CALS TEST NETWORK

CTN Report 93-006

Report on Document Instance Development

30 December 1992

Prepared for the CALS Test Network
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Joint
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CALS Technology Center (CTC)

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Prepared by:

Department of the Army
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CONTRACT NO.: DAAB07-89-D-A047
TASK NO.: 92-016

30 DECEMBER 1992

FINAL

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EXECUTIVE SUMMARY

This report provides a description and the results of the evaluation of *MIL-M-28001B, Markup Requirements and Generic Style Specification for Electronic Printed Output and Exchange of Text*, Draft, dated 13 December 1991 in a Joint Computer-aided Acquisition and Logistics Support (JCALS) environment by testing the efficacy of using its document type definition (DTD) and Formatting Output Specification Instances (FOSI) development guidance, tag set, and output specification to produce a document instance and FOSI for existing military technical manuals.

The report also provides a comparison between the use of the MIL-M-28001B conforming DTD and the modular DTDs concept developed by Accurate Information Systems, Inc., including the advantages/disadvantages of using each type of DTD and the differences in the development efforts.

Samples for an Army Depot Maintenance Work Requirement (DMWR) and Air Force Depot Maintenance Manual (DMM) are provided for those document instances that were successfully developed during these tests using either the conforming MIL-M-28001B DTD or the modular DTDs.

Sample final output for the Army Depot Maintenance Work Requirement (DMWR) and Air Force Depot Maintenance Manual (DMM) using the document instances that were successfully developed during these tests and produced on a Ventura Publishing System, is provided in the companion *Report on FOSI Development.*

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SECTION 1
INTRODUCTION

1.1 Background

MIL-M-28001 focused primarily on the presentation of a document type definition (DTD) that was to be applicable Department of Defense (DoD)-wide to document processing applications. Numerous errors were present in the original, and it did not contain an output specification (OS). As well, users experienced difficulty using the standard to write DTDs or produce output. Many of the errors were corrected in the second version (MIL-M-28001A), and an output specification is now part of the standard. The current draft version of MIL-M-28001B, dated 13 December 1991, reflects the further transformation of the standard to a Standard Generalized Markup Language (SGML) toolkit that can better aid developers of DTDs and Formatting Output Specification Instances (FOSIs) in their work. Its ability to guide the development of DTDs and FOSIs that can be successfully used in the Joint Computer-aided Acquisition and Logistics Support (JCALS) system has to be a significant factor in judging the suitability of the standard; the current design is meant to satisfy MIL-M-28001A requirements. The issue of the form of the DTD -- whether modular or traditional -- also needs investigation.

1.2 Purpose

The purpose of performing this task is to:

- evaluate MIL-M-28001B in a JCALS environment by testing the efficacy of using its DTD and FOSI development guidance, tag set, and output specification to produce a document instance and FOSI for an existing manual;

- evaluate the modular DTD concept in the JCALS environment by testing the efficacy of using the modular DTD development guidance, tag set, and output specification to produce a document instance and FOSI for the same technical manuals used in the above MIL-M-28001B evaluation;

- provide a comparison between the use of the MIL-M-28001B DTD requirements versus the use of the modular DTD requirements to develop document instances;

- determine, during testing, if traditional and modular approaches to DTD development have any influence on the process of developing DTDs and FOSI in a MIL-M-28001B world; and

- report lessons learned not only for the use of the JCALS project, but also for those organizations responsible for the development of the MIL-M-28001B standard.

1.3 Scope

This report on the testing of MIL-M-28001B includes the following descriptions, evaluation and comparison.

- A description of the process used to develop document instances for existing Army and Air Force technical manuals in accordance with the DTD/FOSI requirements of MIL-M-28001B is included in this report. The manuals selected for the tests were *Army Depot Maintenance Work Requirement, DMWR 9-1440-453-1, Tow Missile Launcher, P/N 12295910* and *Air Force Depot Maintenance Manual (DMM) PTO 6J15-8-136-3, Primary Vent Valve, P/N 5710110-101.*

- A description of the process used to develop document instances for existing Army and Air Force technical manuals in accordance with the modular DTD/FOSI concept is included in this report. The manuals used for this process were the same manuals used in the above process.

- This report contains an evaluation of both DTD development processes, including the results of the development effort. Sample document instances and final output for the Army DMWR and the Air Force DMM are provided for those document instances that were successfully developed using either the conforming MIL-M-28001B DTD or the modular DTDs.

- A comparison between the use of the MIL-M-28001B conforming DTD and the modular DTDs, including the advantages/disadvantages of using each type of DTD and the differences in the development efforts is also included.

CHAPTER 2
DEVELOPMENT OF DOCUMENT INSTANCES IN ACCORDANCE WITH THE DTD REQUIREMENTS OF MIL-M-28001B

2.1 Development of Document Instances

Appropriate Army and Air Force Technical Manuals (TMs) were selected to evaluate and test the flexibility and efficacy of using the DTD and FOSI development guidance, tag set, and output specification of MIL-M-28001B in a JCALS environment to produce document instances and associated FOSIs.

A description of the test and process used to develop the document instances for these existing Army and Air Force TMs in accordance with the DTD/FOSI requirements of MIL-M-28001B is provided in the following paragraphs.

2.2 Document Instance for a U.S. Army Depot Maintenance Work Requirement (DMWR)

2.2.1 Description of Test

- The manual selected for the development of a document instance in accordance with the requirements of MIL-M-28001B was DMWR 9-1440-453-1 for the Tow Missile Launcher, P/N 12295910.

- The document instance for the DMWR was developed using the XGML Validator™ parser (Version 1.1E3.22) developed by Exoterica Corporation, on a 386 personal computer.

- The document instance for the DMWR was developed by personnel with a high level of experience in the use of SGML parsers, familiar with the MIL-M-28001B DTD (hereafter referred to as 28001B DTD), and who had developed DTDs for other types of technical documentation, including DTDs for Army, Air Force and Navy TMs. Personnel coordinated the document instance development effort with technical writers who had a minimum of five years experience in the preparation of military technical manuals.

2.2.2 Document Instance Development Process

The following process was followed to test whether the conforming 28001 DTD in MIL-M-28001B could be used to develop the document instance for DMWR 9-1440-453-1, Tow Missile Launcher, P/N 12295910. This DMWR was originally prepared in accordance with MIL-M-63041C, *Manuals, Technical: Preparation of Depot Maintenance Work Requirements* and MIL-M-38784B, *Manuals, Technical: General Style and Format Requirements.*

- All text, including the title page, front matter, and appendices of the Tow Missile Launcher DMWR, were scanned using a Kurzweil scanner which performs optical characteristic recognition (OCR) to convert text to ASCII characters.

- Using the conforming 28001B DTD for MIL-M-38784B and the MIL- M-63041C subset DTD (Appendix D of MIL-M-28001B) with the XGML Validator™ parser (Version 1.1E3.22), an attempt was made to tag the ASCII text file (develop a document instance) for the Tow Missile Launcher DMWR.

- The conforming 28001B DTD is considered to be the"strict" interpretation of MIL-M-38784B and enforces the specification. The MIL-M-63041 subset DTD (Appendix D of MIL-M-28001B) is used to interpret special requirements of MIL-M-63041 not covered by the conforming DTD and enforces those special requirements.

- If it is found that the conforming 28001B DTD and the subset DTD cannot be used, as is often the case with legacy data, the next step is to try to use the Template DTD (Appendix A of MIL-M-28001B) provided. The Template DTD is a "looser" interpretation of MIL-M-38784B. If the template DTD cannot be used "as is," it may be necessary to modify the template, in which case an alternate DTD is written and interchanged with the tagged instance. One may also choose to modify the template DTD to develop an alternate DTD that is not as "loose" as the template DTD.

- If either method of developing the document instance is successful, a FOSI would be developed for the Tow Missile Launcher DMWR to allow an electronic publishing system to produce a final formatted DMWR.

2.2.3 Document Instance Development Results

2.2.3.1 Using the Conforming 28001B DTD and the Subset DTD for MIL-M-63041C

After analyzing the DMWR which was the TM selected for this task, it was determined that a document instance could not be developed and tagged according to the conforming 28001B DTD and the document declaration subset for MIL-M-63041C. The following inconsistencies in the 28001 DTD prevented the development of a complete parsable document instance.

- An error in the 28001 DTD had to be corrected in %bodyatt:

```
stub   STUB        #IMPLIED    to
stub   (stub)  #IMPLIED
```

(Note: This error has already been reported to the Electronic Publishing Consolidation [EPC] committee for correction).

- The 28001B DTD front matter requires a contract number. The DMWR did not have one specified.

- No manufacturer was specified in the DMWR. The 28001B DTD requires a manufacturer's name.

- There was no element in the 28001B DTD to tag the location (Redstone Arsenal, Alabama 35898-5000). This is currently part of the logo (a graphic in this case) and there is no way to enter a graphic on the title page.

- The date of the publication (pubdate) was not in the hierarchical order as specified in the 28001B DTD for a TM title page.

- The 63041 DTD does not accommodate a Warning Summary page as part of the front matter.

- Appendix F of the DMWR included schematic diagrams. These can be tagged as a graphic, but would be better tagged as content (such as SCHDIAG). The 28001B DTD contains no such tag.

- The Preshop Analysis checklists (DMWR, page 3-2 through 3-5) should be content tagged. The 28001B DTD only supports the creation of tables with sequential lists. Tagging the Preshop Analysis Checklist as a table will not provide content identification or add any intelligence to the data. This type of maintenance data should be tagged for "what it is", not for "what it looks like." Hyperlinks and reference capabilities need to be added to the 28001B DTD.

- No referencing capability from a table entry/row to text is provided in the 28001B DTD.

- A signature block tag <sigblk> is required for the rear matter in the 28001B DTD. It is needed since the DMWR rear matter requires various signatures.

2.2.3.2 Using the MIL-M-28001B Template DTD

The results of the test using the conforming 28001B DTD and the document declaration subset for MIL-M-63041 indicated that a document instance could not be generated and parsed. Therefore a second test was conducted to see if the Template DTD could be used to develop a document instance for the Tow Missile Launcher DMWR.

The first step in this test was to compared the DMWR data and structure to the Template DTD requirements. It was determined that the Template DTD could not work "as is" and modifications would have to be made, meaning an alternate or "new" DTD would be required.

In developing an alternate DTD, changes would have to be made to the ELEMENT, ENTITY, and ATTLIST declarations. These changes are summarized below.

- Since the DMWR did not have a List of Effective Pages (lep), Configuration Page (cfgpge), Foreword (foreword) -- Station Locator Diagram (staloc), or Safety Summary (safesum) -- nor were these called for in the MIL-M-63041C (TM) specification, these tags should be removed from the entity.

  The DMWR did have a warning summary page, as per MIL-M-63041C (TM) paragraph 3.11.2. Therefore, warning summary (warnsum) needs to be added to the entity.

  The ENTITY declarations should be changed as follows:

  <!ENTITY % frnt "(idinfo, warnsum, contents, illuslist, tablelist)" >

- An optional graphic element should be added after the title block (titleblk). According to 3.11.1 of MIL-M-63041C (TM), the procuring activity can opt to have a line drawing of the equipment. Neither the conforming, nor the template DTD, provide for such an option. In addition, the contract number was made optional since this particular sample did not have a contract number.

  The ENTITY declarations should be changed as follows:

  <!ENTITY % idinf "(pubno+, prepubno*, nsn?, chgnum?, revnum?, titleblk, graphic?, (mfr, contractno?)+, docmfr?, seal?, notice+, downgrd?, pubdate, chgdate?)" >

  (NOTE: Although this sample had the publication date out of order according to the DTD, it was not per specification. Therefore, it is recommended that the publication date stay in the same location).

- In many instances in the DMWR, paragraphs started directly with a list, so the entity %list needs to be added to the choice between a special paragraph (specpara) and a paragraph (para). An example of this can be found on page 1-1 of the DMWR where a sequential list (seqlist) follows the title of the primary paragraph. In addition, there were times when the DMWR went directly into steps without being preceded by a paragraph (para), special paragraph (specpara), or list (%list;), therefore this group should be made optional and repeatable (*) instead of required and repeatable (+).

  The ENTITY declarations should be changed as follows:

  <!ENTITY % nparcon "(%titles; , (specpara | para | %list;)*, (step1, step1+)?) >

- Changing the parameterized entities does not alleviate all of the difficulties in parsing this particular instance to MIL-M-28001B (using either the Conforming or the Template DTD). In addition, the following element declarations need to be changed.

  a. The location of the document type (doctype) should be changed to allow for DMWR conformance.

     <!ELEMENT titleblk - - (volnum?, docpartn?, revnum?, maintlvl*, doctype, prtitle, stitle?)>

  b. Sections need to be optional and repeatable (*) instead of required and repeatable (+) because Appendix C of the DMWR has only one section in it.

