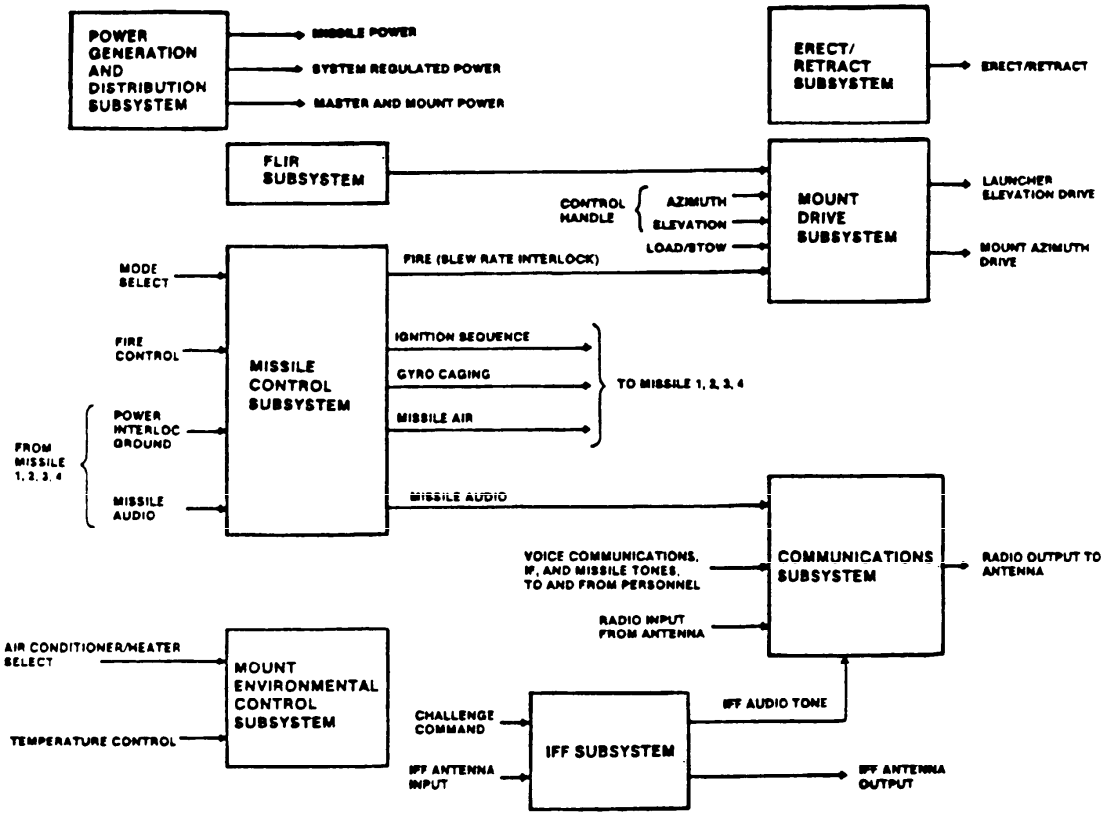
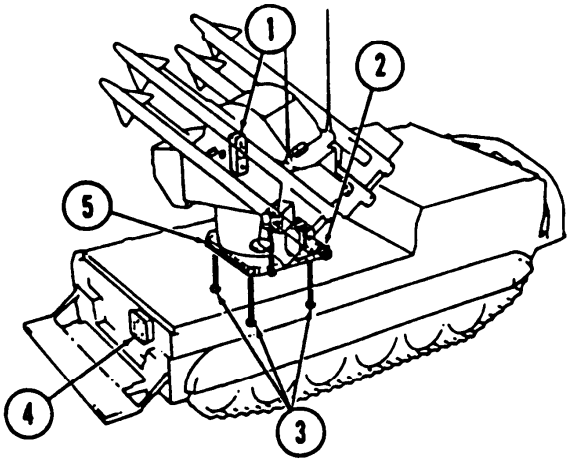


FIGURE 12. Example of principles of operation for multisystem equipment (Sheet 1 of 2). (reference 3.2.2.3)

1.14. **Erect/Retract Subsystem.** The erect/retract subsystem consists of a drive motor, a roller chain, and for jack screws. The erect/retract mechanism raises and lowers the mount vertically on commands from the right-hand control panel. Commands from the master control panel override the right-hand control panel.



1.14.1 *Right Hand Control Panel.* The right hand control panel (1), located in gunner's compartment, has an erect/retract switch to raise or lower the turret.

1.14.2 *Erect/Retract Motor.* The erect/retract motor (2) is located beneath the floor of launching station. The motor drives the chain assembly through the motor drive sprocket. the motor has a friction brake to stop operation.

1.14.3 *Jack Screws.* The jack screws (3), mounted at each corner of the mount elevator, rotate to raise or lower the turret. The top mounted sprockets drive the screws which are inserted into drive chain links. the direction of movement is determined by the erect/retract motor.

1.14.4 *Master Control Panel.* The master control panel (4) has an erect/retract switch for raising and lowering the turret.

1.14.5 *Roller Chain Assembly.* The roller chain assembly (5) engages drive sprockets to raise or lower turret. An idler sprocket is mounted on either side of helix screw sprockets to hold link engagement over screw sprocket teeth.

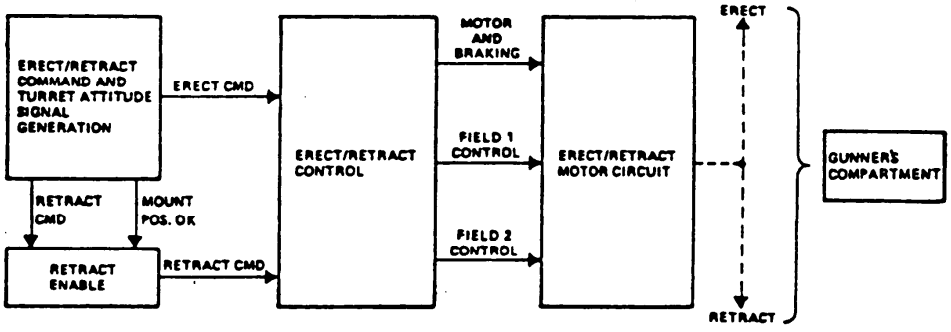


FIGURE 12. Example of principles of operation for multisystem equipment (Sheet 2 of 2). (reference 3.2.2.3)

REPAIR MANUAL RAMP-LOCK RELEASE LEVER ASSEMBLY (EN)

INITIAL SETUP

Tools:

General mechanic's tool kit:
automotive (Item 47, App G)
Fixed open end wrench set
(Item 42, App G)
Snap ring pliers
(Item 86, App G)
Socket wrench set, 3/8 inch
drive (Item 110, App
Torque wrench, 3/8 inch drive,
0-600 in-lb (Item 143, App G)
Torque wrench, 1/2 inch drive,
0-175 ft-lb (Item 144, App G)

Materiels/Parts:

Cotter pin (Item 143, App H)
Cotter pin (2) (Item 147, App H)

Materials/Parts (cont):

Lock washer (2) (Item 215, App H)
Retaining ring (2) (Item 170, App H)
Spring pin (Item 171, App H)

Personnel Required:

ITV/IFV/CFV Sys Mech 63T10

References:

TM 9-2350-284-10-1

Equipment Conditions:

Engine stopped (TM 9-2350-284-10-1)

FIGURE 13. Example of initial setup. (reference 3.2.3.1.1)

TOOL IDENTIFICATION LIST

(1) ITEM NUMBER	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) REFERENCE
1	Adapter, socket, 1/2 male to 3/4 in. female	5120-00-227-8088		SC 4910-95-CL-A72
2	Adapter, socket wrench, 3/8 in-1/2 in	5120-00-240-8703	EX503B	TM 9-2350-284-24P-1
3	Adapter, socket wrench, 1/2 in-3/4 in	5120-00-144-5207	11655788-3	TM 9-2350-284-24P-1
4	Adapter, socket wrench 3/in-1 in	5120-00-227-8104	LA72	TM 9-2350-284-24P-1
5	Adapter, test	4910-01-138-9334	11629693-1	TM 9-2350-284-24P-1
42	Fixed open end wrench set	5120-00-148-7918		SC 4910-95-CL-A74
43	Fixture, track connecting	5120-00-708-3799	7083799	TM 9-2350-284-24P-1
44	Frame, hacksaw	5110-00-289-9657		SC 4910-95-CL-A74
45	Funnel	7240-00-559-7364		SC 4910-95-CL-A74
46	Gage, belt tension	4910-01-128-2669	ST-1274	TM 9-2350-284-24P-1
47	Gen. mechanic's tool kit: automotive	5180-00-177-7033		SC 5180-90-CL-N26
48	Gloves, chemical and oil protective	4240-00-022-2524		SC 4910-95-CL-A72
84	Pin, quick release	5340-01-140-4530	12308762	TM 9-2350-284-24P-1
85	Pliers, slip joint, conduit, plastic jaw	5120-00-624-8065	AT508K	TM 9-2350-284-24P-1
86	Pliers, snap ring	5120-00-789-0492		SC 4910-95-CL-A74
87	Posidrive cross-tip screwdriver set	5180-01-115-6873		SC 4910-95-CL-A74
109	Socket wrench set, 1/4 inch drive	5120-00-081-2305		SC 4910-95-CL-A74
110	Socket wrench set, 3/8 inch drive	5120-00-322-6231		SC 4910-95-CL-A74
111	Socket wrench set, 3/4 inch drive	5120-00-204-1999		SC 4910-95-CL-A74
112	Socket wrench socket set, 1/2 inch drive	5120-00-596-8622		SC 4910-95-CL-A74
142	Wrench, torque, 3/8 in drive,0-200 in-lb	5120-00-853-4538		SC 4910-95-CL-A72
143	Wrench, torque, 3/8 in drive,0-200 in-lb	5120-00-542-5681	B58	TM 9-2350-284-24P-1
144	Wrench, torque, 3/8 in drive,0-200 in-lb	5120-00-640-6364		SC 4910-95-CL-A74
145	Wrench, torque, 3/8 in drive,0-200 in-lb	5120-00-221-7983		SC 4910-95-CL-A74

FIGURE 14. Example of a tool identification list.
(reference 3.2.3.1.1, 3.2.11)

INITIAL SETUP

Tools
Funnel, plastic, 4-ounce, NPN-1
Gun, grease, hand, 8f9866
Kit, tool, 13032300
Kit, tool, 13022302
Pan, drain, NPN8
Pump, oil sampling

Materials/Parts
Cloth, cleaning (4, Appendix C)
Grease, automotive and artillery (9, Appendix C).
Lockwire (12, Appendix C)
Lubricant, oil(13, Appendix C)
Lubricant, oil(14, Appendix C)
Lubricant, oil(15, Appendix C)
Washer, Seal (2)(34, Appendix C)
Solvent, drycleaning(27, Appendix C)
Tubing,clear plastic (32,Appendix C)

Fabricated Tools
Modified hex wrench (E-1,Appendix E)

Personnel Required
Semiannually, MLRS Mechanic MOS 13M
Annually, MLRS Mechanic MOS 13M and MLRS Crewmember MOS 13M

FIGURE 15. Example of initial setup for PMCS table. (reference 3.2.3.4.2)

TABLE 2-1. Unit level Preventive Maintenance Checks and Services for the MLRS Launcher

<table>
<tr><th>Item No.</th><th>Interval</th><th>Location
Item to Check/ Service</th><th>Procedure</th><th>Not Fully Mission Capable if:</th></tr>
<tr><td>1</td><td>Semi-annually</td><td>Shock Absorber Housing (1,2, & 7)</td><td>a. Open required skirt (TM 9-2350-255-10)

b. Check to see if oil level indicator ball (1) is between top and middle of liquid sight indicator (2). If ball (1) is between top and middle of indicator (2) oil level is OK.

<table>
<tr><th rowspan="2">LUBRICANTS/ COMPONENTS</th><th rowspan="2">REFILL CAPACITY</th><th colspan="3">EXPECTED TEMPERATURES*</th></tr>
<tr><th>Above +32°F</th><th>+40°F to -10°F</th><th>0°F to -65°F</th></tr>
<tr><td>Oil: Lubricating Oil, MIL-L-46167</td><td>7 Pints Each</td><td>All Temperatures</td><td>All Temperatures</td><td>All Temperatures</td></tr>
</table>
*For arctic operation, refer to FM 9-207

c. To raise oil level, remove fill machine thread plug (3) and add oil until level ball (1) is at top of indicator (2).

d. Put new packing (4) on plug (3) and lightly coat plug (3) with oil. Install plug (3) and torque between 15-25 lb-ft (20-34 N-m).

e. Exercise shock absorber and recheck sight indicator (2). Add oil if necessary.

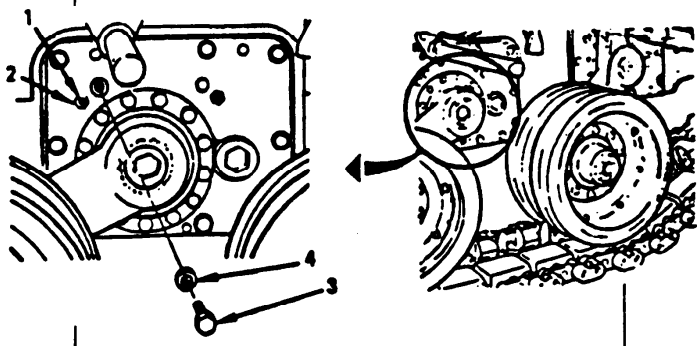
 
</td><td></td></tr>
</table>

FIGURE 16. Example of a PMCS table with lubrication instructions (reference 3.3.3.4.3)

HEMMT

SEMIANNUAL (6000 MILE) PMCS MANDATORY REPLACEMENT PARTS LIST

ITEM NO.	PART NUMBER	NSN	NOMENCLATURE	QTY
1	HC7500Y144	4330-01-217-8184	FILTER ELEMENT, FLUID (M977/M985 ONLY)	1
2	HD233	2940-01-132-4842	FILTER ELEMENT, FLUID	1
3	MS35338-46	5310-00-637-9541	WASHER, LOCK (ALL EXCEPT M984A1	2
4	MS35802-3	2940-00-580-6283	FILTER ELEMENT, FLUID	1
5	S-268-1	5306-01-084-5390	BOLT, MACHINE (ALL EXCEPT M984A1	2
6	WA110	5310-01-061-5302	WASHER, LOCK	4
7	10232C	5330-01-168-8707	GASKET (M978 ONLY)	1
8	11007	5330-01-046-1990	GASKET	1
9	1112310	5330-01-225-4803	PACKING, PREFORMED (M977/M985/M984A1 ONLY)	1
10	1124510	5330-01-143-0135	PACKING, PREFORMED (M977/M985/M984A1 ONLY)	1
11	1128242	5330-01-124-1112	PACKING, PREFORMED (M977/M985/M984A1 ONLY)	1
12	11350	5330-01-147-6003	PACKING PREFORMED	1
13	1199478	5330-01-234-7625	GASKET	1
14	1199738	4330-01-192-7664	SCREEN, BY-PASS FILTER (M977/M985/M984A1 ONLY)	1
15	1300766	4330-01-232-8305	FILTER ELEMENT, FLUID (M984A1 ONLY)	1
16	1300767	4330-01-192-8832	FILTER ELEMENT, FLUID (M977/M985/M984A1 ONLY)	1
17	2020SM	4330-01-046-3399	FILTER ELEMENT, FLUID	1
18	2463HX	5310-01-054-5896	WASHER, FLAT (ALL 2 EXCEPT M984A1)	
19	25010778	2910-01-022-8183	FILTER ELEMENT, FLUID	1
20	4-1/2IN77/	5330-01-163-5849	GASKET (M978 ONLY)	2
21	45D020P6	5330-01-156-3764	PACKING, PREFORMED (M978 ONLY)	1
22	941107	4330-01-163-7326	FILTER ELEMENT, FLUID (M978/M983/M984/ M985E1 ONLY)	1

FIGURE 17. Example of mandatory replacement parts list. (reference 3.2.3.4.4)

APPENDIX B

MAINTENANCE ALLOCATION CHART (MAC)

SECTION I

INTRODUCTION

B.1. The Army Maintenance System MAC.

B.1.1. This introduction (section I) provides a general explanation of all maintenance and repair functions authorized at various maintenance levels under the standard Army Maintenance System concept.

B.1.2. The Maintenance Allocation Chart (MAC) in section II designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component will be consistent with the capacities and capabilities of the designated maintenance levels, which are shown on the MAC in column (4) as:

Unit - includes two subcolumns, C (operator/crew) and O (unit) maintenance.

Direct Support - includes an F subcolumn.

General Support - includes an H subcolumn.

Depot - includes a D subcolumn.

B.1.3. Section III lists the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from section II.

B.1.4. Section IV contains supplemental instructions and explanatory notes for a particular maintenance function.

B.2. Maintenance Functions. Maintenance functions are limited to and defined as follows: (see 3.2.5.2g for ammunition MAC exception).

B.2.1. **Inspect.** To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel).

B.2.2. **Test.** To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item/end item and comparing those characteristics with prescribed standards.

B.2.3. **Service.** Operations required periodically to keep an item in proper operating condition; e.g., to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.

FIGURE 18. Example of the Army maintenance system standard MAC appendix (Sheet 1 of 6). (reference 3.2.6.4, 3.2.6.5)

B.2.4. **Adjust**. To maintain or regulate, within prescribed limits, by bringing into proper position, or by setting the operating characteristics to specified parameters.

B.2.5. **Align**. to adjust specified variable elements of an item to bring about optimum or desired performance.

B.2.6. **Calibrate**. To determine and cause corrections to be made or to be adjusted on instruments or test, measuring, and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

B.2.7. **Remove/Install**. To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

B.2.8. **Replace**. To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and assigned maintenance level is shown as the 3d position code of the SMR code.

B.2.9. **Repair**. The application of maintenance services[1] including fault location/troubleshooting[2], removal/installation, and disassembly/assembly[3] procedures, and maintenance actions[4] to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

B.2.10. **Overhaul**. That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications (i.e., DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

---

[1]Services - Inspect, test, service, adjust, align, calibrate, and/or replace.

[2]Fault location/troubleshooting - The process of investigating and detecting the cause of equipment mal- functioning; the act of isolating a fault within a system or unit under test (UUT).

[3]Disassembly/assembly - The step-by-step breakdown (taking apart) of a spare/functional group coded item to the level of its least component, that is assigned an SMR code for the level of maintenance under consideration (i.e., identified as maintenance significant).

[4]Actions - Welding, grinding, riveting, straightening, facing, machining, and/or resurfacing.

FIGURE 18. Example of the Army maintenance system standard MAC appendix (Sheet 2 of 6). (reference 3.2.6.4, 3.2.6.5)

B.2.11. **Rebuild**. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (e.g., hours/miles) considered in classifying Army equipment/components.

B.3. Explanation of Columns in the MAC, Section II.

B.3.1. **Column 1, Group Number**. Column 1 lists functional group code numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the next higher assembly.

B.3.2. **Column 2, Component/Assembly**. Column 2 contains the item names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

B.3.3. **Column 3, Maintenance Function**. Column 3 lists the functions to be performed on the item listed in Column 2. (For detailed explanation of these functions, see paragraph B.2.)

B.3.4. **Column 4, Maintenance Level**. Column 4 specifies each level of maintenance authorized to perform each function listed in Column 3, by indicating work time required (expressed as man- hours in whole hours or decimals) in the appropriate subcolumn. This work-time figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance levels, appropriate work-time figures are shown for each level. The work-time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (condition/follow-on tasks) (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the MAC. The symbol designations for the various maintenance levels are as follows:

NOTE

When a complete replace or repair task performed at higher level maintenance includes lower level maintenance tasks (equipment condition/follow-on tasks), the lower level work time figures in the MAC must be added to the higher level work time shown in the MAC to determine the total to accomplish that maintenance function.

C	Operator or crew maintenance
O	Unit maintenance
F	Direct support maintenance

FIGURE 18. Example of the Army maintenance system standard MAC appendix (Sheet 3 of 6). (reference 3.2.6.4, 3.2.6.5)

L ..... Specialized Repair Activity (SRA)[5]
H ..... General support maintenance
D ..... Depot maintenance

B.3.5. **Column 5, Tools and Test Equipment reference code.** Column 5 specifies, by code, those common tools sets (not individual tools), common TMDE, and special tools, special TMDE, and special support equipment required to perform the designated function. Codes are keyed to tools and test equipment in section III.

B.3.6. **Column 6, Remarks.** When applicable, this column contains a letter code, in alphabetical order, which is keyed to the remarks contained in Section IV.

B.4. Explanation of Columns in Tool and Test Equipment Requirements, Section III.

B.4.1. **Column 1, Reference Code.** The tool and test equipment reference code correlates with a code used in the MAC, Section II, Column 5.

B.4.2. **Column 2, Maintenance Level.** The lowest level of maintenance authorized to use the tool or test equipment.

B.4.3. **Column 3, Nomenclature.** Name or identification of the tool or test equipment.

B.4.4. **Column 4, National Stock Number.** The National Stock Number of the tool or test equipment.

B.4.5. **Column 5, Tool Number.** The manufacturer's part number, model number, or type number.

B.5. Explanation of Columns in Remarks, Section IV.

B.5.1. **Column 1, Remarks Code.** The code recorded in column 6, Section II.

B.5.2. **Column 2, Remarks.** This column along with the related codes, should be used to clarify maintenance and inspection functions by different MOS' involved in maintaining some components.

---

[5]This maintenance level is not included in Section II, column (4) of the Maintenance Allocation Chart. Functions to this level of maintenance are identified by a work-time figure in the "H" column of Section II, column (4), and an associated reference code is used in the Remarks column (6). This code is keyed to Section IV, Remarks, and the SRA complete repair application is explained there.