     <!ELEMENT appendix - - (%titles;, ((section, section*) | para0+))>

  c. In order to have a warning, caution, or note precede the text of the item, it is necessary to use the special paragraph (specpara) tag. An example of where this occurs in the DMWR is on page 3-6, paragraph 3-5 (d). In addition, the DMWR had items which contained steps, so it would be necessary to add that possibility.

     <!ELEMENT item - o ((para | specpara)+, (step1, step1+)?) +(table)>

  d. The Preshop Analysis Checklist in the sample has steps within the entries. It would therefore be necessary to add that to the list of choices within the content model of entry. An example of this can be seen on pg 3-7 number 7 which then goes into steps.

     <!ELEMENT entry - o (para | step1 | warning | caution | note | legend | % paracon;)+>

- The following attribute list declarations need to be changed:

  a. The attribute list for the element callout needs to have an id attribute attached to it as there are callouts cross referenced in the sample. For example page 4-3 (a) of the DMWR has (4, fig 4-1).

     <!ATTLIST callout id #IMPLIED

  b. The attribute list for the element row needs to have an id attribute attached to it as there are rows of information in tables which were cross referenced in the DMWR. An example of this can be found on page 4-15, step 4 has (item 2, appendix C) which is a row of a table.

<!ATTLIST row id #IMPLIED

- If the above changes were the only changes that were necessary, it would still be possible to provide an alternate DTD which follows the Template DTD of MIL-M-28001B. However, these changes did not take care of one additional requirement contained within the DMWR. The DMWR has an authentication page, which is called for in Specification MIL-M-63041C (TM). This is a tag which would need to be added to the entity %rr. The authentication page needs to be broken down into its sub-elements as well. It is possible that some of these sub-elements would not be in the baseline tagset either.

2.3 Document Instance for a U.S. Air Force Depot Maintenance Manual (DMM)

2.3.1 Description of Test

- The manual selected for the development of a document instance in accordance with the requirements of MIL-M-28001B was Preliminary Technical Order (PTO) 6J15-8-136-3, Primary Vent Valve, P/N 5710110-10.

- The document instance for the DMM was developed using the XGML Validator™ parser (Version 1.1E3.22) developed by Exoterica Corporation, on a 386 personal computer.

- The document instance for the DMM was developed by personnel with a high level of experience in the use of SGML parsers, familiar with the MIL-M-28001B DTD (hereafter referred to as 28001B DTD), and who had developed DTDs for other types of technical documentation, including DTDs for Army, Air Force, and Navy Tms. Personnel coordinated the document instance development effort with technical writers who had a minimum of five years experience in the preparation of military technical manuals.

2.3.2 Document Instance Development Process

The following process was followed to test whether the conforming 28001 DTD in MIL-M-28001B could be used to develop the document instance for PTO 6J15-8-136-3, Primary Vent Valve, P/N 5710110-10. This DMM was originally prepared in accordance with MIL-M-87929A, *Manuals, Technical: Operation and Maintenance Instructions in Work Package Format (For USAF Equipment)* and MIL-M-38784B.

- All text, including the title page, front matter, and appendices of the Primary Vent Valve DMM, were scanned using a Kurzweil scanner which performs optical characteristic recognition (OCR) to convert text to ASCII characters.

- Using the DTD contained in Appendix A of MIL-M-87929A (hereafter referred to as the 87929A DTD) and the conforming 28001B DTD for MIL-M-38784B with the XGML Validator™ parser (Version 1.1E3.22) an attempt was made

to tag the ASCII text file (develop a document instance) for the Primary Vent Valve DMM.

- The conforming 28001B DTD is considered to be the "strict" interpretation of MIL-M-38784B and enforces the specification. The 87929A DTD (Appendix A of MIL-M-87929A) is used to interpret special technical and format requirements of MIL-M-87929A not covered by the conforming 28001B DTD and enforces those special requirements.

- If it is found that the conforming 28001B DTD and the 87929A DTD cannot be used, as is often the case with legacy data, the next step is to try to use the Template DTD (Appendix A of MIL-M-28001B) provided. The Template DTD is a "looser" interpretation of MIL-M-38784B. If the template DTD cannot be used "as is," it may be necessary to modify the template, in which case an alternate DTD is written and interchanged with the tagged instance. One may also choose to modify the template DTD to develop an alternate DTD that is not as "loose" as the template DTD.

- If either method of developing the document instance is successful, a FOSI would be developed for the Primary Vent Valve DMM to allow an electronic publishing system to produce a final formatted DMM.

2.3.3 Document Instance Development Results

2.3.3.1 Using the MIL-M-87929A Subset DTD and the Conforming 28001B DTD

It was determined that a document instance could not be developed and tagged using the MIL-M-87929A Subset DTD and the Conforming 28001B DTD. The following problems were encountered in attempting to use the MIL-M-87929A Subset DTD and the Conforming 28001B DTD to develop a document instance for the Primary Vent Valve DMM.

- The first step in creating a document instance was to parse the MIL-M-87929A subset DTD. In attempting to parse the DTD, it was discovered that the DTD had several errors which would need to be corrected. These errors were corrected.

- Even after the corrections were made a document instance could not be developed for the Primary Vent Valve DMM because the 87929A DTD does not include any entity reference in its declaration for the conforming 28001B DTD which is needed to prepare the document instance. Instead, the 87929A DTD includes a entity reference in its declaration for MIL-M-38807B that in turn contains a entity reference in its declaration for the conforming 28001C DTD.

- In using the 87929A DTD, it was not possible to tag an instance in accordance with MIL-M-28001B as this was not the public DTD referenced in the 87929A

DTD. The 87929 A DTD references the 38807B DTD which in turn references the MIL-M-38784C DTD. The 38784C DTD is not currently considered to be a CALS compliant DTD.

- It should be noted that the two parsers that were used in this test both ran out of memory before the DTDs could be completely parsed. This was basically due to the need to use all three DTDs noted in paragraph 2.3.3.1 b, above.

It should be noted that the following errors were found in the 87929 DTD in the process of attempting to develop the document instance for the Primary Vent Valve DMM.

- <!ENTITY % forwp "(wpidinfo, contents, illuslist?, tablelist?, purpose, scope, %fpi;, manstru, coverage?, indexscheme, locinfo, para0*, leadpartic, (para0 | (maintcon?, envcont?, warrprov?))*, timimprep?)">

  <!ELEMENT forewordwp - - (%forwp;) +(figure | table)>

  <!ELEMENT locinfo - o (para0+)>

  When the %forwp; entity is resolved in the Foreword WP (forewordwp) element, it is seen that the content model contains a required locating information (locinfo) followed by optional and repeatable primary paragraphs (para0). In an instance, if the end tag (/locinfo) is left of the locating information, an SGML parser would be unable to determine if a second primary paragraph belonged to the foreword work package element or the locating information element (i.e., <locinfo><para0>.....<para0>). This is ambiguous and it is suggested an end tag be required on the locating information element.

  (NOTE: Alternately, it could be left as end tag omissible and the user would have to discern when it is necessary to enter the end tag to avoid the ambiguity. This is not recommended.)

- <!ELEMENT rfdsindx - o (((refdes | sssn | (refdes, sssn)), figindex+)+) >

  The element rfdsindx (which is in the 38807B declaration subset) has ambiguous content. The problem occurs with the element refdes. If refdes is chosen in an instance (i.e., <rfdsindx><refdes>), the SGML parser would not be able to discern if this is the single refdes or the one followed by the sssn.

  (NOTE: An SGML parser is not allowed to "look ahead".)

- <!ENTITY % parazero "(%titles;, warning*, caution*, note*, para?, note*, (step1, step1+)?, subpara1*)">

  Each element whose content model contains %parazero; has ambiguous content due to the fact that when the entity is resolved there is a problem occurring

with the sub-element note. If an instance were tagged with two notes (i.e., <para0><note>.....</note><note>....</note>) an SGML parser would not be able to discern if the note is a note which precedes the optional paragraph or comes after the optional paragraph. It would assume it is the one preceding the optional paragraph, even if that is not the intent.

- <!ENTITY % termele "(%text;, ftnote*)">

  Any element whose content model contains %termele; has mixed content upon resolving the entity. When the entity %text; is resolved, #PCDATA is one of the choices which could be followed by ftnote. This is not considered "good" SGML.

- <!ELEMENT callout - - (#PCDATA | graphic)>

  The ELEMENT callout has mixed content. In an instance this would not parse:

  <callout>
  <graphic>

  The above would not parse because the hard carriage return after callout would be picked up as #PCDATA and the content model would be satisfied. (NOTE: There is no "*" or "+" after the parenthesis in the content model).

- <!ELEMENT warning - - (graphic?, (para+, %list;*)+) -(figure | table)>

  <!ELEMENT caution - - (graphic?, (para+, %list;*)+) -(figure | table)>

  <!ELEMENT note - - (graphic?, (para+, %list;*)+) -(figure | table) >

  Each of the above elements need to have parentheses around the entity %list which is resolved within the content model.

- <!ELEMENT item - o (%text;, (%list;)*, ftnote*)>

  The element item has mixed content. Again the %text; entity contains #PCDATA which is then followed by additional elements.

It should be noted that there may well be additional errors in the 87929A DTD. Because the parsers ran out of memory, a full parse was not able to be completed. Since the 87929A DTD did not parse, one cannot parse an instance against the DTD. However, an attempt was made to tag the DMM against the DTD. Although one would not be able to parse the instance by machine to test for errors, one could determine if the DTD is applicable for this DMM. Since the data in the DMM was not developed in strict accordance with the work package format called for in Specification MIL-M-87929A the following difficulties arose.

- On the Title Page, there was no way to mark the text:

  SEQUENTIAL COPY
  No. 1 of 4 Copies

- On the Title Page, there was no way to mark the text:

  Manual Prepared by Technology Applications, Inc.
  F33657-86-D-0074

- The DMM does not contain a numerical index of effective work packages (niewp) and it is a required tag in the 87929A DTD.

- In order to be able to go further into tagging, a work package tag needs to be chosen. However, because this is legacy data, it is not truly in work package form. An attempt was made to determine how far one could tag the instance even though it is not in the work package format. The following problems were discovered:

  a. The element <wp> was chosen. <wpidinfo> is required in a <wp> and it is not part of this document.

  b. The tctolist cannot be tagged as per the content model. There is a paragraph preceding the table that cannot be entered. Also, the column headings include effectivity which is not in the content model. The model is required and repeatable, however, the sample has nothing entered in any of the columns. (Presumably the table is set up automatically by the tctolist tag and the entries would be filled in by the sub-elements.)

  c. The DMM has tcto data, not a pubdate in the tctolist.

  d. The DMM introduction precedes the safety summary in the DTD, in the DMM, the safety summary is first.

  e. In the safety summary there are precautions. These precautions have to be tagged as primary paragraphs because the precautions element does not allow for titles or warnings.

  f. In order to enter the introduction, the wpforewd tag would have to be used.

  g. The DMM has multiple chapters. It is not possible to tag multiple chapters with this DTD. If the element techinfo were used, it would have to be allowed multiple times in the content model.

h. If the tag techinfo is used, there is no way to mark the text:

GENERAL INFORMATION

i. Since techinfo is not allowed multiple times, this is as far as the attempt to tag the document went. It is quite obvious that the DMM does not match the DTD and cannot be tagged as a Work Package.

2.3.3.2 Using the MIL-M-28001B Template DTD

The results of the test using the conforming 28001B DTD and the document declaration subset for MIL-M-87929A DTD indicated that a document instance could not be generated and parsed. Therefore, a second test was conducted to see if the Template DTD could be used to develop a document instance for the Primary Vent Valve DMM.

The first step in this test was to compare the structure and content of the DMM to the Template DTD requirements. An attempt was made to develop a document instance using the Template DTD as the base DTD, since the instance was not in work package format anyway. In an attempt to do this the following problems were encountered.

a. There are no elements or attributes that can be used to indicate that this is a SEQUENTIAL COPY, or the copy number of the document and total copies. Therefore the text "SEQUENTIAL COPY No. 1 of 4 Copies" that appears on the Title Page of the DMM could not be identified.

b. This DMM contains Technical Order Verification Planning Data and Technical Order Verification Status Pages. There are no element tags identified in the 28001B DTD or Template DTD to satisfy these requirements.

c. This DMM contains a TCTO list (page v of the DMM). There is no element tag identified in the 28001B DTD or Template DTD to satisfy this requirement.

d. The Safety Summary contains paragraphs with headings. These look in appearance like primary paragraphs. There is no way to tag these headings in the current model for safety summary in either the 28001B DTD or the Template DTD.

e. There is no ability to cross reference callouts.

f. The DTD does not provide the ability to cross reference either a row or an entry in a table. One or the other is needed for this DMM.

g. The DTD does not provide a way to mark a chapter as intentionally left blank.

h. The only way to tag the text RELATED MANUALS NONE (page 10-4 of the DMM) is using the verbatim element (there are several other examples like this).

i. In accordance with the conforming 28001B DTD, the DMM introduction is out of order, but this would not be a problem if the Template DTD was used.