FIGURE 18. Example of the Army maintenance system standard MAC appendix (Sheet 4 of 6). (reference 3.2.6.4, 3.2.6.5)

Section II. MAINTENANCE ALLOCATION CHART FOR TSE/ST-34

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
00	TSEC/ST-34	INSPECT	0.1						A
		SERVICE	0.2						B
		REPLACE	0.4					1	C, D
		TEST	0.3						E
		REPAIR			1 .5			1-2	F
		REPAIR				2.0		1-5	G, J
		REPAIR					2.0	1-9	H
		OVERHAUL					16.0	1-9	I
01	STP-34 POWER UNIT	INSPECT	0.1						A
		TEST	0.3						E
		REPAIR			1. 8			1-2	F
		REPAIR				2.0		1-5	G,J
		REPAIR					2.0	1-9	H
0101	STP-34 PRINTED CIRCUIT BOARD								
010101	E-EBO/1	INSPECT			0.1				A
		TEST			0.5			1,2	E
		TEST					1.0	1-3, 6-8	I
		REPLACE			0.5			1	
		REPAIR					2.0	1-4, 6-8	G
010102	SWITCHING ASSEMBLY	INSPECT			0.1			1	A
		REPLACE			0.5			1	
		TEST					1.0	1-3, 6-8	
		REPAIR					2.0	1-4, 6-8	H
02	STB-34 LOGIC UNIT	INSPECT	0.1						A
		TEST	0.5						E
		REPAIR			1.0			1-2	F
		REPAIR				2.0		1-5	G, J
0201	STB-34 PRINTED CIRCUIT BOARDS	INSPECT			1.0				A
		TEST			0.2				E
		TEST				1.0		1-3, 5	J
		REPLACE			0.3			1	
		REPAIR				2.0		2-5	G

FIGURE 18. Example of the Army maintenance system standard MAC appendix (Sheet 5 of 6). (reference 3.2.6.4, 3.2.6.5)

SECTION III. TOOLS AND TEST EQUIPMENT FOR TSEC/ST-34

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE LEVEL	NOMENCLATURE	NATIONAL STOCK NUMBER	TOOL NUMBER
1	F	TOOL, KIT, ELECTRONIC EQUIPMENT	5180-00-610-8177	TK-105/6
2	F	MULTIMETER, DIGITAL	6625-01-139-2512	AN/PSM-45
3	H	OSCILLOSCOPE	6625-01-187-7847	AN/USM-488
4	H	REPAIR AND SOLDERING CENTER (PAGE)	4940-01-031-4541	PRC-350C/ EQUIP
5	H	AUTOMATIC TEST SYSTEM ST-51	5810-089-4599	TSEC/ST-51
6	D	POWER SUPPLY (0-30 VDC 2.4A	6130-00-006-5224	HP 6434B86
7	D	MULTIMETER, DIGITAL	6625-01-145-2430	AN/USM 486
8	D	POWER SUPPLY TESTER	N/A	ON502427

SECTION IV. REMARKS FOR TSEC/ST-34

REMARKS CODE	REMARKS
A	EXTERNAL
B	PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)
C	REPLACE RACK INSTALLED UNIT, 0.4 HRS
D	BENCH TOP USE ONLY, 0.1 HRS
E	SELF-TEST
F	REPAIR BY PMA AND AUTHORIZED COMPONENT REPLACEMENT ONLY
G	COMPLETE UNIT AND SUBASSEMBLY REPAIR (EXCEPT STP-34 SWITCHING ASSEMBLY AND E-EBO/1
H	COMPLETE UNIT AND SUBASSEMBLY REPAIR
I	IN COMPLIANCE WITH TSEC/ST-34 CIDOS
J	FUNCTION PERFORMED BY SPECIALIZED REPAIR ACTIVITY (SRA) (THEATER COMSEC LOGISTIC SUPPORT CENTER-EUROPE OR LEXINGTON-BLUEGRASS ARMY DEPOT)

FIGURE 18. Example of the Army maintenance system standard MAC appendix (Sheet 6 of 6). (reference 3.2.6.4, 3.2.6.5)

APPENDIX B

MAINTENANCE ALLOCATION CHART

SECTION I

INTRODUCTION

B-1. Aviation Maintenance Allocation Chart.

B.1.1. This Maintenance Allocation Chart (MAC) assigns maintenance functions in accordance with the Aviation Maintenance concept for Army aviation. These maintenance levels - Aviation Unit Maintenance (AVUM), Aviation Intermediate Maintenance (AVIM), and Depot Maintenance - are depicted on the MAC as follows:

AVUM - corresponds to an O code in the Repair Parts and Special Tools List (RPSTL).

AVIM - corresponds to an F code in the RPSTL.

DEPOT - corresponds to a D code in the RPSTL.

B.1.2. The maintenance to be performed below depot and in the field is described as follows:

B.1.2.1 **AVUM** activities will be staffed and equipped to perform high frequency "on-aircraft" maintenance tasks required to retain or return aircraft systems to a serviceable condition. The maintenance capability of the AVUM will be governed by the Maintenance Allocation Chart (MAC) and limited by the amount and complexity of ground support equipment (GSE), facilities required, authorized manning strength, and critical skills available. The range and quantity of authorized spare modules/components will be consistent with the mobility requirements dictated by the air mobility concept. (Assignments of maintenance tasks to divisional company sized aviation units will consider the overall maintenance capability of the division, the requirement to conserve personnel and equipment resources, and air mobility requirements.)

B.1.2.1.1 Company Sized Aviation Units: Perform those tasks which consist primarily of preventive maintenance and maintenance repair and replacement functions associated with sustaining a high level of aircraft operational readiness. Perform maintenance inspections and servicing to include preflight, daily, intermediate, periodic (or phased), and special inspections, as authorized by the MAC or higher headquarters. Identify the cause of equipment/system malfunctions using applicable technical manual troubleshooting instructions, built-in test equipment (BITE), installed aircraft instruments, or test, measurement, and diagnostic equipment (TMDE). Replace worn or damaged modules/components that do not require complex adjustments or system alignment and which can be removed/installed with available skills, tools, and ground support equipment. Perform operational and continuity checks and make minor repairs to the electrical system. Inspect, service, and make operational,

FIGURE 19. Example of Aviation MAC appendix (Sheet 1 of 9). (reference 3.2.6.4, 3.2.6.5)

capacity, and pressure checks to hydraulic systems. Perform servicing, functional adjustments, and minor repair/replacement to the flight control, propulsion, power train, and fuel systems. Accomplish airframe repair that does not require extensive disassembly, jigging, or alignment. The manufacture of airframe parts will be limited to those items which can be fabricated with tools and equipment found in current air mobile tool and shop sets. Evacuate unserviceable modules/components and end items beyond the repair capability of AVUM to the support AVIM.

B.1.2.1.2. Less than Company Sized Aviation Units: Aviation elements organic to brigade, group, battalion headquarters, and detachment size units are normally small and have less than 10 aircraft assigned. Maintenance tasks performed by these units will be those which can be accomplished by the aircraft crew chief or assigned aircraft repairman and will normally be limited to preventive maintenance, inspections, servicing, spot painting, module/component fault diagnosis, and replacement of selected modules/components. Repair functions will normally be accomplished by the support AVIM unit.

B.1.2.2 **Aviation Intermediate Maintenance (AVIM).**

B.1.2.2.1 Provides mobile, responsive "one-stop" maintenance support. (Maintenance functions which are not conducive to sustaining air mobility will be assigned to depot maintenance.)

B.1.2.2.2 May perform all maintenance functions authorized to be done at AVUM. Repair of equipment for return to user will emphasize support or operational readiness requirements. Authorized maintenance includes replacement and repair of modules/components and end items which can be accomplished efficiently with available skills, tools, and equipment.

B.1.2.2.3 Establishes the Direct Exchange (DX) program for AVUM units by repairing selected items for return to stock when such repairs cannot be accomplished at the AVUM level.

B.1.2.2.4 Inspects, troubleshoots, performs diagnostic tests, repairs, adjusts, calibrates, and aligns aircraft system modules/components. AVIM units will have capability to determine the serviceability of specified modules/components removed prior to the expiration of the Time Between Overhaul (TBO) or finite life. Module/component disassembly and repair will support the DX program and will normally be limited to tasks requiring cleaning and the replacement of seals, fittings, and items of common hardware. Airframe repair and fabrication of parts will be limited to those maintenance tasks which can be performed with available tools and test equipment. Unserviceable reparable modules/components and end items which are beyond the capability of AVIM to repair will be evacuated to Depot Maintenance.

B.1.2.2.5 Performs aircraft weight and balance inspections and other special inspections which exceed AVUM capability.

B.1.2.2.6 Provides quick response maintenance support, including aircraft recovery and air evacuation, on-the-job training, and technical assistance through the use of mobile maintenance contact teams.

FIGURE 19. Example of Aviation MAC appendix (Sheet 2 of 9).
(reference 3.2.6.4, 3.2.6.5)

B.1.2.2.7. Maintains authorized operational readiness float aircraft.

B.1.2.2.8 Provides collection and classification services for serviceable/unserviceable material.

B.1.2.2.9 Operates a cannibalization point in accordance with AR 710-2 and DA Pam 710-2-2. (The aircraft maintenance company within the maintenance battalion of a division will perform AVIM functions consistent with air mobility requirements and conservation of personnel and equipment resources. Additional intermediate maintenance support will be provided by the supporting nondivisional AVIM unit.)

B.2. Use of the Maintenance Allocation Chart (Section II).

NOTE

Approved item names are used throughout this MAC. Generic terms/nomenclatures (if any) are expressed in parentheses and are not to be considered as official terminology.

B.2.1 This Maintenance Allocation Chart assigns maintenance functions to the lowest level of maintenance, based on past experience and the following considerations:

Skills available.

Work time required.

Tools and test equipment required and/or available.

B.2.2 Only the lowest level of maintenance authorized to perform a maintenance function is indicated. If the lowest maintenance level cannot perform all tasks of any single maintenance function (e.g., test, repair), then the higher maintenance level(s) that can accomplish additional tasks will also be indicated.

B.2.3 A maintenance function assigned to a maintenance level will automatically be authorized to be performed at any higher maintenance level.

B.2.4 A maintenance function that cannot be performed at the assigned level of maintenance for any reason may be evacuated to the next higher maintenance level. Higher maintenance levels will perform the maintenance functions of lower maintenance levels when required by the commander who has the authority to direct such tasking.

B.2.5 The assignment of a maintenance function will not be construed as authorization to carry the related repair parts or spares in stock. Information to requisition or otherwise secure the necessary repair parts will be as specified in the associated RPSTL.

FIGURE 19. Example of Aviation MAC appendix (Sheet 3 of 9). (reference 3.2.6.4, 3.2.6.5)

B.2.6 Normally there will be no deviation from the assigned level of maintenance. In cases of operational necessity, at the request of a lower maintenance level and on a one-time basis, transfer of maintenance functions to the lower level may be accomplished by specific authorization of the maintenance officer of the higher level of maintenance to which the function is assigned. The special tools, equipment, etc., required by the lower level of maintenance to perform this function will be furnished by the maintenance level to which the function is assigned. This transfer of a maintenance function to a lower maintenance level does not relieve the higher maintenance level of the responsibility for the function. The higher level of maintenance will provide technical supervision and inspection of the function being performed at the lower level.

B.3. **Maintenance functions**. Maintenance functions will be limited to and defined as follows:

B.3.1 **Inspect**. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel).

B.3.2 **Test**. To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards.

B.3.3 **Service**. Operations required periodically to keep an item in proper operating condition, i.e., to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.

B.3.4 **Adjust**. To maintain or regulate, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

B.3.5 **Align**. To adjust specified variable elements of an item to bring about optimum or desired performance.

B.3.6 **Calibrate**. To determine and cause corrections to be made or to be adjusted on instruments or test, measuring, and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

B.3.7 **Remove/install**. To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

B.3.8 **Replace**. To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and assigned maintenance level is shown as the 3d position code of the SMR code.

FIGURE 19. Example of Aviation MAC appendix (Sheet 4 of 9).
(reference 3.2.6.4, 3.2.6.5)

B.3.9 **Repair**. The application of maintenance services[1], including fault location/troubleshooting[2], removal/installation and disassembly/assembly procedures[3], and maintenance actions[4] to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

B.3.10 **Overhaul**. That maintenance effort (service/action) prescribed to restore an item to a completely service- able/operational condition as required by maintenance standards in appropriate technical publications (i.e., DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

B.3.11 **Rebuild**. Those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (e.g., hours/miles) considered in classifying Army equipment/components.

B.4. Explanation of Columns in the MAC, Section II.

B.4.1 **Functional Groups (Columns 1 and 2)**. The functional groupings shown in the sample below identify maintenance significant components, assemblies, subassemblies, and modules with the next higher assembly.

---

[1]Services - Inspect, test, service, adjust, align, calibrate, and/or replace.

[2]Fault locate/troubleshoot - The process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or unit under test (UUT).

[3]Disassemble/assemble - Encompasses the step-by-step taking apart (or breakdown) of a spare/functional group coded item to the level of its least componency identified as maintenance significant (i.e., assigned an SMR code) for the level of maintenance under consideration.

[4]Actions - Welding, grinding, riveting, straightening, facing, machining, and/or resurfacing.

FIGURE 19. Example of Aviation MAC appendix (Sheet 5 of 9). (reference 3.2.6.4, 3.2.6.5)

GROUP NUMBER	DESCRIPTION	GROUP NUMBER	DESCRIPTION
04	POWER PLANT		
0401	ENGINE GENERAL Servicing, handling, inspection requirements, lubrication charts, overhaul and retirement schedules. External lines & hoses. (As applicable).	0406	FUEL SYSTEM Fuel control, fuel boost pump, governors, fuel filter assembly, sequence valve, fuel manifold, fuel nozzle, external lines and hoses.
0402	COMPRESSOR SECTION (COLD SECTION MODULE) Rotor, blades, vanes, impeller, stators, inlet guide vanes, main frame, particle separator, bleed valve, bearings, seals, external lines & hoses.	0407	ELECTRICAL SYSTEM Electrical control units, exciters, thermocouples, ignition harness, electrical cables, history record, torque overspeed sensor, Np sensor, external lines and hoses.
0403	COMBUSTION SECTION (HOT SECTION MODULE) Liners, nozzles, stators, rotor, seals, couplings, blades.	0408	OIL SYSTEM Tanks, oil filter, oil cooler, lube and scavenge pumps, oil filter bypass sensor, eternal lines and hoses.
0404	POWER-TURBINE (POWER TURBINE MODULE) Nozzles, rotors, blades, exit guide vanes, exhaust frame, drive shaft, bearings, seals, external lines and hoses.	0409	DRIVE SYSTEM Reduction gear assembly, output shaft, seal, bearing.
0405	ACCESSORY GEAR BOX (ACCESSORY SECTION MODULE) Input and output gears, seals, chip detector, housings, drive shaft, bearings.	0410	MISCELLANEOUS EQUIPMENT (As applicable).

FIGURE 19. Example of Aviation MAC appendix (Sheet 6 of 9). (reference 3.2.6.4, 3.2.6.5)

B.4.2 **Maintenance Function (Column 3).** Column 3 lists the functions to be performed on the items listed in column 2.

B.4.3 **Maintenance Levels (Column 4).** The maintenance levels AVUM, AVIM, and DEPOT are listed on the Maintenance Allocation Chart with individual columns that include the work times for maintenance functions at each maintenance level. Work time presentations such as "0.1" indicate the average time (expressed in man-hours in whole hours or decimals) it requires a maintenance level to perform a specified maintenance function. If a work time has not been established, the columnar presentation will indicate "--". Maintenance levels higher than the level of maintenance indicated are authorized to perform the indicated function.

B.4.4 **Tools and Equipment Reference Code (Column 5).** Column 5 specifies, by code, those common tool sets (not individual tools), common TMDE, and special tools, special TMDE, and special support equipment required to perform the designated function.

B.4.5 **Remarks Code (Column 6).** When applicable, this column contains a letter code, in alphabetical order, which is keyed to the remarks contained in Section IV.

B.5 Explanation of Columns in Tools and Test Equipment Requirements, Section III.

B.5.1 **Column 1, Tools and Test Equipment Reference Code.** The tool and test equipment reference code correlates with a code used in the MAC, Section II, Column 5.

B.5.2 **Column 2, Maintenance Level.** The lowest level of maintenance authorized to use the tool or test equipment.

B.5.3 **Column 3, Nomenclature.** Name or identification of the tool or test equipment.

B.5.4 **Column 4, National Stock Number.** The National Stock Number of the tool or test equipment.

B.5.5 **Column 5, Tool Number.** The manufacturer's part number.

B.6. Explanation of Columns in Remarks, Section IV.

B.6.1 **Column 1, Remarks Code.** The code recorded in column 6, Section II.

B.6.2 **Column 2, Remark.** This column lists information pertinent to the maintenance function being performed as indicated in the MAC, Section II.

FIGURE 19. Example of Aviation MAC appendix (Sheet 7 of 9). (reference 3.2.6.4, 3.2.6.5)

SECTION II. MAINTENANCE ALLOCATION CHART (AVIATION) FOR T-XXX TURBINE ENGINE

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL			(5) TOOLS & EQUIP REF CODE	(6) REMARKS CODE
			AVUM (0)	AVIM (F)	DEPOT (D)		
04	POWER PLANT						
0401	TURBINE ENGINE	INSPECT	--			1	A
		TEST	--				B
		TEST		--(3)			
		TEST			--		
		SERVICE	0.2				J
		INSTALL	--				
		REPLACE	--				
		REPAIR	--				
		REPAIR		--(4)			L
		OVERHAUL			--		
040101	EXTERNAL LINES & HOSES	INSPECT	--			3	K
		TEST		--			
		INSTALL	--				
		REPLACE	--				
		REPAIR		--			
0402	COMPRESSOR SECTION (COLD SECTION) MODULE	INSPECT	0.1				K
		INSPECT		0.2			
		TEST		--			
		SERVICE	0.2				
		REPAIR	0.4				
		REPAIR		0.6			
		OVERHAUL			--		

FIGURE 19. Example of Aviation MAC appendix (Sheet 8 of 9). (reference 3.2.6.4, 3.2.6.5)

SECTION III. TOOLS AND TEST EQUIPMENT REQUIREMENTS FOR T-XXX TURBINE ENGINE

TOOL OR TEST EQUIPMENT REFERENCE CODE	MAINTENANCE LEVEL	NOMENCLATURE	NATIONAL STOCK NUMBER	TOOL NUMBER
1	AVUM/AVIM	Sling, Aircraft Maintenance	1730-00-903-5019 LL	LTCT 773
2	AVUM/AVIM	Wrench, Crowfoot	5120-00-034-6193	LTCT 4810
3	AVIM	Wrench, Socket	5120-00-875-2588	LTCT 393
4	AVIM	Wrench, Spanner	5120-00-886-1794	LTCT 9263

SECTION IV. REMARKS T-XXX TURBINE ENGINE

REMARKS CODE	REMARKS
A	Diagnostic Inspection using Borescope.
B	Functional Test at AVUM - Engine in Airframe.
C	Functional Test at AVIM - Engine in METS.
D	Repair at AVIM includes the engine assembly, individual Line Replacement Units (LRU) (Accessories) and Modules.
E	Replace Seal.
F	Repair limited to replacement of Rotor Assembly, Stator, Stage 1 Nozzle, Face Type Seal and Combustion Liner.
G	Repair limited to replacement of External Lines, Hoses, and Line Replacement Units (LRU) (Accessories).
H	Replacement of Carbon Steel.
I	Reset Button.
J	Water Wash.
K	Visible inspection without detailed disassembly.
L	All repair and replacement of parts performed by AVUM is limited to authorized items listed in TM (cite specific TM -20P or -23P).

FIGURE 19. Example of Aviation MAC appendix (Sheet 9 of 9). (reference 3.2.6.4, 3.2.6.5)

APPENDIX C

EXPENDABLE AND DURABLE ITEMS LIST

SECTION I. INTRODUCTION

C.1. SCOPE

This appendix lists expendable and durable items you will need to maintain the M1 tank hull. This listing is for informational purposes only and is not authority to requisition the listed items. these items are authorized to you by CTA 50-970, expendable items (except Medical, Class V, Repair Parts, and Heraldic Items).

C.2. EXPLANATION OF COLUMNS

C.2.1. Column (1) - Item number. This number is assigned to the entry in the listing for referencing when required.

C.2.2. Column (2) - Level. This column identifies the lowest level of maintenance that requires the listed item.

C - Operator/Crew
O - Unit Maintenance
F - Direct Support Maintenance
H - General Support Maintenance

C.2.3. Column (3) - National Stock Number. This is the national stock number assigned to the item; use it to request or requisition the item.

C.2.4. Column (4) - Description. Indicates the federal item name and, if required, a description to identify the item, The last line for each item indicates the Commercial and Government Entity Code (CAGEC) parentheses followed by the part number.

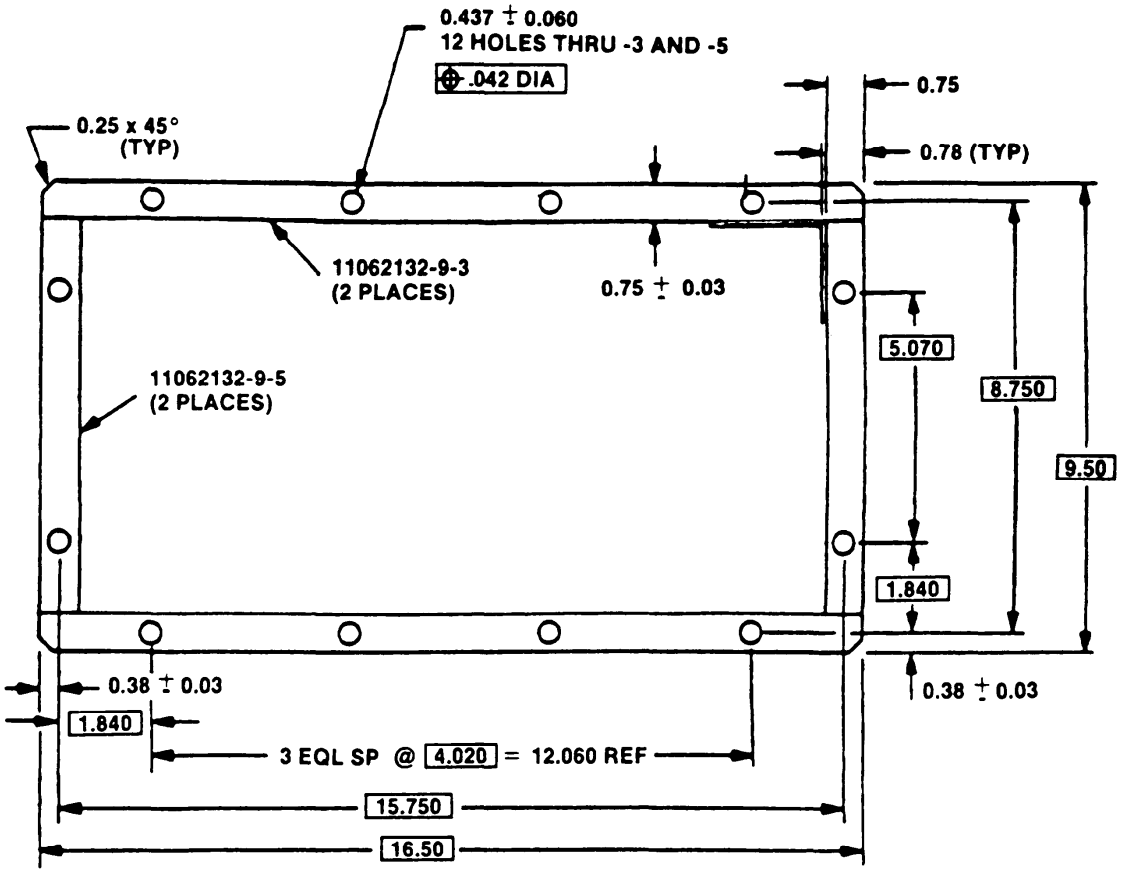
C.2.5. Column (50 - Unit of Measure (UM)/Unit of Issue (UI). This measure is expressed by a two-character alphabetical abbreviation (e.g., EA, IN, PR). If the unit of measure differs from the unit of issue as shown in the Army Master Data File (AMDF) requisition the lowest unit of issue that will satisfy your requirements.