CHAPTER 3
DEVELOPMENT OF DOCUMENT INSTANCES IN ACCORDANCE WITH THE MODULAR DTD CONCEPT

3.1 The Modular DTD Concept

Modular DTDs are different from DTDs currently under development. The conforming DTD now existing in MIL-M-28001A is used for a complete manual and contains rules for structuring the front matter, body, and the rear parts of a manual. It also requires that the entire technical manual, from cover to cover be complete and rigidly structured in accordance with its rules. This is not an ideal situation especially when a particular military service requires a different content structure or presentation method to meet the users needs.

Modular DTDs were developed by analyzing each specific type of technical content requirement (i.e., maintenance, theory, troubleshooting, etc.) required by current Army, Navy and Air Force technical manual preparation specifications and samples of these requirements contained in existing Army, Navy, and Air Force technical manuals. The results of the analysis concluded that:

- the same types of technical information are required regardless of the TM preparation specification used, regardless of the maintenance level required, and regardless of the service for which it is being prepared (i.e., almost all specifications contain some level of maintenance data, theory of operation, troubleshooting, etc.);

- this technical information can be classified into five major categories:

  - General information, Description, and Theory of Operation
  - Operating instructions (including preventive maintenance)
  - Troubleshooting
  - Maintenance
  - Parts Data; and

- the above technical information makes up approximately 85% of the required data for all types and levels of technical manuals. Confirming this is the fact that the new Army Standard for the preparation of technical manuals, MIL-STD-361, is written in a modular format employing the identical five major categories and *MIL-M-GCSFUI, Manuals, Interactive Electronic Technical: General Content, Style, Format, and User-Interaction Requirements* requires that technical data be divided into descriptive, procedural, troubleshooting, and parts information.

Based on those findings, the concept of developing modular DTDs for each type of technical content information in lieu of individual DTDs for an entire type of technical manual was born. There are over 66 different types of technical manuals required by the services, therefore, using the accepted method of developing conventional DTDs it is conceivable that over 66 DTDs would have to be developed. Potentially this could lead to a duplication in effort and the development of many non-standard DTDs.

Content specific modular DTDs can be used for all manuals regardless of type or for which service they are written (i.e., a maintenance module DTD can be used for maintenance procedures developed for an Army DMWR or Operator's Manual, a work package in a Navy Organizational or Intermediate Maintenance Manual, a Air Force Job Guide or Depot Maintenance Manual, etc.).

Modular DTDs delineate the structure and attributes for each of these content-specific requirements. In modeling these DTDs, many of the format attributes and elements (Sections, Titles, Primary Paragraphs, etc.) have been replaced by content-specific attributes and elements.

Although the tag set of MIL-M-28001A has been used in the development of the modular DTDs, some structures as defined in MIL-M-28001A are not applicable to the technical content requirements contained in the specifications. Tags for Volumes, Document Part, Front, Body, and Rear Matter are not relevant for specific technical content information, and therefore, are not required in a modular DTD. For example, a maintenance information module does not require Front Matter structures such as a Table of Contents, a Forward, or a Preface. In the same way, it does not have Body structures such as Chapters nor Rear Matter structures such as an Index.

3.2 Development of Document Instances

The same Army and Air Force Technical Manuals (TMs) that were selected to evaluate and test the flexibility and efficacy of using the DTD and FOSI development guidance, tag set, and output specification of MIL-M-28001B in Chapter 2 were used to test the ability of the modular DTD/FOSI concept to produce the same document instances. The intent of using the same TMs was to ascertain which of the DTD types (the conforming DTD or the modular DTD) is more effective and efficient in producing document instances for existing technical manual data.

A description of the test and process used to develop the document instances for these existing Army and Air Force TMs in accordance with the modular DTD/FOSI concept is provided in the following paragraphs.

3.3 Document Instance for a U.S. Army Depot Maintenance Work Requirement (DMWR)

3.3.1 Description of Test

- The manual selected for the development of a document instance in accordance with the modular DTD concept was DMWR 9-1440-453-1 for the Tow Missile Launcher, P/N 12295910.

- The document instance for the DMWR was developed using the maintenance module DTD and the XGML Validator™ parser (Version 1.1E3.22) developed by Exoterica Corporation, on a 386 personal computer.

- The document instance for the DMWR was developed by personnel with a high level of experience in the use of SGML parsers, familiar with the maintenance module DTD, and who had developed DTDs for other types of technical documentation, including DTDs for Army, Air Force, and Navy TMs. Personnel coordinated the document instance development effort with technical writers who had a minimum of five years experience in the preparation of military technical manuals.

- Since the maintenance module DTD used for this test is applicable only to TM maintenance data, the document instance developed was for the maintenance portions of DMWR 9-1440-453-1 only. The document instance consists of the disassembly, inspection, repair, and assembly procedures from this DMWR.

3.3.2 Document Instance Development Process

The following process was followed to test whether the maintenance module DTD could be used to develop the document instance for the maintenance procedures contained in DMWR 9-1440-453-1, Tow Missile Launcher, P/N 12295910. This DMWR was originally prepared in accordance with MIL-M-63041C, *Manuals, Technical: Preparation of Depot Maintenance Work Requirements* and MIL-M-38784B, *Manuals, Technical: General Style and Format Requirements.*

- All of the disassembly, inspection, repair, and assembly procedures and associated supporting illustrations from the Tow Missile Launcher DMWR, were scanned using a Kurzweil scanner, which performs optical characteristic recognition (OCR), to convert text to ASCII characters and the illustrations to a raster format.

- Before a document instance could be developed in accordance with the modular DTD, the content structure of the maintenance procedures had to be modified in accordance with the technical manual requirements contained in *MIL-STD-361-5, Military Standard, Manuals, Technical: Maintenance Instructions.* The modular DTD used for this test were developed for the US

Army in accordance with this Standard. Modifications to the content and format were necessary since the existing DMWR maintenance procedures were developed in accordance with MIL-M-63041C, *Manuals, Technical: Preparation of Depot Maintenance Work Requirements* and MIL-M-38784B, *Manuals, Technical: General Style and Format Requirements.* For an example of content and format differences refer to the *Report on FOSI Development, dated February 12, 1993.*

- After the content structure of the DMWR maintenance procedures was modified in accordance with the technical manual requirements contained in MIL-STD-361-5, an attempt was made to develop a document instance for the DMWR maintenance procedures in accordance with the maintenance module DTD using the XGML Validator™ parser (Version 1.1E3.22).

3.3.3 Document Instance Development Results

The first attempt to develop a document instance for the DMWR maintenance procedures in strict accordance with the maintenance module DTD was not successful. This was because the existing DMWR maintenance procedures contained technical data that was not addressed in the modular DTD and the procedures were not presented in the same order of precedence as required by the modular DTD. To correct this problem, the modular DTD was expanded and modified to include these additional technical content requirements and the maintenance procedures were rearranged to match the order reflected in the DTD. Using the modified maintenance module DTD, a document instance for the DMWR maintenance procedures was successfully generated. See paragraph A.2, Appendix A, for the final document instance for the DMWR maintenance procedures.

3.4 Document Instance for a U.S. Air Force Depot Maintenance Manual (DMM)

3.4.1 Description of Test

- The manual selected for the development of a document instance in accordance with the modular DTD concept was Preliminary Technical Order (PTO) 6J15-8-136-3, Primary Vent Valve, P/N 5710110-10.

- The document instance for the DMM was developed using the maintenance module DTD and the XGML Validator™ parser (Version 1.1E3.22) developed by Exoterica Corporation, on a 386 personal computer.

- The document instance for the DMM was developed by personnel with a high level of experience in the use of SGML parsers, familiar with the MIL-M-28001B DTD (hereafter referred to as 28001B DTD), and who had developed DTDs for other types of technical documentation, including DTDs for Army, Air Force, and Navy TMs. Personnel coordinated the document instance development effort with technical writers who had a minimum of five years experience in the preparation of military technical manuals.

- Since the maintenance module DTD used for this test is applicable only to TO maintenance data, the document instance developed was for the maintenance portions of Preliminary Technical Order (PTO) 6J15-8-136-3, Primary Vent Valve, P/N 5710110-10 only. The document instance consists of the disassembly, cleaning, inspection, repair, replacement, assembly, and testing procedures from this DMM.

3.4.2 Document Instance Development Process

The following process was followed to test whether the maintenance module DTD could be used to develop the document instance for the maintenance procedures contained in PTO 6J15-8-136-3, Primary Vent Valve, P/N 5710110-10. This DMM was originally prepared in accordance with MIL-M-87929A, *Manuals, Technical: Operation and Maintenance Instructions in Work Package Format (For USAF Equipment)* and MIL-M-38784B.

- All of the disassembly, cleaning, inspection, repair, replacement, assembly and testing procedures, and the supporting illustrations for the Primary Vent Valve DMM, were scanned using a Kurzweil scanner, which performs optical characteristic recognition (OCR), to convert text to ASCII characters and illustrations to a raster format.

- Before a document instance could be developed in accordance with the modular DTD, the content structure of the maintenance procedures had to be modified in accordance with the technical manual requirements contained in *MIL-STD-361-5, Military Standard, Manuals, Technical: Maintenance Instructions.* The modular DTD used for this test were developed for the US Army in accordance with this Standard. Modifications to the content and format were necessary since the existing DMM maintenance procedures were developed in accordance with MIL-M-87929A, *Manuals, Technical: Operation and Maintenance Instructions in Work Package Format (For USAF Equipment)* and MIL-M-38784B. For an example of content and format differences refer to the *Report on FOSI Development, dated February 12, 1993.*

- After the content structure of the DMM maintenance procedures was modified in accordance with the technical manual requirements contained in MIL-STD-361-5, an attempt was made to develop a document instance for the DMM maintenance procedures in accordance with the maintenance module DTD using the XGML Validator™ parser (Version 1.1E3.22).

3.4.3 Document Instance Development Results

The first attempt to develop a document instance for the DMM maintenance procedures in strict accordance with the maintenance module DTD was not successful. This was because the existing DMM maintenance procedures contained technical data that was not addressed in the modular DTD and the procedures were not presented in the same order of precedence as

required by the modular DTD. To correct this problem, the modular DTD was expanded and modified to include these additional technical content requirements and the maintenance procedures were rearranged to match the order reflected in the DTD. Using the modified maintenance module DTD, a document instance for the DMWR maintenance procedures was successfully generated. See paragraph B.2, Appendix B, for the final document instance for the DMM maintenance procedures.

CHAPTER 4
COMPARISON BETWEEN THE USE OF THE MIL-M-38784B CONFORMING DTD AND THE MODULAR DTD CONCEPT

4.1 Advantages/Disadvantages

The instances used for this test could not be tagged using the MIL-M-28001 application and could be tagged using the modular DTD concept, therefore, the primary discussion below will be on the advantages of using the modular DTDs. There are also a few disadvantages to using the modular DTDs and these will be mentioned as well. Finally, even though it was found that MIL-M-28001B could not be used without providing an alternate DTD, there will be a brief discussion of the advantages/disadvantages of using the 28001 application.

4.1.1 Modular DTDs

4.1.1.1 Advantages

The following is a list of advantages which would be obtained by applying the modular DTD concept. An explanation of each advantage is given.

- Each document type has its own definition. This means that each document type (maintenance, operation, etc.) is a stand-alone application. By building the document in this manner, there are several advantages as follows.

  a. Changes or updates that might need to be made to the DTD will not have a domino affect on other applications. For example, if it is necessary to alter the maintenance module it would not be necessary to check the implications of this change on the operations module.

  b. Supporting tools can be built as modules. Each module would have its own application built around it. This should not only save memory, but will also make it easier for the user. The user of the maintenance module would never have to be exposed to elements that did not apply to the maintenance application.

  c. The modular DTD concept allows for the development of additional modular DTDs for the same type of technical information content if a different content structure was necessary due to user needs or based on user skill level. For instance, if the majority of technicians required the use of logic type or flow type procedures for the performance of troubleshooting, a modular DTD could be developed to reflect this type of content structure. However, if for some reason technicians required troubleshooting to be tabular, a separate modular DTD could be

developed just for a tabular type content structure without affecting the other modular DTD.

- The modules are used to build an encapsulating document type. This "production DTD" would be the one used to produce an entire manual. The encapsulating document type would, for example, contain the front matter elements, a call in for each module necessary to produce an entire manual, and rear matter elements. In this example, the person involved in piecing together the entire document would have access to entering the front and rear matter elements and would basically reference the modules needed to build the application. Each module would have already been tagged via the stand-alone application. This concept should be able to be supported by the SGML feature SUBDOC.

- Since each module is a stand-alone DTD, like element names do not need to have like content models in each application. For example, if in one module a material parts list contains an item number, the name of the item, the part number, and a cage number, but in another module there is no cage number, the modular DTDs can reflect this. The first module would contain the following element declaration: <!element mtrllist -- (itemno, itemname, partno, cageno)> and the second module would contain: <!element mtrllist -- litemno, itemname, partno) > without causing an SGML error because each module is a stand-alone DTD. This reduces the need for parameterizing content models for changes or including many elements as optional because of a dependence on the manual type.

- The modular DTDs have more content based elements included. This adds more intelligence to the data and personnel had no difficulty in correctly tagging the DMWR/DMM since many of the tags are content-based and it was easy to determine the proper content element.

- The modular DTDs were built so that test type elements (such as steps, paras, figures, and tables) are modeled as much like 28001B as possible. Users of the 28001 application would be familiar with this part of the tag set.

- Specifications being rewritten with element names incorporated is a tremendous advantage. It will help during the training process and will leave less room for interpretation errors.

- A FOSI can be written for each module type using the OS DTD. Each separate unit would have its own FOSI and could be produced as a stand-alone unit. Each FOSI would only contain the necessary pieces to produce the module. The FOSI for the entire manual would contain the elements in the "production DTD." The overall application would provide a method for pulling the modules into the application.

- Modular DTDs are small in size and are user friendly. Modular DTD size ranges from six to 16 pages.

4.1.1.2 Disadvantages

Below is a list of disadvantages in using the modular DTD concept.

- Many new elements would need to be accepted into the CALS baseline tagset in order to be considered CALS compliant. However, it should be noted that a procedure has been developed to handle this through the EPC Registry Committee. Also, for this test, the manuals would need to have an alternate DTD developed which would also have to go through the registry process to be considered compliant.

- The modular DTDs are not currently the DoD standard. However, each stand-alone DTD can go through the registry process so that they would be considered to be compliant.

4.1.2 MIL-M-28001B DTDs

4.1.2.1 Advantages

Below is a list of advantages in using the DTDs provided in MIL-M-28001B.

- This is currently the DoD standard.

- Off-the-shelf support for applications.

- Most DTDs developed in accordance with the current requirements of MIL-M-28001B are large in size and are not user friendly.

4.1.2.2 Disadvantages

Below is a list of disadvantages in using the DTDs provided in MIL-M-28001B.

- The document instances for both the Army DMWR and the Air Force DMM could not be created using the MIL-M-28001B DTDs. Alternate DTDs would have to be developed or the conforming DTDs would have to be modified.

- Off-the-shelf software could not be used as is. Changes in the alternate DTDs would have to be reflected.

- Updates/changes made to the DTDs would have a domino affect on all parts of the application instead of a single unit.

4.2 Differences in the Development Effort

4.2.1 Comparison

Although both the conforming MIL-M-28001B DTD and the Modular DTD developed for this task used SGML in the development effort, the document types are very different. In fact, the modular DTD was designed based on a totally different concept (see paragraph 3.1 for a description of the Modular DTD concept). In the 28001B DTD there is a base DTD and if the document does not conform it may be necessary to use a subset DTD. In addition, there are means by which one can call in a DTD and overwrite some of the entities to more precisely follow the document. However, an investigation is currently underway to determine the point at which an alternate DTD should be used.

The Modular DTD is designed as a group of units. These units can then be used to create an entire manual by designing a master DTD which references the modular DTDs when appropriate (similar to the SGML feature SUBDOC). It should be noted that, in theory, the units currently being utilized can be "programmed" at an even lower level than is currently in use.

When using the conforming MIL-M-28001B DTD it is necessary to collect all of the necessary declaration subsets and have a complete understanding of which entities are being used for the current document. Whereas if the modular DTD is used there is one basic DTD to follow.

In addition, when using MIL-M-28001B, there are appropriate rules to follow whenever changes are required. The possibility of additional elements in a baseline tagset should also be taken into consideration. Although this is a concern, the current listing of baseline tags is currently unattainable. The modular DTD is privately "owned" and therefore developers are more easily accessible to those using the DTD. It should be noted that for this effort, no changes were needed to be made to the Maintenance Module DTD.

4.2.2 Recommendations

Recently a new version of MIL-M-28001B was released, thus the draft version used in this effort had changes made to it even as this report was being written. The content specific document type declaration(s) have been worked and reworked; even now changes are being made in how the main body of the specification will work. The OS and related FOSI(s) were recently modified and their feasibility has just begun to be tested. Since this specification relates to MIL-M-38784B, it should contain a complete, working FOSI for MIL-M-38784B documents. Ideally the specification will be well commented and proven to work on several output devices when released. The current DTD contains only fragments of a FOSI.

It is known that the current version of the specification is considered to be a transition specification (from paper to electronic). Another area that needs to be addressed is the method by which these transitions should occur (i.e., from 28001A to 28001B to the future).

CHAPTER 5
GLOSSARY OF TERMS AND ABBREVIATIONS

CALS	Computer-aided Acquisition and Logistic Support
CTC	CALS Technology Center
DMM	Depot Maintenance Manual
DMWR	Depot Maintenance Work Requirement
DoD	Department of Defense
DTD	Document Type Definition
EPC	Electronic Publishing Consolidation
FOSI	Formatting Output Specification Instance
IPB	Illustrated Parts Breakdown
JCALS	Joint Computer-aided Acquisition and Logistic Support
OCR	Optical Character Recognition
OS	Output Specification
PTO	Preliminary Technical Order
SGML	Standard Generalized Markup Language
TM	Technical Manual

CHAPTER 6
LIST OF REFERENCES

DMWR 9-1440-453-1 *Depot Maintenance Work Requirement for Tow Missile Launcher, NSN 1440-01-167-7514, P/N 12295910*

MIL-M-GCSFUI, Manuals, Interactive Electronic Technical: General Content, Style, Format, and User-Interaction Requirements

MIL-M-28001B, *Markup Requirements and Generic Style Specification for Electronic Printed Output and Exchange of Text, Draft*, 13 December 1991

MIL-M-38784B, *Manuals, Technical: General Style and Format Requirements*

MIL-M-38784C, *Manuals, Technical: General Style and Format Requirements*

MIL-M-38807B, *Manuals, Technical: Preparation of Illustrated Parts Breakdowns, Preparation of*

MIL-M-63041C, *Manuals, Technical: Preparation of Depot Maintenance Work Requirements*

MIL-M-87929A, *Manuals, Technical: Operation and Maintenance Instructions in Work Package Format (For USAF Equipment)*

MIL-STD-361-5, Military Standard, Manuals, Technical: Maintenance Instructions.

PTO 6J15-8-136-3 *Overhaul Instructions with Illustrated Parts Breakdown, Depot Maintenance for Primary Vent Valve, P/N 5710110-101*

APPENDIX A

DOCUMENT INSTANCE SAMPLES FOR ARMY TOW MISSILE LAUNCHER, DMWR 9-1440-453-1

This appendix provides two samples of the document instances for DMWR 9-1440-453-1 *Depot Maintenance Work Requirement for Tow Missile Launcher, NSN 1440-01-167-7514, P/N 12295910.* The first sample reflects a document instance tagged in accordance with the DTD requirements contained in MIL-M-28001B, *Markup Requirements and Generic Style Specification for Electronic Printed Output and Exchange of Text, Draft,* dated 13 December 1991.

The second sample reflects a document instance tagged in accordance with the maintenance modular DTD, and contains only the maintenance portions of DMWR 9-1440-453-1.

A.1 Sample of Document Instance in Accordance with MIL-M-28001B DTD Requirements.

Provided below is the document instance for DMWR 9-1440-453-1 *Depot Maintenance Work Requirement for Tow Missile Launcher, NSN 1440-01-167-7514, P/N 12295910* tagged in accordance with the DTD requirements contained in MIL-M-28001B. Comments about the development of the document instance or problems encountered in the tagging process are indicated in the body of the document instance by the symbol designation <!-- _____ -->.

```
<!-- NOTE:  In order to continue parsing this document there are
            areas of text that are commented out -->

<doc service="army">

<front>
<idinfo>
<pubno><user>DMWR</user>
<docno>9-1440-453-1</docno>
<titleblk>
<doctype>WORK REQUIREMENT<brk>
<maintlvl>DEPOT MAINTENANCE
<prtitle>
<nomen>TOW</nomen>
<eqpttype>MISSILE LAUNCHER</eqpttype>

<nsn>1440-01-167-7514</nsn>
<partno>P/N 12295910</partno>
```

```
</prtitle>
</titleblk>
<!-- graphic not allowed in conforming or template
<graphic boardno="tml">
-->
<mfr>U.S. ARMY MISSILE COMMAND<brk>
Redstone Arsenal, Alabama 35898-5000

<!-- DGK:  NOTE:  if address is to be in different type it will
need a separate tag for the fosi as will the zip -->


<notice notctype="auth">
<para>
DISTRIBUTION AUTHORIZED TO DEPARTMENT OF DEFENSE AND
DOD CONTRACTORS ONLY TO PROTECT CRITICAL TECHNICAL
DATA ON SYSTEMS OR HARDWARE.  THIS DETERMINATION WAS
MADE NOV 1986.  OTHER REQUESTS SHALL BE REFERRED TO
PROJECT MANAGER, TOW PROJECT MANAGER, TOW SYSTEMS,
ATTN: AMCPM-TO, REDSTONE ARSENAL, AL 35898-6710.

<notice notctype="WARNING">
<para>
THIS DOCUMENT CONTAINS TECHNICAL DATA WHOSE EXPORT IS
RESTRICTED BY THE ARMS EXPORT CONTROL ACT (TITLE 2, U.S.C.
SEC. 2751 ET SEQ.) OR EXECUTIVE ORDER 12470. VIOLATORS OF
THESE EXPORT LAWS ARE SUBJECT TO SEVERE CRIMINAL PENALTIES.

<notice notctype="destr">
<para>
DESTRUCTION NOTICE - DESTROY BY ANY METHOD THAT WILL
PREVENT DISCLOSURE OF CONTENTS OR RECONSTRUCTION OF
THE DOCUMENT.

<notice notctype="dist">
<para>
THIS PUBLICATION IS NOT AVAILABLE THROUGH THE U.S. ARMY
PUBLICATIONS CENTERS.  THIS PUBLICATION IS AVAILABLE
THROUGH THE U.S. ARMY MISSILE COMMAND, ATTN: AMSMI-LC-
ME-PE, REDSTONE ARSENAL, AL 35898-5238.

<pubdate>FEBRUARY 1989

</idinfo>

<warnsum>
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<warning type="HAZARDOUS CHEMICALS AND SOLVENTS
FLAMMABLE AND TOXIC COMPOUNDS">
<para>
THE USE OF FLAMMABLE AND TOXIC CHEMICAL COMPOUNDS CALLED IN THESE PROCEDURES <emphasis emph="ul">REQUIRE</emphasis> SAFETY PRECAUTIONS AS FOLLOWS:
<seqlist numstyle="arabic">
<item><para>USE IN WELL VENTILATED AREAS.
<item><para>KEEP AWAY FROM SPARKS, OPEN FLAMES AND HEAT SOURCES.
<item><para>AVOID REPEATED OR PROLONGED CONTACT WITH THE SKIN BECAUSEOF IRRITATING AND DRYING EFFECTS; HOWEVER, SHOULD CHEMICALS CONTACT THE SKIN, WASH THE EXPOSED AREAS THOROUGHLY WITH SOAP AND WATER.
</seqlist>
</warning>

<warning>
<para>
METHYL ETHYL AND TOLUENE ARE HIGHLY TOXIC. VAPORS IN HIGH CONCENTRATIONS ARE ANESTHETIC AND DANGEROUS TO LIFE. AVOID PROLONGED OR REPEATED BREATHING OF THIS VAPOR.
</warning>

<warning type="CAUSTIC COMPOUNDS">
<para>
WHEN USING CAUSTIC COMPOUNDS OR SOLUTIONS (I.E., IRIDITE, ALODINE, OR COMMON ACIDS), WEAR RUBBER GLOVES, PROTECTIVE CLOTHING AND ACID TYPE SAFETY GOGGLES. AVOID CONTINUOUS INHALATION OF CAUSTIC FUMES AND REPEATED EXPOSURE OF EYES TO THESE CHEMICAL VAPORS.
</warning>

<warning>
<para>FALLING SLIDE SUPPORTS CAN CAUSE INJURY TO PERSONNEL. KEEP FINGERS AND HANDS FROM BENEATH SLIDE SUPPORTS DURING DISASSEMBLY.
</warning>

<warning>
<para>SURFACE TREATMENTS PER MIL-C-5541 AND MIL-M-3171 ARE CAUSTIC MIXTURES; WHEN USING THEM, WEAR RUBBER GLOVES, A RUBBER APRON, AND
ACID-TYPE SAFETY GOGGLES. AVOID CONTINUOUS INHALATION OF CAUSTIC FUMES AND REPEATED EXPOSURE OF EYES TO THESE CHEMICAL VAPORS.
</warning>

```
<contents>

<!-- DGK:  NOTE:  all text at top is generated on table of contents

                per spec
                notices should be generated from notices on front

                cover as they are identical
                This should be handled by a FOSI  -->

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<tablelist tocentry="0">

</front>

<body>

<chapter>
<title>INTRODUCTION

<section>
<title>GENERAL

<para0 tocentry="0"><title>Scope.
<para>
<seqlist numstyle="alphalc">
<item><para>&scope1;

<item><para>This DMWR describes the overhaul, testing, packaging,
and storage of the TML, P/N <partno>12295910</partno>, NSN
<nsn>1440-01-167-7514</nsn>.