FIGURE 20. Example of expendable and durable items list appendix introduction. (reference 3.2.8)

SECTION II. EXPENDABLE AND DURABLE ITEMS LIST

(1) Item Number	(2) Level	(3) National Stock Number	(4) Item Name, Description CAGEC, Part Number	(5) UM/UI
1	O	8040-01-154-0038	Adhesive Kit, no mix, adhesive and activator: (05972) 00206	KT
2	O	8040-00-880-7332	Adhesive, liquid rubber, Type II, 12-ounce can: (81348) MIL-A-46106	OZ
3	O	8040-00-273-8708	Adhesive, sealant: (81349) MIL-A-3316	GL
4	O	8040-00-118-2695	Adhesive, sealant, Type I, 3-ounce tube: (80244) MIL-A-46146	OZ
5	O	8040-00-877-9872	Adhesive, sealant, Type I, 3-ounce tube: (81348) MIL-A-46106	OZ
6	O	8040-01-009-1562	Adhesive, sealant, Type II, 3-ounce tube: (80244) MIL-A-46146	OZ
7	O	8040-00-900-6296	Adhesive, Type I: (80244) MMM-A-134	KT
8	O	8040-00-142-9193	Adhesive, Type I, Class 1, 1-ounce bottle: (81349) MIL-A-46050	OZ
9	O	8040-00-664-2912	Adhesive, Type I, Class 3, 1-pint can: (80244) MMM-A-132	PT
10	O	8040-00-664-4318	Adhesive, Type II, 1-pint can: (81348) MMM-A-1617	PT
11	O	8040-00-322-4034	Adhesive, Type II, Class 3: (80244) MMM-A-132	PT
12	O		Adhesive, Type A: (59997) Swift 17135	EA
13	O	8040-01-123-0082	Adhesive, Type B: (19200) 11669677	GL
14	O	8030-00-597-5367	Antiseize Compound, 1050 F temperature rating, 2.5-pound can: (81349) MIL-A-907	LB
15	O	8105-00-837-7754	Bag, plastic, package of 1000: (81348) PPP-B-26	EA
16	O	9530-00-236-8449	Bar, metal, aluminum alloy, 2-inch x 2-inch x 10-foot long: (81348) QQ-A-225/6	FT

FIGURE 21. Example of expendable and durable items list appendix table. (reference 3.2.8)



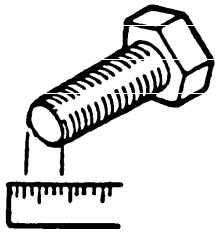
MATERIALS	
DESCRIPTION	NSN
CELLULAR RUBBER, CHEM BLWN MIL-R-6130, GRADE A, SOFT, TYPE 2	9320-00-034-7442

NOTES:
1. DIMENSIONS SHOWN ARE IN INCHES.
2. TOLERANCES ARE 0.03 INCH UNLESS OTHERWISE STATED.
3. ANGULAR TOLERANCES IS ± 2°

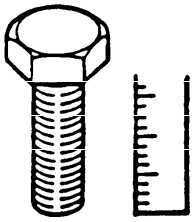
PROCEDURE:
1. USE COVER 11062132-1 AS TEMPLATE.
2. CUT RUBBER AS SHOWN USING TEMPLATE AS GUIDE
3. DRILL HOLES AS SHOWN USING TEMPLATE AS GUIDE.

FIGURE 22. Example of a manufactured items illustration. (reference 3.2.9.3)

G.1 HOW TO USE TORQUE TABLE:



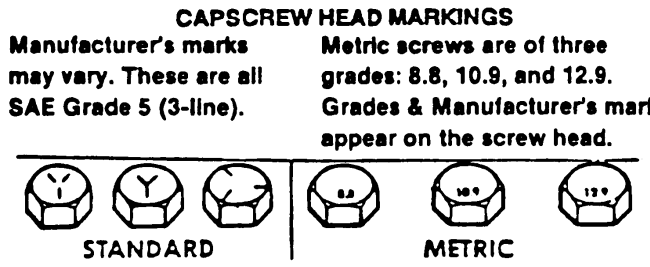
G.1.1 Measure the diameter of the screw you are installing.



G.1.2 Count the number of threads per inch or use a pitch gage.

G.1.3 Under the heading SIZE, look down the left hand column until you find the diameter of the screw you are installing (there will usually be two lines beginning with the same size).

G.1.4 In the second column under size, find the number of threads per inch that matches the number of threads you counted in step 2. (Not required for metric screws).



G.1.5 To find the grade screw you are installing, match the markings on the head to the correct picture of CAPSCREW HEAD MARKINGS on the torque table.

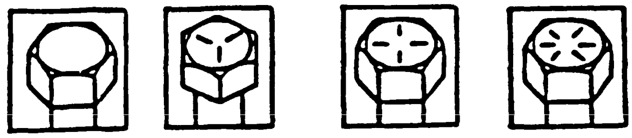
G.1.6 Look down the column under the picture you found in step 5 until you find the torque limit (IN/LB/FT or NM) for the diameter and threads per inch of the screw you are installing.

FIGURE 23. Example of the type of information presented in a torque limits appendix (Sheet 1 of 5). **(reference 3.2.10)**

TORQUE LIMITS FOR WET FASTENERS

CAPSCREW HEAD MARKINGS

Manufacturer's marks may vary
These are all SAE Grade 5
(3-line)

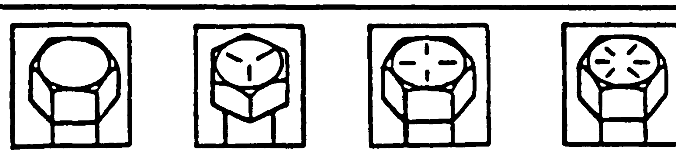


SIZE			TORQUE							
			SAE GRADE NO. 2		SAE GRADE NO. 5		SAE GRADE NO. 6 OR 7		SAE GRADE NO. 8	
Dia. Inches	Threads Per Inch	Millimeters	Pound Feet	Newton Meters	Pound Feet	Newton Meters	Pound Feet	Newton Meters	Pound Feet	Newton Meters
1/4	20	6.35	4	6	6	8	8	11	9	12
1/4	28	6.35	5	7	7	9	9	12	10	14
5/16	18	7.94	8	11	8	18	16	22	18	24
5/16	24	7.94	9	12	14	19	18	34	20	27

TORQUE LIMITS FOR DRY FASTENERS

CAPSCREW HEAD MARKINGS

Manufacturer's marks may vary
These are all SAE Grade 5
(3-line)



SIZE			TORQUE							
			SAE GRADE NO. 2		SAE GRADE NO. 5		SAE GRADE NO. 6 OR 7		SAE GRADE NO. 8	
Dia. Inches	Threads Per Inch	Millimeters	Pound Feet	Newton Meters	Pound Feet	Newton Meters	Pound Feet	Newton Meters	Pound Feet	Newton Meters
1/4	20	6.35	5	7	8	11	10	14	12	16
1/4	28	6.35	6	9	10	14	12	16	14	19
5/16	18	7.94	11	15	17	23	21	28	25	34
5/16	24	7.94	12	16	19	26	24	33	25	34

FIGURE 23. <u>Example of the type of information presented in a torque limits appendix (Sheet 2 of 5)</u>.
(reference 3.2.10)

G.1 TIGHTENING METAL FASTENERS

When torquing a fastener, select a wrench whose range fits the required torque value. A torque wrench is most accurate from 25% to 75% of its stated range. A wrench with a stated range of 0 to 100 will be most accurate from 25 to 75 Pound Feet. The accuracy of readings will decrease as you approach 0 Pound Feet or 100 Pound Feet. The following ranges are based on this principle:

TORQUE RANGES

STATED RANGE	MOST EFFECTIVE RANGE
0-200 lb-in	4-13 lb-ft
0-600 lb-ft	50-450 lb-ft
0-170 lb ft	44-131 lb-ft
15-75 lb-ft	30-60 lb-ft

FIGURE 23. Example of the type of information presented in a torque limits appendix (Sheet 3 of 5). **(reference 3.2.10)**

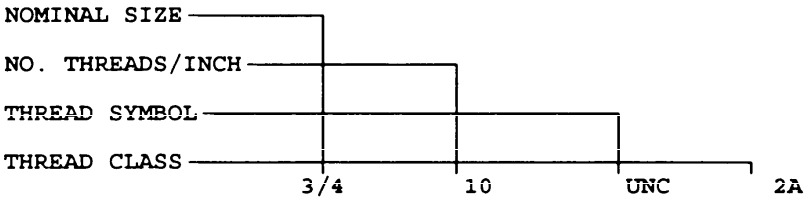
G.1 FASTENER SIZE AND THREAD PATTERN

Threaded fasteners are categorized according to diameter of the fastener shank. Thread style are divided into broad groups, the two most common being coarse (Unified Coarse-UNC) and fine (Unified Fine-UNF). These groups are defined by the number of threads per inch on the bolt shanks. In addition, threads are categorized by thread class, which measure the degree of fit between the threads of the bolt or screw (external threads) and the threads of the attaching nut or tapped hole (internal threads). The most common thread class for bolts and screws is Class 2.

THREAD CLASSES AND DESCRIPTION

EXTERNAL	INTERNAL	FIT
1A	1B	LOOSE FIT
2A	2B	MEDIUM FIT
3A	3B	CLOSE FIT

Thread patterns are designated as follows:



Note: Unless followed with -LH (e.g., 1 OUNC-2A-LH), threads are right hand.

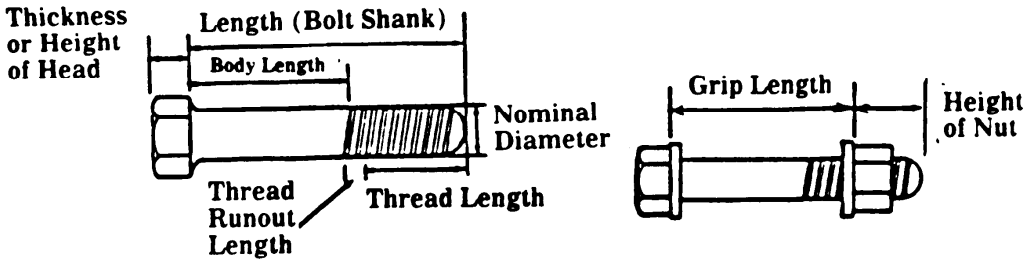


FIGURE 23. Example of the type of information presented in a torque limits appendix (Sheet 4 of 5). (reference 3.2.10)

G.1 FASTENER GRADE

In addition to being classified by thread type, threaded fasteners are also classified by material. The most familiar fastener classification system is the Society of Automotive Engineers (SAE) grading system.

SAE Screw and Bolt Markings

SCREWS	BOLTS
SAE GRADE 2 NO MARKING	SAE GRADE 6 4 RADIAL DASHES 90° APART
SAE GRADE 3 2 RADIAL DASHES 180° APART	SAE GRADE 7 5 RADIAL DASHES 72° APART
SAE GRADE 5 3 RADIAL DASHES 120° APART	SAE GRADE 8 6 RADIAL DASHES 60° APART
	GRADE 8.2 6 RADIAL DASHES 30° APART

NOTE

Torque values for Grade 8.2 bolts are the same as for Grade B.

Markings On Hex Locknuts

GRADE A - No Marks	GRADE A - No Marks
GRADE B - 3 Marks	GRADE B - Letter B
GRADE C - 6 Marks	GRADE C - Letter C

GRADE A - No Notches

GRADE B - One Notch

GRADE C - Two notches

FIGURE 23. Example of the type of information presented in a torque limits appendix (Sheet 5 of 5). (reference 3.2.10)

GLOSSARY

Section I. ABBREVIATION

ASCII	American Standard Code for Information Interchange
COMSEC	Communication Security
CPU	Central Processing Unit
SATCOM	Satellite Communication
UPS	Uninterruptible Power Supply

Section II. DEFINITION OF UNUSUAL TERMS

Modem - Acronym for modulator/demodulator. Converts one type of radio signal to another type of signal and vice versa.