<item><para>For the purpose of this DMWR, overhaul is defined as
the repair/rework required to restore the TML to an operational
condition suitable for field use.

</seqlist>

<para0 tocentry="0">
<title>Forms, Records, and Reports.
<indxflag ref1="Forms, records, and reports">
<para>Department of the Army forms, records, and reports used for
equipment maintenance will be those prescribed in DA PAM 738-750,
The Army Maintenance Management System (TAMMS) and in the contract.
```

Other reporting forms are contained in DARCOM-R 702-7 (Depot Quality Assurance). Internal control forms may be used in accordance with the administrative requirements of the overhaul activity.

<para0 tocentry="0"><title>Reporting Equipment Improvement Recommendations (EIR).<indxflag ref1="Reporting equipment improvement">
<para>EIR will be prepared using SF 368, Quality Deficiency Report (QDR). Instructions for preparing QDRs are provided in DA PAM 738-750. Mail them to Commander, US Army Missile Command, ATTN: AMSMI-QA-CF Redstone Arsenal, AL 35898-5290. A reply will be furnished directly to you.

<!-- DGK: NOTE: There is a boilerplate paragraph for this,
but the wording in this document is not per spec
-->

<para0 tocentry="0"><title>Engineering Change Proposals (ECP).
<indxflag ref1="Engineering change proposals (ECPs)">
<para>&ecp;

<para0 tocentry="0"><title>Deviations and Exceptions.
<para>
<seqlist numstyle="alphalc">
<item><para><emphasis emph="ul">Contractor</emphasis>. &excp;

<item><para><emphasis emph="ul">Depots</emphasis>.
Defects shall be processed in accordance with DESCOM-R 702-1.

</seqlist>

</section>

<section>
<title>DESCRIPTION, DATA PLATES, AND DATA

<para0 tocentry="0"><title>Description.
<para>The TOW Missile Launcher (TML) houses the missile tubes before firing and provides a steady platform during launch. It provides the circuitry to remotely arm, disarm, and control the missiles.

<para0 tocentry="0"><title>Data Plates
<xref xrefid="fig1-1" xidtype="figure">

<indxflag ref1="Data plates">
<para>
<seqlist numstyle="alphalc">

<item><para>The equipment identification plate will be located as shown in figure 1-2. &dataplt;

<item><para>Lettering, border, and blocks to be satin finish. Background to be lusterless black.

<figure id="fig1-1"><title>Data Plate.
<graphic boardno="data">
</figure>

<item><para>Mark in accordance with MIL-STD-130 method, indentation

stamp, height .06 inches (1.59 mm) letters and numbers, color black <xref xrefid="item6" xidtype="text">. Apply treatment varnish
<xref xrefid="item19" xidtype="text">.

<item><para>Attach data plate using sealing compound <xref xrefid="item14" xidtype="text">. Prepare surfaces for adhesive bonding in accordance with MIS-35707.

<item><para>Identification plate will be .020 thick (.508 mm) aluminum sheet, A1 alloy 1100-TO, QQ-A-250/1 TEM TO. Refer to drawing number 12333899. This data plate will be installed as shown in <xref xrefid="fig1-2" xidtype="figure">.

<item><para>Using ink <xref xrefid="item6" xidtype="text">, stamp the following overhaul information as near the equipment identification plate as possible.

<seqlist numstyle="arabic">

<item><para>Initials of facility performing the overhaul or modification.

<item><para>Contract number (if nongovernment).

<item><para>Date of overhaul or modification.

<item><para>Part number.

<item><para>The number of any modifications performed during

overhaul.

</seqlist>

<item><para>For proper warning label requirements for TML, refer to drawing number 12333910.

<figure id="fig1-2"><title>Overhaul Data Plate Location.
<graphic boardno="overhaul">
</figure>

</seqlist>

<para0 tocentry="0"><title>Data.
<indxflag ref1="Data, tabulated">
<para>Tabulated characteristics of the equipment
covered by this DMWR are as follows:

<table tocentry="0" frame="topbot" colsep="1" rowsep="0"
orient="port"
pgwide="1">
<title>
<!-- DGK: required title
this probably not meant to be tagged as a table
since it doesn't number as one -->
<tgroup cols="2">

<thead>
<row rowsep="1">
<entry>Item
<entry>Characteristic

<tbody>

<row>
<entry>Army part number
<entry>12295910

<row>
<entry>Weight
<entry>255 lbs.

<row>
<entry>Height
<entry>14.5 inches

```
<row>
<entry>Width
<entry>20 inches

<row>
<entry>Length
<entry>47.5 inches

</table>

<para0 tocentry="0"><title>Configuration Data.
<para>TOW Missile Launcher (TML), P/N
<partno>12295910</partno>, NSN <nsn>1440-01-167-7514</nsn>.

</section>

<!-- DGK: NOTE:  added last section as it is boilerplate -->
<section><title>MOBILIZATION REQUIREMENTS
<para0 tocentry="0"><title>General.<indxflag refl="Mobilization
requirements">
<para>&mobil;
</section>
</chapter>

<!-- skipped chapter 2  -->

<chapter><title>PRESHOP ANALYSIS OPERATIONS

<section><title>PURPOSE, TEST, AND ANALYSIS STANDARDS

<para0 tocentry="0"><title>Purpose.<indxflag refl="Preshop analysis
purpose">  <para>&anal;<xref xrefid="tab3-1"
xidtype="table">  When
a 100 percent teardown overhaul will be accomplished, a preshop
analysis is not mandatory.

<!-- DGK:  NOTE:  put reference to table after entity so the entity
could be used  to call in text -->

<para0 tocentry="0"><title>Inspection of Forms.
<para>Inspect all tags and forms
attached to the TOW missile launcher to determine the reason
for removal from service and any other discrepancy.  Do not
remove tags or forms from the TOW missile launcher.  If the
equipment is received without documented notification of
maintenance or overhaul requirements, contact (in writing)
```

the procuring activity before proceeding. Address inquiry to Commander, US Army Missile Command, Attn: AMSMI-LC-ME-LTT, Redstone Arsenal, Al 35898-5238.

<para0 tocentry="0"><title>Removal of End Item, Assembly, Subassembly, or Component from Shipping Container, Package or Storage.
<para>Unpack the TOW missile launcher and check all tags and forms attached to the packing case to determine that the item shipped matches the item described on the forms received. Save the shipping container for use when transporting the assembly to other areas on the depot.

<table frame="topbot" colsep="1" rowsep="1" pgwide="1" orient="port">
<title>Preshop Analysis Checklist<indxflag ref1="Preshop analysis checklist">
<tgroup cols="5">
<colspec colnum="1" colname="item" align="left" colsep="1" rowsep="1">
<colspec colnum="2" colname="eval" align="left" colsep="1" rowsep="1">
<colspec colnum="3" colname="cond" align="left" colsep="1" rowsep="1">
<colspec colnum="4" colname="rem" align="left" colsep="1" rowsep="1">
<colspec colnum="5" colname="evalinit" align="left" colsep="1" rowsep="1">

<spanspec namest="item" nameend="cond" spanname="nomen" align="left" colsep="1" rowsep="1">
<spanspec namest="rem" nameend="evalinit" spanname="nsn" align="left" colsep="1" rowsep="1">
<spanspec namest="item" nameend="eval" spanname="serno" align="left" colsep="1" rowsep="1">
<spanspec namest="rem" nameend="evalinit" spanname="date" align="left" colsep="1" rowsep="1">

<thead>
<row><entry spanname="nomen">
Nomenclature

```
<entry spanname="nsn">NSN

<row><entry spanname="serno">Serial No.
<entry>Evaluator
<entry spanname="date">Date

<row rowsep="1"><entry>Item No.
<entry>Evaluation Point
<entry valign="middle">Condition (Repair, Overhaul, Replace,
Clean, Missing Part, Test, or Satisfactory)
<entry>Remarks
<entry>Eval. Init.

<tbody>
<row><entry>1
<entry>Armament Control

<!-- DGK:  NOTE:  added step1 to entry so these could be tagged
                  as steps

<step1><para>Check electrical connectors for missing, bent, broken,
and loose
pins and for cracks, dents, rust, and corrosion.

<step1<para>Check input cable assembly for cracks, cuts, burned
wiring, and damage to insulation material.
-->
<!-- skipped to 3  -->

<row><entry>3
<entry>Acceptance Testing
<para>If no defects are noted or noted defects are corrected,
perform boresight alignment test as outlined in chapter 4.

<note><para>
If unit cannot be boresighted to meet requirements of chap 4, no
repair
to correct the defect at depot level is available or authorized.
</note>

<!-- skipped to 3-5  -->

</table>

<para0 tocentry="0"><title>Cleaning.<indxflag ref1="Cleaning">
<para>
```

```
<seqlist numstyle="alphalc">

<item><para>If cleaning is required, the TOW launcher will be
cleaned by removing dirt, grease, and paint necessary to
accomplish the requirement of preshop analysis.

<item><para>DMWR 9-1425-550-50 is the guideline document for all
cleaning processes. Use care when cleaning TOW missile
launcher or circuit card assemblies and modules to prevent
removal of stampings, lettering, color coding, and other
functional markings.

<item><para>Light cleaning with a brush
<xref xrefid="item5" xidtype="table"> and
isopropyl alcohol <xref xrefid="item5" xidtype="table">
may be used to remove
dirt, oil, and other foreign matter that can be removed
with only light cleaning. This method can be used for
cleaning the assembly exterior as well as the components
within the interior of the assembly.

<!-- DGK: changed the element item to be a choice between
        specpara and para -->
<!--
<item>
<specpara>

<warning><para>
Particles blown by compressed air are hazardous.
Direct the air stream away from the user and other
personnel in the area. Wear safety glasses or
goggles.</warning>

<para><emphasis emph="ul">Compressed Air</emphasis>. Compressed
air regulated not to exceed 15 psi (103 kPa) may be used to remove
loose dirt and
foreign material.
</specpara>