FIGURE 24. Example of a glossary page. (reference 3.2.13)

Authorized Projectile-Fuze Combinations for 8-inch Howitzer, SP, M110A2 Cannon M201A1

Type and Model Number of Projectile	FUZE										
	PD		MT		MTSQ			PROX (VT)		ET	
	M739 Series	M557	M572	M565	M564	M577 Series	M582 Series	M728	M732	M762	M767
Agent GB, VX, M426	X	X	X					X 4	X 4		
HE, M106 (Shallow Cavity)	X	X	X		X 3		X		X		X
HE, M106 (Deep Cavity)	X	X	X		X 3		X	X 2	X		X
HE, M404 ICM				X		X				X	
HE, M509A1 ICM						X				X	
HERA, M650 (Rocket-On)	X	X	X								X
HERA M650' (Rocket-Off)	X	X	X		X 3		X		X		X

WARNING: 1-DO NOT FIRE THE M650 PROJECTILE IF THE OBTURATING BAND IS MISSING OR BROKEN. IF THE BAND IS DISPLACED AND CAN BE REPOSITIONED AND REMAIN IN THE GROOVE, THE PROJECTILE CAN BE FIRED.

NOTE: 2-AUTHORIZED, REQUIRES REMOVAL OF SUPPLEMENTARY CHARGE.

3-FUZE, MTSQ, M564 IS RESTRICTED FROM FIRING WITH ZONE 9 M188A1 PROPELLING CHARGE.

4-M728 AND M732 FIRED ONLY WITH "VX" PROJECTILE AND ONLY IN COMBAT EMERGENCY.

FIGURE 25. Example of ammunition information (Sheet 1 of 6). (reference 3.3.12)

Authorized Propelling Charges Combinations for 8-inch Howitzer, SP, M110A2 with Cannon M201A1

Type and Model Number of Projectile	M1 ZONE					M2 ZONE			M188 ZONE	M188A1 ZONE	
	1	2	3	4	5	5	6	7	8	8	9
Agent, GB, VX M426	●	●	●	●	●	●	●	●	●	●	●
HE, M106 (Shallow Cavity)	●	●	●	●	●	●	●	●	●	●	● 2
HE, M106 (Deep Cavity)	●	●	●	●	●	●	●	●	●	●	● 2
HE, M404 ICM	●	●	●	●	●	●	●	●			
HE, M509A1 ICM	●	●	●	●	●	●	●	●	●	●	●
HERA, M650 (Rocket-On)								●	●	●	●
HERA M650[1] (Rocket-Off)	●	●	●	●	●	●	●	●	●	●	● 2

WARNING: 1-DO NOT FIRE THE M650 PROJECTILE IF THE OBTURATING BAND IS MISSING OR BROKEN. IF THE BAND IS DISPLACED AND CAN BE REPOSITIONED AND REMAIN IN THE GROOVE, THE PROJECTILE CAN BE FIRED.

NOTE: 2-FUZE, MTSQ, M564 IS RESTRICTED FROM FIRING WITH ZONE 9 M188A1 PROPELLING CHARGE.

FIGURE 25. Example of ammunition information (Sheet 2 of 6). (reference 3.3.12)

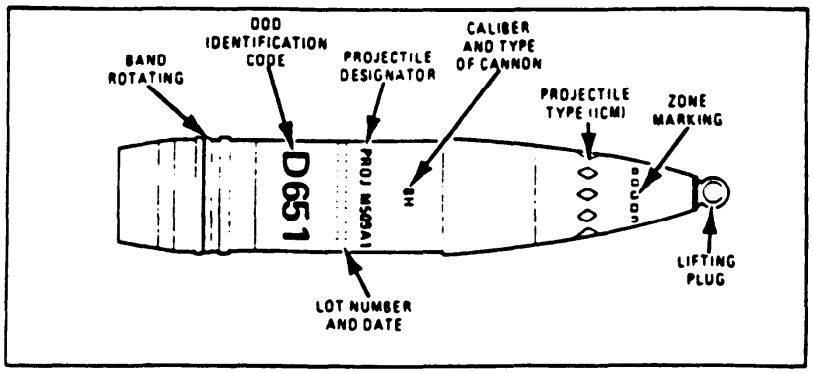
Model Number and Color Coding of Projectiles for 8-inch Howitzer, M110A2

Type and Model No. of Projectile	New Manufacture			Old Manufacture		
	Color of Projectile	No/Color of Bands	Marking	Color of Projectile	No/Color of Bands	Marking
**Agent (GB) w/burster, M426	Gray	3/Green 1/Yellow	Green	Gray	1/Green	Green
**Agent (VX) w/burster, M426	Gray	3/Green 1/Yellow	Green	Gray	2/Green	Green
HE, (ICM) M404	Olive Drab	*Diamonds	Yellow	Olive Drab	None	Yellow

*Row of yellow diamonds between nose and bourrelet of projectile.
**Renovated or newly manufactured projectile (post 1976) will be marked with one green band and if burster, one yellow band.

FIGURE 25. Example of ammunition information (Sheet 3 of 6). (reference 3.3.12)

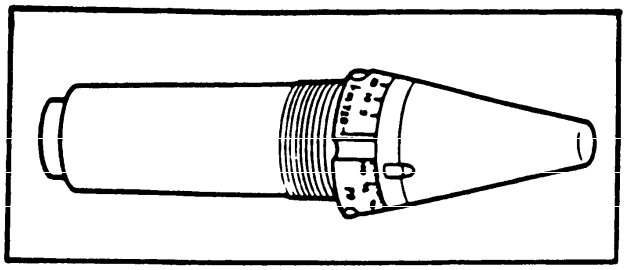
MARKING OF 8-INCH DPICM, M509A1 PROJECTILE



PROJECTILE, 8-INCH: DPCIM, M509A1. This projectile is used to deliver a concentration of grenades effective against personnel and materiel. The projectile is longer than the M404 projectile (requiring it to be loaded over the rear of the vehicle) and requires separate registration. The projectile is provided with a fusible or universal lifting plug (yellow). The cargo consists of M180 M42 dual purpose grenades which are expelled from the projectile in flight when a preset fuze ignites an expulsion charge. Upon ejection from the carrier, the grenades are dispersed by the projectile spin and are oriented and armed by a stabilizing ribbon device. On impact, the grenade fuze ignites the high explosive charge producing an armor penetrating shaped-charge jet and a large number of small fragments. A spotting charge is available as a separate item of issue and when substituted for the expulsion charge permits observation of the projectile functioning in relation to the target. The M509A1 projectile weighs approximately 208 lb (94 kg). Refer to page 5-8 for authorized fuze combinations.

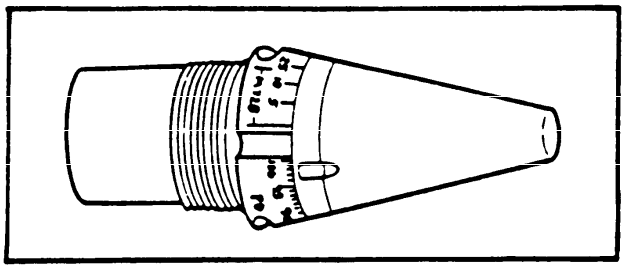
FIGURE 25. Example of ammunition information (Sheet 4 of 6). (reference 3.3.12)

FUZE, PROXIMITY: M728



FUZE, PROXIMITY VARIABLE TIME (VT) M728. The M728 proximity (VT) fuze is a long-intrusion fuze used with deep cavity projectiles and is essentially a self-powered radio and transmitting unit. The fuze can be set from 50 to 100 seconds. The time setting determines at what time along the trajectory the fuze will become activated. The M728 has an impact element that is armed 3 seconds after firing and will function either on proximity action or impact action, whichever comes first. The M728 should be set for impact action by setting the time ring to 90.0 seconds or PD mark. A protective coating is on the fuze ogive to reduce the possibility of static electricity causing early downrange function.

FUZE, PROXIMITY: M732

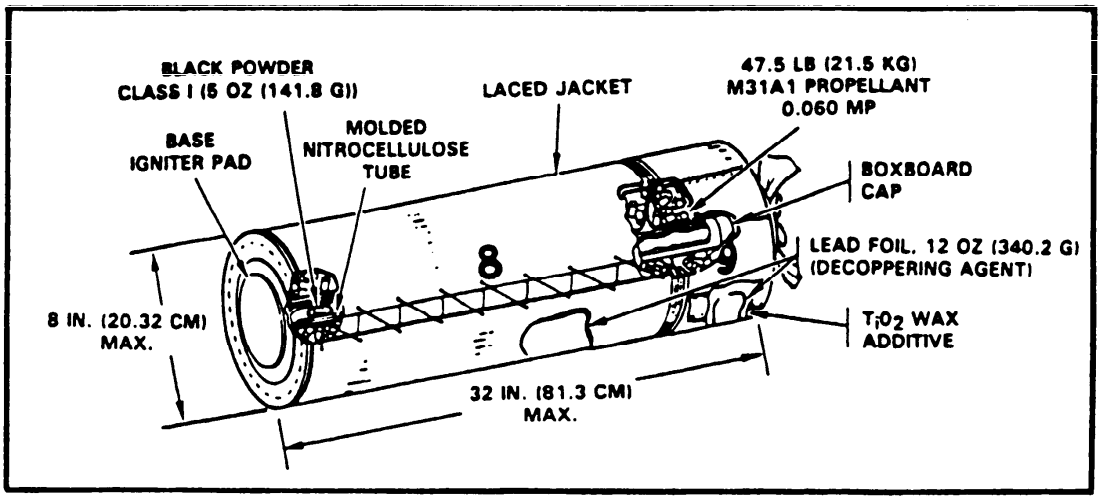


FUZE, PROXIMITY VARIABLE TIME (VT) M732. This short intrusion proximity fuze has a plastic nose cone fitted to a movable steel ring which rotates on s steel sleeve. The movable ring has an index mark for setting time. The fuze is shipped with the index mark aligned with the PD line on the sleeve. When set at any value between 5 and 150 seconds, the proximity arming occurs approximately 3 seconds prior to the set time. If the fuze fails to function in the proximity mode, it will function on ground impact.

NOTE: The PD setting of the M732 VT fuze when fired into soft impact areas will produce less lethality than the superquick setting of the M739 series PD fuze.

FIGURE 25. Example of ammunition information (Sheet 5 of 6). (reference 3.3.12)

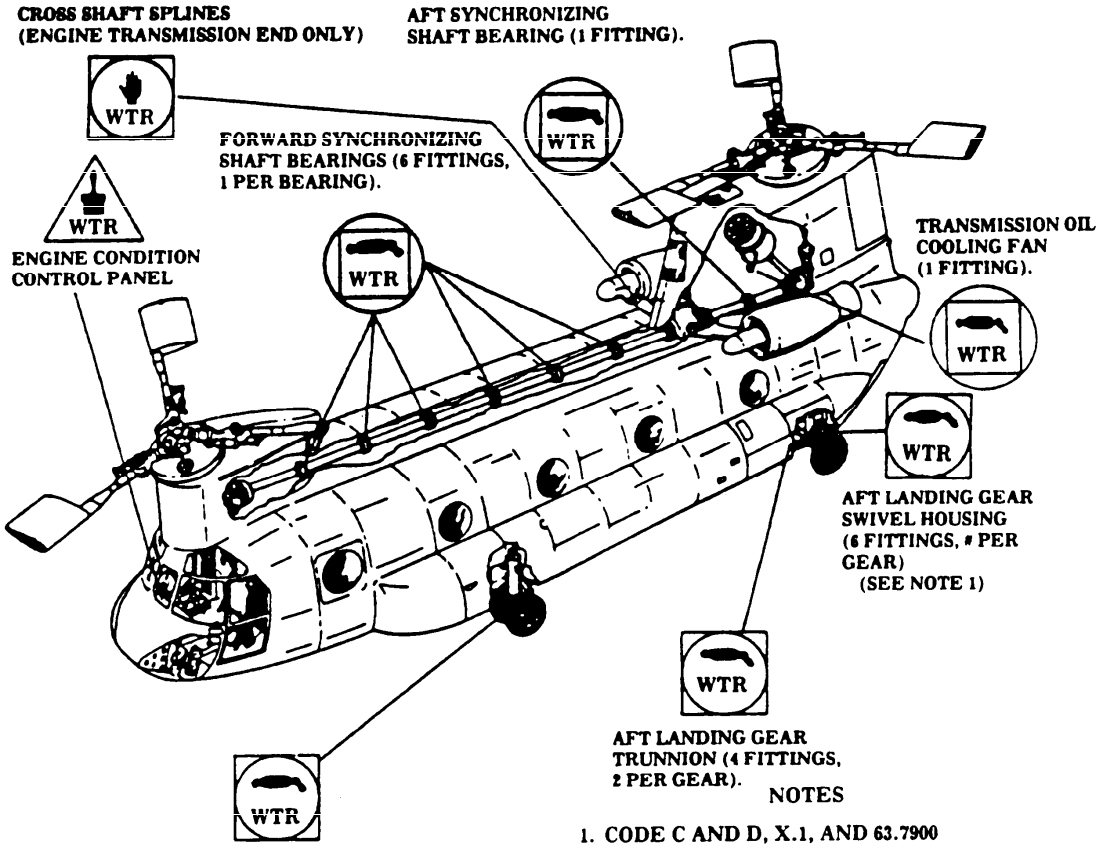
8-IN. PROPELLING CHARGE M188A1



NOTE: A yellow discoloration of the M188A2 bag may occur but does not affect performance and is safe to fire.