-->
<item><para><emphasis emph="ul">Cleaning Processes</emphasis>.
<seqlist numstyle="arabic">
<!--
<item>
<specpara>
<warning><para>
```

Drycleaning solvent is flammable. Do not use near
an open flame. A fire extinguisher will be kept
in the immediate area when this solvent is used.
Solvent will be used only in open or well ventilated
areas. Failure to provide proper ventilation may
result in injury to personnel.</warning>

<para><emphasis emph="ul">Drycleaning Solvent Cleaning
Process</emphasis>. Clean items in drycleaning solvent (item 15,
appendix C) and drain. Do
not pressure spray. Repeat cleaning in fresh solution. Dry
with compressed air.
</specpara>
-->
<item><para><emphasis emph="ul">Vapor Degreasing
Process</emphasis>.
Subject items to vapors from degreasing fluids or solvent until no
further solvent condensation occurs.

<!-- skip to item 7 -->

<item><para><emphasis emph="ul">Abrasive Blast Cleaning</emphasis>.

Subject item to abrasive blasting to remove paint, rust, corrosion,
etc. Rinse item in cold water or blow off with air.

<seqlist numstyle="alphalc">
<!--
<item>
<specpara>
<note><para>Ferrous items which have been cleaned shall be
protected with a light coat of oil if a delay in
finishing/processing is evident.
</note>
<para>Use river sand <xref xrefid="item12" xidtype="table"> or
walnut hulls <xref xrefid="item17" xidtype="table">on large, heavy
steel items.
</specpara>
-->
<item><para>Use silicon sand <xref xrefid="item13" xidtype="table">
on light steel items.
<!-- DGK: When doing FOSI this may need to change to have xidtype
choice
include appendix inorder to get proper wording on xref
-->
<!--

<item>
<specpara>
<note><para>Items with threaded or machined surfaces will have such areas protected prior to blasting with river or silicon sand.
</note>
<para>Use walnut hulls <xref xrefid="item17" xidtype="table">on items with threads, mechanical surfaces, light aluminum, or aluminum alloys, etc.
</specpara>
-->
</seqlist>
</seqlist>
<!--<item>
<specpara>
<warning>
<para>When using methyl ethyl ketone, the room or work area will be well ventilated. Do not use near an open flame. A fire extinguisher will be kept in the immediate area when this cleaner is used. Failure to provided ventilation may result in injury to personnel.
</warning>
<para><emphasis emph="ul">Removal of Adhesives</emphasis>. When replacing adhesive-backed equipment data plates or other adhesive-backed markings, methyl ethyl ketone <xref xrefid="item7" xidtype="table"> may be used to clean the area where the plate/marker has been removed.
</specpara>
-->
<item><para><emphasis emph="ul">Cleaning after Nondestructive Inspection of Components</emphasis>. After performing liquid penetrant or magnetic particle inspection, the fluorescent and visible dyes and magnetic particles must be removed from parts passing the inspection. Clean after liquid penetrand or magnetic particle inspection in accordance with MIL-I-6868. Preserve parts as required.
</seqlist>

</section>

<section>
<title>PRESHOP ANALYSIS CHECKLIST

<para0 tocentry="0">
<title>Preshop Analysis (PSA) Checklist <xref xrefid="tab3-1" xidtype="table">
<indxflag ref1="Preshop analysis checklist">

<para>The preshop analysis checklist contains those items that assess the extent of overhaul operations required for the equipment. Analysis maintenance actions will be listed with the reference for replacement procedures. For complete overhaul, refer to chapter 4 of this DMWR.
</section>
</chapter>

<!-- skipped to chapter 4 -->

<chapter>
<title>OVERHAUL OPERATIONS

<section><title>GENERAL REQUIREMENTS

<para0 tocentry="0"><title>General Arrangement.
<indxflag ref1="Overhaul, general">
<para>Overhaul operations presented in this chapter are arranged in sections in top down generation breakdown. Tasks are presented in a logical sequence of performance with illustrations to support instructions.

<para0 tocentry="0"><title>Scope.
<para>
<seqlist numstyle="alphalc">

<item><para>This chapter contains specific instructions including removal, disassembly, cleaning, inspection, repair and assembly of components.

<item><para>Maximum repair and renovation of items is mandatory. Parts, components, subassemblies or assemblies found to be worn or defective beyond repairable limits established by this Depot Maintenance Work Requirement (DMWR) will be condemned and disposed of as directed by appropriate directives, or case of commercial contracts, as specified in provisions of the contract. Tolerances and wear limits set forth herein are the minimum acceptable standards.
</seqlist>

<!-- skipped to 4-4 -->

<para0 tocentry="0">
<title>In-Process Inspection.
<indxflag ref1="In-process inspection">
<para>

<seqlist numstyle="alphalc">

<item><para>Used components and refinished parts recovered as products of disassembly will be inspected one hundred percent by the contractor or depot to determine serviceability.

<item><para>Areas that require inspection include, but are not limited to:

<seqlist numstyle="arabic">

<item><para><emphasis emph="ul">Hardware</emphasis>. Inspect screws, bolts, nuts, washers, snap rings, rivets, dowel pins etc., for corrosion, thread
damage, proper locking devices, rust, breaks, burrs and abrasions. Parts must be free of defects which would degrade the corrosion resistance or function.

<item><para><emphasis emph="ul">Assemblies</emphasis>. Inspect assemblies for cracks, dents, breaks, enlarged holes, bends, etc. No defects are allowed
that would degrade the strength of the metal or corrosion resistant coating.

<!-- skipped to 7 -->

<item><para><emphasis emph="ul">Shafts.</emphasis>Shafts will be inspected for excessive wear, bending, scores, cracks and burrs. No defects allowed.

<seqlist numstyle="arabic">

<item><para>Inspect all castings for breaks, cracks, wear or scoring that would impair serviceability.

<item><para>Inspect mounting faces for nicks, scratches, and scores. Minor defects will be removed with small file
or soft honing stone <xref xrefid="item16" xidtype="table">.

<item><para>Inspect all threaded parts for damaged threads.
</seqlist>
</seqlist>
</seqlist>

<para0 tocentry="0"><title>Tolerances, Wear Limits, Corrosion

```
Limits, Torque
Values and Adjustments.
<para>Tolerances, wear limits, torque values,
corrosion limits, and adjustments will be complied with
unless otherwise stated in the contract/work directive.

<!-- skipped 4-6 -->

</section>

<section><title>DISASSEMBLY/ASSEMBLY OF THE TOW MISSILE

<!-- NOTE: the para0's do not renumber at a new section. This
will
                be taken care of by the FOSI. -->

<para0 tocentry="0"><title>Armament Control Unit Disassembly.
<para>
<step1><para>Disconnect cable assembly <xref xrefid="call4-4-1"
xidtype="figure">) from Armament
Control Unit (ACU) power connector.

<!-- DGK: need to be able to id callouts added id attribute to
callouts -->

<step1><para>Remove ACU (5) by removing screws (6), lockwashers
(7), and flat washers (8).

<!-- skip to figure -->

<figure id="fig4-1">
<title>TML Assembly.
<graphic boardno="tml">
<!-- DGK: added ID to callout element
<legend assocfig="fig4-1">

<callout id="call1-4-1" assocfig="fig4-1">1.</callout>
<def><para>Screw, cap, socket HE
<callout id="call2-4-1" assocfig="fig4-1">2. </callout>
<def><para>Washer, lock
<callout id="call3-4-1" assocfig="fig4-1">3. </callout>
<def><para>Washer, flat
<callout id="call4-4-1" assocfig="fig4-1">4. </callout>
<def><para>Cable assembly, input W3
<callout id="call5-4-1" assocfig="fig4-1">5. </callout>
<def><para>Armament control (ACW)
```

```
<callout id="call6-4-1" assocfig="fig4-1">6.  </callout>
<def><para>Screw, cap, socket HE
<callout id="call7-4-1" assocfig="fig4-1">7.  </callout>
<def><para>Washer, lock
<callout id="call8-4-1" assocfig="fig4-1">8.  </callout>
<def><para>Washer, flat
<callout id="call9-4-1" assocfig="fig4-1">9.  </callout>
<def><para>Structure assembly launcher
<callout id="call10-4-1" assocfig="fig4-1">10. </callout>
<def><para>Plate, identification
<callout id="call11-4-1" assocfig="fig4-1">11. </callout>
<def><para>Washer, lock
<callout id="call12-4-1" assocfig="fig4-1">12. </callout>
<def><para>Washer, flat
<callout id="call13-4-1" assocfig="fig4-1">13. </callout>
<def><para>Screw, cer, flat
<callout id="call13-4-1" assocfig="fig4-1">13. </callout>
<def><para>Screw, cap, socket HE
-->
</figure>

<figure id="fig4-2">
<title>Armament Control
<graphic boardno="sht2">
<!--
<legend assocfig="fig4-2">
<callout id="call1-4-2" assosfig="fig4-2">1.  </callout>
<def><para>Cover, housing
<callout id="call2-4-2" assosfig="fig4-2">2.  </callout>
<def><para>Screw, cap, socket HE
<callout id="call3-4-2" assosfig="fig4-2">3.  </callout>
<def><para>Washer, lock
<callout id="call4-4-2" assosfig="fig4-2">4.  </callout>
<def><para>Washer, flat
<callout id="call5-4-2" assosfig="fig4-2">5.  </callout>
<def><para>Screw, cap, socket HE
<callout id="call6-4-2" assosfig="fig4-2">6.  </callout>
<def><para>Washer, lock
<callout id="call7-4-2" assosfig="fig4-2">7.  </callout>
<def><para>Washer, flat
<callout id="call8-4-2" assosfig="fig4-2">8.  </callout>
<def><para>Spring, act switch
<callout id="call9-4-2" assosfig="fig4-2">9.  </callout>
<def><para>Screw, cap, socket HE
<callout id="call10-4-2" assosfig="fig4-2">10. </callout>
<def><para>Washer, lock
```

<callout id="call11-4-2" assosfig="fig4-2">11. </callout>
<def><para>Washer, flat
<callout id="call12-4-2" assosfig="fig4-2">12. </callout>
<def><para>Block, mounting, spring
<callout id="call13-4-2" assosfig="fig4-2">13. </callout>
<def><para>Pin, assembly
-->
</figure>

<!-- skip to 4-14 -->

<para0 tocentry="0"><title>Assembly of Armament Control Unit
<xref xrefid="fig4-2" xidtype="figure">
<para>
<step1><para>Install mounting block (54) and bearing (53) into drive assembly (15).

<step1><para>Connect drive assembly (15) power plug to cable assembly (37) J6.

<!-- skip to n. -->

<step1>
<specpara>
<para>Install drive assembly (15) into actuator housing (36).
<note>
<para>Shaft at rear of pointer override shaft must be alined with slot in lock rod arm.
</note>
</specpara>

<step1><para>Install bearing unit housings (18) by installing screws (22), lockwashers (21), and flat washers (20). Finger tighten.

<!-- skip to z. -->

<step1><para>Install cable assembly (37) electrical connectors to circuit card assembly (51).

<step1><para>Connect plug (4) to Armament Control Unit (ACU) power connector.

<step1><para><emphasis emph="ul">Electrical Control Switch

Adjustments</emphasis>.

<step2><para>Using TOW Missile Launcher Test Station and Bto spec.

<step1><para><emphasis emph="ul">Electrical Control Switch
Adjustments</emphasis>.
<step2><para>Using TOW Missile Launcher Test Station and Breakout
Box (LTBB), apply 24 Vdc to TOW missile launcher.

<step2><para>Switches S1, S2, S3, and S4 are for identification
and availability of missile present and missile selection.
Switches S1, S2, S3, and S4 are adjusted to activate when
the TOW missile launcher is placed in the ARM position.
Distance from TOW missile launcher housing to tip of holdback
pin plunger will be .940 ± .002 inches (2.398
± 0.050 mm)
when switches activate as shown in figure 404. Torque screws
to 6 ± 1 in. -lbs. (.49 to .79 N &mindot;m).

<figure id="swit"><title>Switches (S1, S2, S3, and S4).
<graphic boardno="sw">
</figure>

</section>
<section>
<title>FINAL ASSEMBLY/TESTING
<para0 tocentry="0"><title>General.
<para>
<seqlist numstyle="alphalc">
<item><para>This section covers a series of tests required to
insure the operability of the launcher subassembly.
<item><para>If the UUT does not meet the test requirements, aline
as required. Upon completion of the test for the item repaired.
</seqlist>
<!-- SKIP to 4-21 -->

<para0 tocentry="0"><title>Adjustments.<indxflag
ref1="Adjustments">
<para>
<seqlist numstyle="alphalc">
<item><para><emphasis emph="ul">Bellcrank Arm
Adjustment</emphasis>.
<!-- DGK: no steps in items
<step1><para>Calibrate bellcrank adjustment gage, P/N
<partno>92295912-40101-4</partno>

using master gage P/N <partno>12295912-40101-2</partno>. Adjust
dial
indicator on adjustment gage for zero reading when flush with
inside walls of master gage.
-->
<!-- skip to 7 -->
<!--
<step1><para>Bellcrank arm adjustment is complete.
-->
<!--
<item>
<specpara>
<caution><para>
Ensure LTBB power is off, potential equipment damage.
</caution>

<note><para>
Remove spacer and adjustment gage before unlocking
bellcrank to prevent damage to indicator.
</note>
<para><emphasis emph="ul">Setscrew Adjustments</emphasis>.
</specpara>
<step1><para>Calibrate set screw adjustment gage, P/N
<partno>12295912-40101-5</partno>
using calibration plate P/N <partno>12295912-40101-1</partno>.
Install calibration plate on setscrew mount by installing three
allen head screws. Torque screws to 26 ± 2 in.-lbs.
(2.71 to 3.16 N m) and adjust dial indicators for zero readings.
Remove
calibration plate.

<step1><para>Install spacer P/N <partno>12295912-40101-3</partno>
in inboard
launcher tube to maintain 6.646 low limit between bellcrank
arms.
-->
<!-- skipped to appendix A (after chapter 5)
skipped the tables in chapter 4, nothing new or unique in
them
-->
</seqlist>
</section>
</chapter>
<chapter>
<title>QUALITY ASSURANCE REQUIREMENTS
<section><title>GENERAL

<para0 tocentry="0"><title>Responsibility.<indxflag ref1="Quality assurance requirements">
<para><!--&-->respons;
<para0 tocentry="0"><title>Definitions.<indxflag ref1="Quality assurance definitions">
<para>The quality assurance terms used shall be those defined in MIL-STD-109, AR 702-10, and MIL-W-63150 or similar commodity specification appropriate to the subject material.
<para0 tocentry="0"><title>Inspection Equipment.
<para>Unless otherwise specified, the contractor/depot shall be responsible for maintenance and disposition of acceptance and test equipment. All acceptance inspection and test equipment used in conjunction with this program shall be controlled in accordance with requirements of MIL-STD-120, MIL-I-45607, and MIL-STD-45662 as amended (contractors only), or DESCOM-R 702-1 (depots only).
<para0 tocentry="0"><title>Certification Requirements<indxflag ref1="Certification of personnel, materials, and processes">
<para><!--&-->cert;

<para0 tocentry="0"><title>Quality Assurance Plan<indxflag ref1="Quality assurance plan">
<para><!--&-->qa63041;
</section>

<section>
<title>INSPECTION REQUIREMENTS
<para0 tocentry="0"><title>Initial Reconditioning Inspection (First Article, AR 702-10).
<para>
<seqlist numstyle="alphalc">

<item><para><emphasis emph="ul">Requirements</emphasis>. The first article initial overhaul or rebuilt units) shall be submitted for inspection in a
accordance with the contract. The first article shall be representative of the rebuild process for rebuild and/or repaired units. The sample shall be rebuilt/overhauled or repaired in the same manner, using the same materials, equipment, processes, and procedures as used in regular rebuild/overhaul or repair program. All parts and materials, including packaging and packing, shall be obtained from the same source of supply as used in regular rebuild/overhaul or repair program.
<!--skip to item d -->
<item><para><emphasis emph="ul">Contractor Responsibility</emphasis>. When the contractor/depot is

responsible for conducting first article approval tests, the sample shall be inspected by the contractor for all the requirements of the contract. The sample and a record of requirements of the contract. The sample and a record of this inspection, including certificates of conformance for all submitted to the Government for approval. The Government reserves the right to witness the contractor's inspection.
</seqlist>
<!--skip to 5-9-->
<para0 tocentry="0"><title>Acceptance Inspections.
<para><!--&-->accinsp63041;
</section>
</chapter>
</body>

<rear>
<appendix><title>REFERENCES

<para0 tocentry="0"><title>Scope.
<para>The applicable publications listed are used for overhaul of the TOW Missile Launcher (TML) and should be consulted frequently for latest change or revisions to them. Indexes should also be consulted frequently for new publications relating to the material covered in this DMWR.
<para0 tocentry="0"><title>Army Regulations.
<para>
<deflist>
<term>AR 385-40
<def><para>Accident Reporting and Records
<term>AR 725-50
<def><para>Requisitioning, Receipt, and Issue System
<term>AR 702-10
<def><para>Post Production Testing of Army Material
<term>AR 755-1
<def><para>Disposal of Supplies and Equipment
</deflist>
</appendix>

<appendix>
<title>EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST
<indxflag ref1="Expendable/durable supplies and materials list">
<section><title>DUMMY SECTION
<para0><title>DUMMY TITLE
<para>DUMMY para
</section>
<section>