PROPELLING CHARGE M188A10. This is a two-increment "white bag" charge, 32 in. long by 8 in. (81.28 cm long by 20.32 cm) in diameter. A red cloth igniter charge is sewed to the rear (breech end) of increment 8. An igniter core extends through the center of the charge. An additive to reduce gun-tube wear is part of increment 9. A jacket made of acrylicviscose rayon is wrapped around incr ement 8 and laced up with cord. The jacket serves to maintain the proper propellant charge configuration.

FIGURE 25. Example of ammunition information (Sheet 6 of 6). (reference 3.3.12)



NOTES

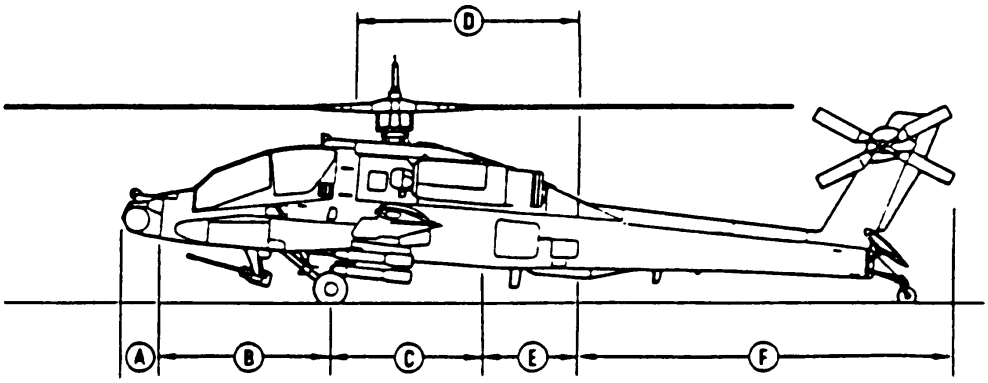
1. CODE C AND D, X.1, AND 63.7900 THRU 63-7921 WITHOUT HIGH FLOTATION LANDING GEAR HAVE 4 FITTINGS (2 PER GEAR)
2. LUBRICATION INTERVAL SHOWN IS FOR AVERAGE CONDITIONS. MORE FREQUENT LUBRICATION MAY BE NECESSARY UNDER EXTREMELY DUSTY CONDITIONS

TABLE OF LUBRICANTS		
IDENTIFICATION LETTER	SPECIFICATION	TYPE OF LUBRICANT
WTR	MIL-G-81322B (C221)	GREASE, AIRCRAFT GENERAL PURPOSE, WIDE TEMPERATURE RANGE

SYMBOLS	FREQUENCY	METHOD OF APPLICATION
	25 HOURS	GREASE GUN
	100 HOURS	BRUSH
	500 HOURS	HAND

FIGURE 26. Example of an aviation lubrication chart. (reference 3.6.2.2.2)

3.4.8.4 Reporting errors and recommending improvements in



Nomenclature	Part Number	NSN	Qty Rqd
SECTION A - NOSE ELECTRONICS			
TADS Turret	130760000	1270-01-188-4138	1
PNVS Turret and Fairing	130900000	1090-01-169-9415	1
Multiplex Terminal - Type 3	4032298-956	7025-01-210-7768	1
Signal Data Converter - Eng.	7-311C20019	6620-01-160-3518	1
Radar Jammer Transmit Antenna	SM-A-919685-2		1
Radar Warning Antenna	AS2891/APR-39V	1020-00-024-7608	2
Power Transformer	7-219510089	5950-01-186-8032	1
SECTION B - RIGHT FORWARD AVIONICS BAY			
Gun Control Box	7-317222500-603	1005-01-211-4165	1
Multiplex Terminal - Type 1	4032297-955	7025-01-211-0130	1
Turret Control Box	7-317222004	5930-01-239-2391	1
PNVS Electronic Box	13080274	4931-01-169-9369	1
Display Electronics - IHADSS	7-319430041	1270-01-183-0518	1
Sight Electronic Unit - IHADSS	7-319430031	1270-01-183-0519	1
Fire Control Computer	7-319200001	1430-01-211-0023	1
Remote Electronic Unit	7-317141001	1270-01-187-5778	1
Portable Fire Bottle	7-211180002-501	4210-00-555-8837	1
Electromagnet Relay	7-211B12033	5945-01-160-5639	1

FIGURE 27. Example of inventoriable items presentation. (reference 3.6.7)

ng 3.4.3 Warnings, cautions, icons, and notes. Warnings, cautio

APPENDIX A
CONTENT/FORMAT SELECTION SUMMARY
UNIT OR AVIATION UNIT, DIRECT SUPPORT,
AVIATION INTERMEDIATE, AND GENERAL SUPPORT
MAINTENANCE TMS

10. SCOPE

10.1 **Scope.** This appendix to be used by the contracting activity to specify which optional requirements of this specification are to be contractually imposed in the acquisition of Unit, Aviation Unit, Direct Support, Aviation Intermediate, and General Support Maintenance Manuals. This Appendix is a mandatory part of this specification. The information contained herein is intended for compliance.

10.2 **Application.** This appendix is intended to be copied/ reproduced, completed, and become a part of the Technical Manual Contract Document Summary List for solicitation/contract application. A separate content/format selection summary sheet(s) is required for each acquisition of a specific TM.

10.3 **Explanation of columns - Content/Format Selection Summary.**

a. Column (1), (Item No.) - self-explanatory.

b. Column (2), (Requirement) - identifies the requirement.

c. Column (3), (Applicable Paragraph Number) - identifies the paragraph where the requirement shown in column (2) is described.

d. Column (4), subcolumn (a), (Requirement Selected - (yes)) - is marked with an "X" if the requirement shown in column (2) is required.

e. Column (4), subcolumn (b), (Requirement Selected - (no)) - is marked with an "X" if the requirement shown in column (2) is not required.

f. Column (4), subcolumn (c), (Explanation/Remarks) - is used when a yes or no alone is not adequate to completely identify the requirement. If necessary, additional explanation or information may be provided on a separate sheet(s) of paper and attached to this summary list when completed.

10.4 **Tailoring requirements.** Each requirement listed on the content/selection summary must be marked yes or no, and an explanation or remarks should be added, as necessary, to assure that selected requirements are adequately identified. Additional information may be placed on plain paper and attached to the summary. Reference to the contract statement of work or the contract documents/attachments containing applicable information may be made in the explanation/remarks column.

20. APPLICABLE DOCUMENTS. This section is not applicable to this appendix.

APPENDIX A
CONTENT/FORMAT SELECTION SUMMARY

Equipment
name/nomenclature_____

(1) Item No.	(2) Requirement (Option)	(3) Applicable Paragraph (No.)	(4)		
			(a)	(b)	(c)
			Options Selected		Explanation/Remarks
			(Yes)	(No)	
1	Reading Grade Level	3.1.3			
2	Manual Page Size	3.1.4.1			
3	Foldout pages	3.1.4.2			
4	How-to-use this manual section	3.2.1f 3.2.1.5			
5	Front cover illustration	3.2.1.1b			
6	List of Effective Pages	3.2.1.3			
7	Content of Section I, Chapter 1	3.2.2.1			
8	Destruction TM reference	3.2.2.1.3			
9	Quality assurance paragraph	3.2.2.1.5			
10	Placement of major components information	3.2.2.2.2b			
11	Common tools & Equipment information	3.2.3.1.1c			
12	Checks/for missile systems equipment	3.2.3.3a 3.2.3.3.1			
13	Equipment/ user fitting instructions	3.2.3.3.2			
14	Maintenance procedure format	3.2.3.6a			

APPENDIX A
CONTENT/FORMAT SELECTION SUMMARY

(1) Item No.	(2) Requirement (Option)	(3) Applicable Paragraph (No.)	(4)		
			(a)	(b)	(c)
			Options Selected		Explanation/Remarks
			(Yes)	(No)	
15	Lubrication abbreviations	3.2.3.6.2.13			
16	Admin. storage info	3.2.3.7e			
17	MAC format	3.2.6.5			
18	RPSTL appendix	3.2.7			
19	Mandatory replacement parts appendix	3.2.12			
20	Ammunition appendix	3.3.12			
21	Separate Trouble-shooting manual	3.6.3.1			
22	Failure symptom chapter format	3.7.3			
23	Extra Appendices in a trouble-shooting manual	3.7.4.1 3.7.6			
24	Integrated system trouble-shooting chapter	3.7.5			

NOTE: The above selected requirements tailoring options identified by an "X" in the Options Selected column 4, subcolumn 4(a) or 4(b), or the explanation provided in the Remarks subcolumn 4(c) are a mandatory part of this contract.

Completed by:_____
(authorized signature)

Publications Activity:_____ Date:_____

APPENDIX B

SINGLE HAZARD ICONS PRESENTATION

10. SCOPE

10.1 **Scope.** This appendix lists single hazard icons which may be used in technical manuals warnings either singly or in combination. This list is intended to include all approved single hazard icons; additional icons and definitions will be added, as applicable, when this document is amended or revised. This appendix is a mandatory part of this specification. The information contained herein is intended for compliance.

20. APPLICABLE DOCUMENTS.

This section is not applicable to this appendix.

30. DEFINITIONS

30.1 **Icon.** Pictorial representation; visual image to give immediate recognition of a hazard.

40. GENERAL REQUIREMENTS.

40.1 **Usage of icons.** Icons shall be used with signal word(s). The signal word(s) shall be placed to the right of or below the icon(s) as shown in figure A-1. The icon(s) shall precede applicable text in the technical manual.

40.2 **Development of icons.**

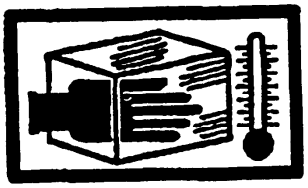
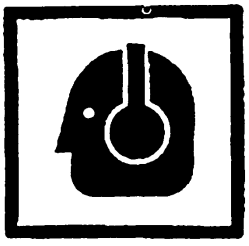
a. Icons shall be enclosed in a square or rectangular box. the signal word(s) for single icons shall appear outside the box at the upper right-hand side. Type size for signal word(s) shall be no smaller than 10 point; 12 point bold face type is recommended. (See figure A-1 for presentation format for icon usage.)

b. As specified by the contracting activity, icons shall or shall not be prepared for electronic presentation (digitizing) per Government-provided requirements.