```
<title>INTRODUCTION
<!-- DGK:  This appendix has only one section.  Need to change
content of appendix    accordingly  put in dummy section to
parse-->
<para0 tocentry="0"><title>Scope
<para>This appendix lists expendable supplies and materials needed
to repair and overhaul the assemblies listed in this DMWR.  These
items are authorized to you by CTA-50-970, Expendable Items (Except
Medical, Class V, Repair Parts, and Heraldic Items.
<para0 tocentry="0"><title>Explanation of Columns

<para>
<seqlist numstyle="alphalc">
<item><para><emphasis emph="ul">Column (1) - Item
Number</emphasis>.  The number is assigned to the entry in the
listing and is referenced in the narrative instructions to identify
the material (e.g., "use cleaning
compound (item 1, appendix C).

<item><para><emphasis emph="ul">Column (2) - Level</emphasis>.
This column identifies the level of maintenance that requires the
listed items.  (D - Depot
Maintenance).

</seqlist>

<!--  skip to table C-1;  only doing items
2,5,6,7,12,13,14,16,17,19 which

were referenced in chapter 4  -->


<table id="tabc-1" frame="topbot" colsep="0" rowsep="0"
orient="port" pgwide="1">
<title>Expendable/Durable Supplies and Materials List
<tgroup cols="5" align="left">
<colspec colnum="1" align="center">
<colspec colnum="2" align="center">
<colspec colnum="4" colname="four">

<thead>
<row><entry>
(1)<brk>
Item No.

<entry>(2)<brk>
```

```
Level
<entry>(3)<brk>
National Stock Number
<entry>(4)<brk>
Description


<entry>(5)<brk>
U/M

<tbody>
<!--  Need to have ID available at the row or entry level to xref
to
      DGK added id to row element-->
<row><entry>2
<entry>D
<entry>6810-00-753-4993
<entry>Alcohol, isopropyl, (81348), TT-I-735
<entry>PT


<row><entry>5
<entry>D
<entry>7920-00-514-2417
<entry>Brush, acid swabbing, (81348), H-B-643
<entry>EA


<row><entry>6
<entry>D
<entry>7510-00-148-9817
<entry>Ink, black, (81348), TT-I-1795
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<entry>6810-00-281-2762
<entry>Methyl ethyl detone, technical (81348), TT-M-261
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<entry colname="four">Sand, river, abrasive (81349)
<entry>BG

<row><entry>13
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<entry>D
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<entry>Sand, silicon, (81349), MIL-G-9954
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<entry>Sealant, MIS 35708, Grade C
<entry>BT

<row><entry>16
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<entry>5345-00-598-8277
<entry>Stone, fine, (81348), P-D-680
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<row><entry>17
<entry>D
<entry colname="four">Walnut hulls (81349)
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<row><entry>19
<entry>D
<entry>
<entry>Varnish, MIL-T-152, Type II

</table>
</section>
</appendix>

<glossary>
<title>A
<deflist>
<term>ACCEPTANCE INSPECTION
<def><para>The examination and/or testing of material to determine acceptance to specified requirements set forth in purchase descriptions, contracts, and/or other criteria.

<term>ALLOY
<def><para>Amn identifies the level of maintenance that requires the listed items. (D - Depot

Maintenance).

</deflist>

<title>B
<deflist>
<term>BEND
<def><para>A force change in configuration due to wear, mutilation, or deterioration.
<term>BURR
<def><para>A protruding, ragged metal edge raised on a surface in drilling, shearing, etc.
</deflist>

</glossary>

<index>

<!-- DGK: this is called an authentication page...need structure for this

FOR THE COMMANDER
OFFICIAL:
JOHN C. BURLINGAME
Colonel, GS
Chief of Staff

ANTHONY W. HORTON
Acting Director
Maintenance Engr Dir
Missile Logistics Center

DISTRIBUTION: S

-->
</rear>
</doc>

A.2 Sample of Document Instance using the Maintenance Module DTD.

The document instance for DMWR 9-1440-453-1 *Depot Maintenance Work Requirement for Tow Missile Launcher, NSN 1440-01-167-7514, P/N 12295910* tagged in accordance with the maintenance module DTD is provided below. Comments about the development of the

document instance or problems encountered in the tagging process are indicated in the body of the document instance by the symbol designation <!-- _____ -->.

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<mim tmno="DMWR 9-1440-453-1" revno="0" chngno="0">
<maintwp level="Depot" wpno="04-01-00">
<title>TOW MISSILE MAINTENANCE
<wpsum>Disassembly, inspection, repair, and assembly.
<wpinfo>
<maintlvl level="depot">
<mtrlpart>
<name id="item04-01-00-2">Isopropyl Alcohol
<partno idref="item04-01-00-2">TT-I-735</partno>
<cageno idref="item04-01-00-2">(81348)</cageno>
<extref docno="Appendix D" pretext="Item 2">

<name id="item04-01-00-5">Swabbing acid brush
<partno idref="item04-01-00-5">H-B-643</partno>
<cageno idref="item04-01-00-5">(81348)</cageno>
<extref docno="Appendix D" pretext="Item 5">

<name id="item04-01-00-14">Sealant, MIS 35708
<partno idref="item04-01-00-14">Grade C</partno>
<extref docno="Appendix D" pretext="Item 14">


<name id="item04-01-00-16">Honing Stone
<extref docno="Appendix D" pretext="Item 16">


<name id="item04-01-00-18">Lockwire
<partno idref="item04-01-00-18">MS20995, NC20</partno>
<extref docno="Appendix D" pretext="Item 18">

<name id="item04-01-00-21">Conformal Coating
<partno idref="item04-01-00-21">MIL-I-46058A</partno>
<extref docno="Appendix D" pretext="Item 21">
</mtrlpart>

<ref>
<extref docno="TPS 1229395B">
<extref docno="MS33540" posttext="Practices for Safety Wiring and
                                  Cotter Pinning">
<extref docno="MIL-I-46058" posttext="Inspection System
                                  Requirements" >
<extref docno="MIL-S-45743" posttext="Soldering, Manual Type">
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<extref docno="MIL-W-8160" posttext="Wiring, Guided Missile">


<dwgreq>
<dwgno id="drwng04-01-00-1">122 93958
<dwgno id="drwng04-01-00-2">122 93897
<dwgno id="drwng04-01-00-3">122 93875
<dwgno id="drwng04-01-00-4">122 93858
<dwgno id="drwng04-01-00-5">122 93957
<dwgno id="drwng04-01-00-6">122 94188

</wpinfo>

<maintsk>

<disassem>
<proc>
<title>Armament Control Unit

<step1 id="step104-01-00-1" idref="fig0200" assocfig="fig0200">
<para>Disconnect cable assembly (4, fig. 4.1.1) from Armament
Control Unit (ACU) power connector.

<figure tocentry="0" id="fig0200" idref="step104-01-00-1">
<title>TML ASSEMBLY
<subfig>
<graphic boardno="MM000003.1A" idref="fig0200" graphsty="1">
</subfig>
<subfig>
<graphic boardno="MM000003.1B" idref="fig0200" graphsty="1">
</subfig>
</figure>

<step1 idref="fig0200">
<para>Remove ACU (5) by removing screws (6), lockwashers (7), and
flat washers (8).
<step1 id="step104-01-00-2" idref="fig0201" assocfig="fig0201">
<para>Remove cover (1, fig. 4.1.2) by
removing screws (2), lockwashers (3), and flat washers (4).

<figure tocentry="0" id="fig0201" idref="step104-01-00-2">
<title>TML ASSEMBLY
<subfig>
<graphic boardno="MM000004.1A" idref="fig0201" graphsty="1">
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<graphic boardno="MM000004.1B" idref="fig0201" graphsty="1">
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<subfig>
<graphic boardno="MM000004.1C" idref="fig0201" graphsty="1">
</subfig>
</figure>

<step1 idref="fig0201">

<para>Disconnect cable assembly (37) electrical connectors from circuit card assembly (51). Remove circuit card assembly (51) by removing screws (39), lockwashers (21), flat washers (28), and flat washers (40).

<step1 idref="fig0201">
<para>Remove setscrews (46) from universal joint (52).
Remove cotter pin (50) from pointer override (48). Remove pointer override (47).

<step1 idref="fig0201">
<para>Remove left and right link assemblies (14) by removing screws (26), lockwashers (10), and flat washers (27).

<step1 idref="fig0201">
<para>Remove screws (55) from block assembly (54).

<step1 idref="fig0201">
<para>Remove bearing unit housings (18) by removing screws (22), lockwashers (21), and flat washers (20).

<step1 idref="fig0201">
<para>Remove drive assembly (15) by removing screws (29), lockwashers (21), and flat washers (28).

<step1 idref="fig0201">
<para>Remove setscrews (16) from cable assembly (37). Remove drive assembly (15).

<step1 idref="fig0201">
<para>Remove universal joint (52) by removing setscrews (46).

<step1 idref="fig0201">
<para>Remove lock rod arm (30) by removing cotter pin (17), flat washer (4), and pin (31).

<step1 idref="fig0201">

<para>Remove power cable assembly (38) by removing jam nut (56).

<step1 idref="fig0201">
<para>Remove actuator switch springs (8) by removing screws (5), lockwashers (6), and flat washers (7).

<step1 idref="fig0201">
<para>Remove mounting spring blocks (12) by loosening screws (9).

<step1 idref="fig0201">
<para>Remove pins (24) by removing cotter pins (17) and flat washers (4) from pin crank (25).

<step1 idref="fig0201">
<para>Remove pins (19) by removing cotter pins (17) and flat washers (4) from pin crank (25).

<step1 idref="fig0201">
<para>Remove pin assemblies (13) from link assembly (14).

<step1 idref="fig0201">
<para>Remove pins (24) by removing cotter pins (17) and flat washers (4) from umbilical crank (23).

<step1 idref="fig0201">
<para>Remove cotter pins (17), washer (4), and pins (24) from umbilical crank (23).