50. DETAILED REQUIREMENTS

50.1 **Icons and definitions.** The following icons shall be used in warnings for all technical manuals governed by this specification when applicable. Unless requirement is specifically excluded by the contracting activity, the signal words and definitions shall be used as listed herein.

APPENDIX B

ICON	SIGNAL WORD - DEFINITION
	NOTE: Signal word appears in all capital letters below, preceding the definition.
1 	BIOLOGICAL - abstract symbol bug shows that a material may contain bacteria or viruses that present a danger to life or health.
2 	CHEMICAL - drops of liquid on hand shows that the material will cause burns or irritation to human skin or tissue.
3 	CRYOGENIC - hand in block of ice shows that the material is extremely cold and can injure human skin or tissue.
4 	EAR PROTECTION - headphones over ears shows that noise level will harm ears.

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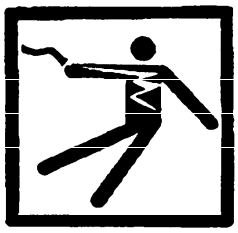
5 

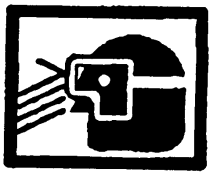
ELECTRICAL - electrical wire to arm with electricity symbol running through human body shows that shock hazard is present.

6 

ELECTRICAL - electrical wire to hand with electricity symbol running through hand shows that shock hazard is present.

7 

EXPLOSION - rapidly expanding symbol shows that the material may explode if subjected to high temperatures, sources of ignition or high pressure.

8 

EYE PROTECTION - person with goggles shows that the material will injure the eyes.

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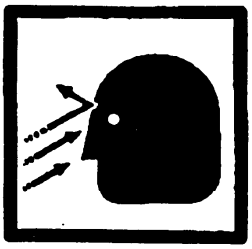
9 

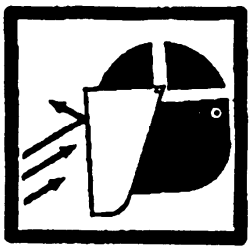
FALLING PARTS - arrow bouncing off human shoulder and head shows that falling parts present a danger to life or limb.

10 

FIRE - flame shows that a material may ignite and cause burns.

11 

FLYING PARTICLES - arrows bouncing off face shows that particles flying through the air will harm face.

12 

FLYING PARTICLES - arrows bouncing off face with face shield shows that particles flying through the air will harm face.

or by a next [illegible] reduced or no protection due to absorbed

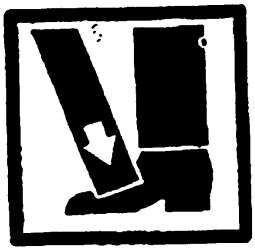
APPENDIX B

13 

HEAVY OBJECT - human figure stooping over heavy object shows physical injury potential from improper lifting technique.

14 

HEAVY PARTS - hand with heavy object on top shows that heavy parts can crush and harm.

15 

HEAVY PARTS - foot with heavy object on top shows that heavy parts can crush and harm.

16 

HEAVY PARTS - heavy object on human figure shows that heavy parts present a danger to life or limb.

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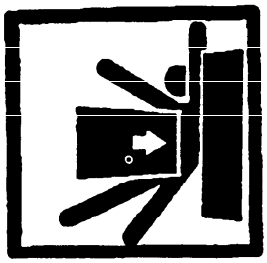
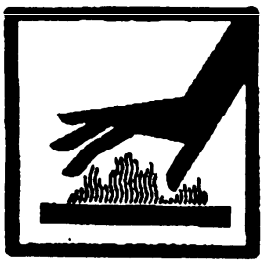
17 

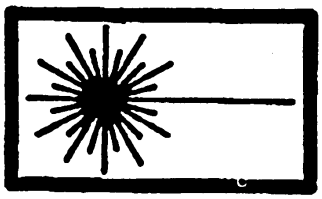
HEAVY PARTS - heavy object pinning human figure against wall shows that heavy, moving parts present a danger to life or limb.

18 

HELMET PROTECTION - arrow bouncing off head with helmet shows that falling parts present a danger.

19 

HOT AREA - hand over object radiating heat shows that part is hot and can burn.

20 

LASER LIGHT - laser light hazard symbol indicates extreme danger for eyes from laser beams and reflections.

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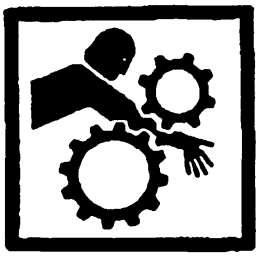
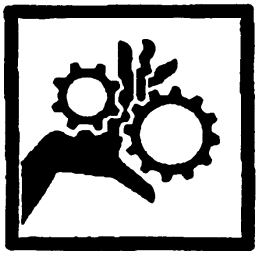
21 

MOVING PARTS - human figure with an arm caught between gears shows that the moving parts of the equipment present a danger to life or limb.

22 

MOVING PARTS - hand with fingers caught between gears shows that the moving parts of the equipment present a danger to life or limb.

23 

MOVING PARTS - hand with fingers caught between rollers shows that the moving parts of the equipment present a danger to life or limb.

24 

POISON - skull and crossbones shows that a material is poisonous or is a danger to life.

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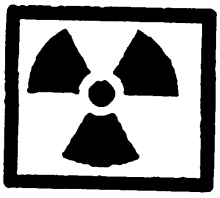
25 

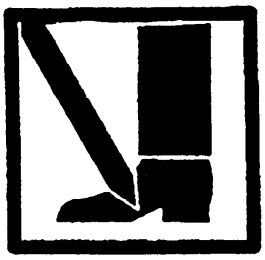
RADIATION - three circular wedges shows that the material emits radioactive energy and can injure human tissue.

26 

SHARP OBJECT - pointed object in hand shows that a sharp object presents a danger to limb.

27 

SHARP OBJECT - pointed object in hand shows that a sharp object presents a danger to limb.

28 

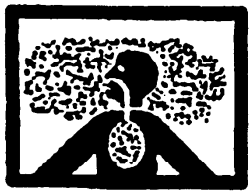
SHARP OBJECT - pointed object in foot shows that a sharp object presents a danger to limb.

data needed by the manual user for maint... other critica

APPENDIX B

29 

SLICK FLOOR - wavy line on floor with legs prone shows that slick floor presents a danger for falling.

30 

VAPOR - human figure in a cloud shows that material vapors present a danger to life or health.

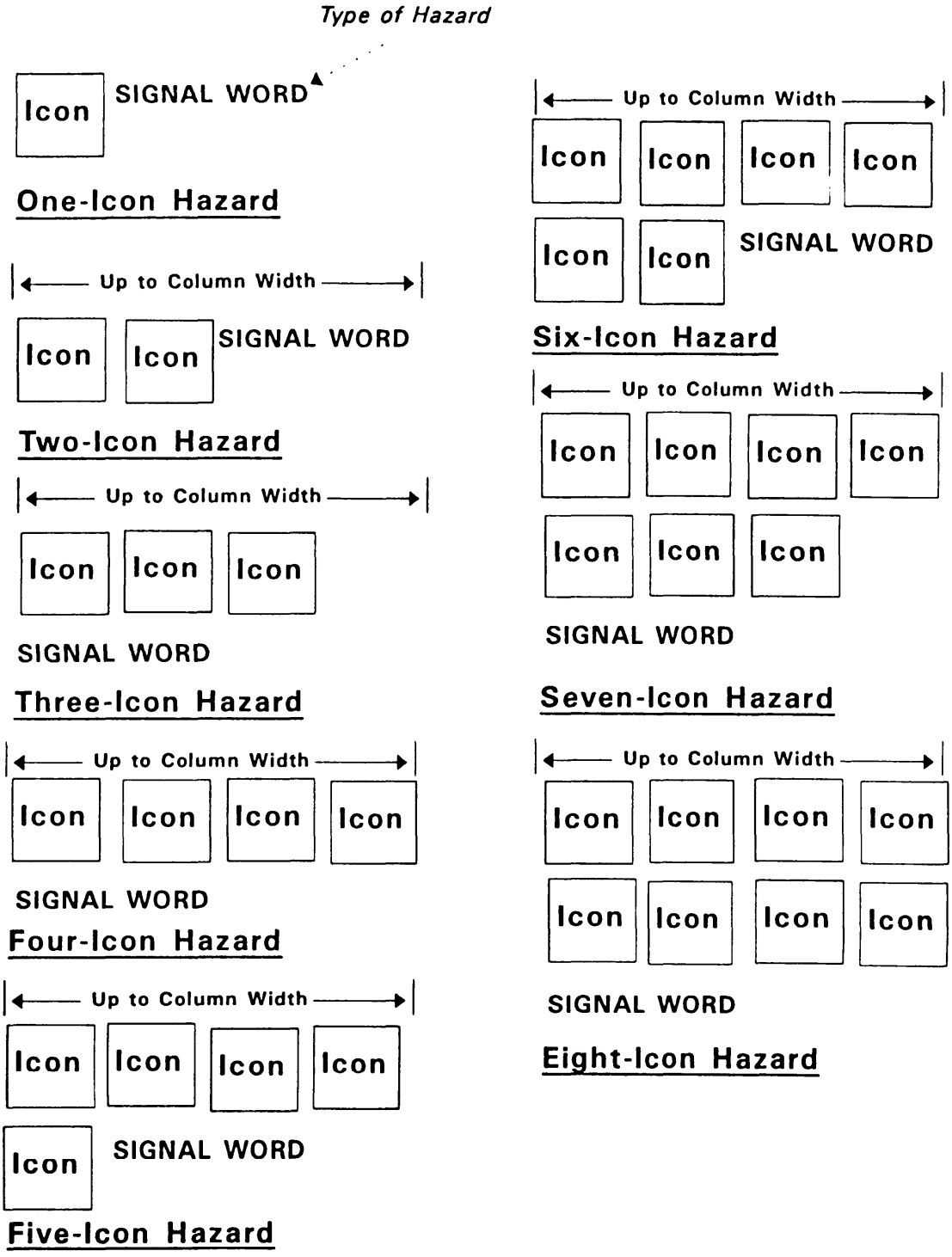


FIGURE B-1. Multiple icon usage and presentation format (reference Appendix B, 40.1, 40.2a).

INDEX

temperature | controller

CUSTODIAN:

ARMY - TM

REVIEW ACTIVITIES:

ARMY - AR, AT, AV, CU, ME,
SC, CR, AL, MI, EA
PT

PREPARING ACTIVITY:

ARMY - TM

PROJECT TMSS-A264

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1,2,3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4,5,6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of this form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractural requirements.

I RECOMMEND A CHANGE	1.DOCUMENT NUMBER MIL-M-63038D(TM)	2.DOCUMENT DATE *(YYMMDD)* 931210

3.DOCUMENT TITLE
Manuals, Technical: Unit/AVUM, DS, AVIM, and GS Maintenance, Preparation of

4.NATURE OF CHANGE *(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)*

5.REASON FOR RECOMMENDATION

6.SUBMITTER

a.NAME *(Last, First, Middle Initial)*	b.ORGANIZATION	
c.ADDRESS *(Include Zip Code)*	d.TELEPHONE (Include Area Code) (1)Commercial (2)AUTOVON(If applicable)	7.DATE SUBMITTED *(YYMMDD)*

8.PREPARING ACTIVITY

a.NAME USAMC Logisitics Support Activity	b.TELEPHONE *(Include Area Code)* (1)Commercial (205) 955-9860 (2)AUTOVON 645-9860
c.ADDRESS *(Include Zip Code)* ATTN: AMXLS-AP Redstone Arsenal, AL 35898-7466	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340