<step1 idref="fig0201">
<para>Remove pin (19) by removing cotter pin (17) and flat washer (4).

<step1 idref="fig0201">
<para> Remove umbilical crank (23).

<step1 idref="fig0201">
<para>Remove switches (60 and 61) by removing screws (5), lockwashers (6), and flat washers (35).

<step1 idref="fig0201">
<para>Remove switches (62 and 63) by removing screws (57), lockwashers (58), and flat washers (59).

<step1 idref="fig0201">
<para>Disconnect power plug from drive assembly (15).

<step1 idref="fig0201">
<para>Remove mounting block (54) and bearing (53) from drive assembly (15).
</proc>

<proc>
<title>Structure Assembly Launcher

<step1 idref="fig0200">
<para>Remove input cable assembly (4, fig. 4.1.1) by removing screws (1), lockwashers (2), and flat washers (3). Remove screws (13), lockwashers (12), and flat washers (11).

<step1 id="step104-01-00-3" idref="fig0202" assocfig="fig0202">
<para>Remove missile stops (23, fig. 4.1.3) by removing screws (22) and flat washers (7).

<figure id="fig0202" idref="step104-01-00-3">
<title>Structure Assembly Launcer
<subfig>
<graphic boardno="MM000005.1A" idref="fig0202" graphsty="1">
</subfig>
<subfig>
<graphic boardno="MM000005.1B" idref="fig0202" graphsty="1">
</subfig>
</figure>

<step1 idref="fig0202">
<para>Remove latch bracket (6) by removing screws (8) and flat washers (7).

<step1 idref="fig0202">
<para>Remove latch (18) by removing screw (17), flat washers (7), spring (16), cotter pin (15), flat washer (14), and pin (19).

<step1 idref="fig0202">
<para>Remove handle (13) by removing cotter pin (15), flat washer (14), and pin (19). Remove pin (20) by removing setscrews (21).

<step1 idref="fig0202">
<para>Remove bellcrank actuators (31 and 32) by removing cotter pins (15), flat washers (14), pins (36), screws (34), lockwashers (35), flat washers (7), and pillow block bearings (33).

<step1 idref="fig0202">
<para>Remove actuator couplers (9) through rear opening of housing (1) by rotating actuators 180 degrees.

<step1 idref="fig0202">
<para>Remove mechanical post (11) and eye bolt (12) by loosening jam nut (10).

<step1 idref="fig0202">
<para>Remove idler arms (40) by removing retaining rings (41). Remove idler arm pivots (44) by removing screws (42) and flat washers (43).

<step1 idref="fig0202">
<para>Remove adjustment blocks (46) by removing screws (48), lockwashers (49), flat washers (14), and pins (50).

<step1 idref="fig0202">
<para>Remove adjusting pads (52) by removing nuts (51).

<step1 idref="fig0202">
<para>Remove pin spacer (25) by removing nut (27), flat washer (26), and screw (24).

<step1 idref="fig0202">
<para>Remove lock rod (4) and spring (3) by removing retaining ring (2).

<step1 idref="fig0202">
<para>Remove idler arms (39) by removing cotter pin (15), flat washer (14), pin (28), press out pin spacer (30), and sleeve (29).
</proc>
</disassem>

<acptrejinsp>
<proc>
<step1>
<para>Used components and refinished parts recovered as products of disassembly will be inspected one hundred percent by the contractor or depot to determine serviceability.

<step1>
<para>Areas that require inspection include, but are not limited to:

<step2>
<para parahead="Hardware">Inspect screws, bolts, nuts, washers, snap rings, rivets, dowel pins etc., for corrosion, thread damage, proper locking devices, rust, breaks, burrs and abrasions. Parts must be free of defects which would degrade the corrosion resistance or function.

<step2>
<para parahead="Assemblies">Inspect assemblies for cracks, dents, breaks, enlarged holes, bends, etc. No defects are allowed that would degrade the strength of the metal or corrosion resistant coating.

<step2>
<para parahead="Finishes">Inspect for proper color, chips, scratches, peeling, blisters and general condition. Finish will be the proper color and will be free of defects which would degrade the corrosion resistance of the parts inspected. Touch-up of the finish, whether it be painted or chemical, is acceptable if the affected area does not exceed ten percent of the total area.

<step2>
<para parahead="Springs">Inspect springs for wear, distortion, breaks and loss of tension or compression. Discard defective springs.

<step2>
<para parahead="Data Plates">Inspect for improper installation, incorrect information, or other damage. No defects allowed.

<step2>
<para parahead="Lettering and Placarding">All lettering and placarding must be clearly legible.

<step2>
<para parahead="Shafts">Shafts will be inspected for excessive wear, bending, scores, cracks and burrs. No defects allowed.

<step3>
<para>Inspect all castings for breaks, cracks, wear or scoring that would impair serviceability.

<step3>
<para>Inspect mounting faces for nicks, scratches, and scores. Minor defects will be removed with small file or soft honing stone

<xref xrefid="item04-01-00-16" xidtype="text">.

<step3>
<para>Inspect all threaded parts for damaged threads.
</proc>
</acptrejinsp>

<repair-rplc>
<proc>
<step1>
<para>All soldering must be accomplished in accordance with <extref docno="MIL-S-45743">MIL-S-45743.

<step1>
<para>All repairs to wiring must be accomplished in accordance with <extref docno="MIL-W-8160">MIL-W-8160.

<step1>
<para>All wiring and component configuration must conform to drawings 12293958, 12293897, 12293875, 12293957, and 12294188.

<step1>
<para>Repair circuit card and/or printed wiring board as outlined below.
<step2>
<specpara>
<caution>
<para>Use extreme caution during removal of conformal coating. Excess heat could severely damage parts, printed conductors, or pads.</caution>
<para>Removal of conformal coating.
</specpara>
<step3>
<para>Using a heated tip, apply heat to work area and, with the aid of a soft edged tool (nylon, teflon, or orange wood), use light pressure to remove softened or overcured coating.

<step3>
<para>Use low pressure air or bristle brush
<xref xrefid="item04-01-00-5" xidtype="text"> to remove waste material during the parting process to allow good visual access.

<step3>
<para>Remove sufficient amount of conformal coating to effect part

separation from board and to expose the solder junction areas on both sides of board.

<step3>
<para>It is permissible to leave the small trench or cradle of conformal coating from which part and part leads are lifted provided the replacement part is identical in physical shape.

<step2>
<para>Removal of defective electronic parts.

<step3>
<specpara>
<caution>
<para>Do not apply pressure with tools to area of plated through-holes. Pressure can cause dimpling and separation of pad from board.
</caution>
<para>If a part has leads that can be cut between the part and solder junction, remove as follows:
</specpara>

<step4>
<para>Cut leads on component side of board.

<step4>
<para>Remove part from conformal coating or epoxy by applying heated tip
or heated air and carefully rocking component free from softened coating or epoxy.

<step4>
<para>Straighten leads and wick or vacuum solder from both sides of junction. Remove by applying soldering iron to end of lead and pulling lead free with tweezers.

<step4>
<para>Clean junction of all flux residue using isopropyl alcohol <xref xrefid="item04-01-00-2" xidtype="text">.

<step3>
<para>If a part has leads that cannot be cut between part and soldered connections, proceed as follows:

<step4>
<para>Wick or vacuum off solder from each printed wire pad and lead. If leads are clinched, carefully straighten using a soldering aid tool.

<step4>
<para>Alternately wick and/or vacuum extract solder from each lead or part until all leads are free.

<step4>
<para>After the part is free, wick or vacuum solder from both sides of junctions. Conformal coating, flux residue, and solder can be removed from plated through-holes by using a short length of correct size buss wire and hot tweezers to ream or clean residue from hole.

<step4>
<para>Clean junctions with isopropyl alcohol
<xref xrefid="item04-01-00-2" xidtype="text">.

<step2>
<para>Installing replacement electronic parts.

<step3>
<para>Clean repair area with isopropyl alcohol
<xref xrefid="item04-01-00-2" xidtype="text">.

<step3>
<para>Position replacement part in place. If part is polarized, make sure it is correctly oriented in the designated direction. Leave part identification, either value or part number, visible.

<step3>
<para>Solder and secure part to board in same position as the part was removed.

<step3>
<para>Restore any obliterated markings.

<step3>
<specpara>
<note>
<para>Some components require epoxy bonding. Follow manufacturer's instructions for application and curing.

</note>
<para>Clean repaired area and apply epoxy cement
<xref xrefid="item04-01-00-21" xidtype="text">.
</specpara>

<step2>
<para>Repairing lifted printed conductor. To repair a printed conductor other than pads or connector tabs, which has lifted from the board after soldering but is not broken proceed as follows:

<step3>
<para>Clean area at lifted conductor. Check that area under lifted conductor is free of foreign material.

<step3>
<para>Prepare epoxy cement
<xref xrefid="item04-01-00-21" xidtype="text"> per manufacturer's instructions.

<step3>
<para>Carefully force the epoxy cement under the lifted conductor. Press the conductor down to teh board and spread the excess epoxy, forming a smooth layer over the lifted conducotr and adjacent area on the board.

<step3>
<para>Cure epoxy cement per manufacturer's instructions.

<step3>
<para>Clean repaired area with isopropyl alcohol
<xref xrefid="item04-01-00-2" xidtype="text">.

<step2>
<para>Repairing damaged printed conductors. A damaged conductor may have a break, scratches, nicks, or pin holes which reduce the cross sectional area. Repairs shall be limited to two per conductor and not more than five repairs per circuit card. Repair a damaged conductor in areas other than pads as follows:

<step3>
<para>Repair a break in a circuit run that does not exceed 0.010 inch (.25 mm) in length by solder bridging in a manner that will not leave any indetnation in the solder coat over the circuit run.

Clean area with isopropyl alcohol
<xref xrefid="item04-01-00-2" xidtype="text">.

<step3>
<para>Repair a break in a circuit run that exceeds 0.010 inch (.25 mm) by using either a No. 24 tinned buss wire or an equivalent conductor from a donor board. Circuit runs must overlap a maximum of .063 inch (1.6 mm) at the solder junction for either the buss wire or the replacement run from the donor board. Clean area of repair. Coat repaired runs with epoxy cement
<xref xrefid="item04-01-00-21" xidtype="text"> if repaired circuit exceeds .500 inch (12.7mm) in length.

<step2>
<para>Repairing lifted pads (terminal areas). Repairs must be made if the lifting or separation exceeds a distance equal to or greater than one-half the distance from the interface of the hole to the nearest edge of the pad area, and the lifting or separation extends more than 180 degrees around periphery of pad. This repair is limited to pads that are not broken from conductors.

<step3>
<para>To repair a lifted pad to which a part lead is properly soldered, proceed as follows:

<step4>
<para>Clean lifted pad and adjacent area. Carefully check that the area under lifted portion of pad is free of foreign material.

<step4>
<para>Prepare epoxy cement
<xref xrefid="item04-01-00-21" xidtype="text"> or
equivalent per manufacturer's instructions.

<step4>
<para>Force epoxy cement under lifted portion of pad. Press pad down to board, spreading the excess epoxy to form a smooth layer on the lifted pad and adjacent area of the board.

<step4>
<para>Cure epoxy cement per manufacturer's instructions. If necessary, clamp pad and part lead to board during cure.

<step4>
<para>Clean area of repair.

<step3>
<para>To repair a pad lifted from a board which does not have a part lead soldered to it, repeat the above procedures ~~except~~ do not spread the layer of epoxy over the pad. The pad must be left free of epoxy for subsequent soldering.

<step2>
<para>Replacing missing circuit pads.

<step3>
<para>Remove sufficient conformal coating material to expose board areas to accommodate replacement pad and at least .063 inch (1.60 mm) of circuit run in instances where the missing pad was attached to a continuing circuit.

<step3>
<para>Remove from a donor board an equivalent size pad and a sufficient length of the attached circuit run, if required, to permit a minimum of .063-inch (1.60 mm) overlap over the continuing circuit run when pad is positioned on the board to be repaired. Remove all traces of adhesive on the circuit run attached to the replacement pad. All exposed copper shall be tinned.

<step3>
<para>Position pad on board and, maintaining pad firmly against board, solder pad to part lead or connector pin. Solder circuit run to continuing run as required. Clean repaired area.

<step2>
<specpara>
<para>Application of conformal coating.
<note>
<para>Refer to MIL-I-46058 for application of conformal coating.
</note>
</specpara>
<step3>
<para>Clean repaired areas by scrubbing with clean, unused ispropyl alcohol <xref xrefid="item04-01-00-2" xidtype="text"> and soft bristle brush <xref xrefid="item04-01-00-5" xidtype="text">. Clean a second time in the same manner.

<step3>
<para>Mask off adjacent areas that are not to be coated. Be sure

that connector mating areas, adjustable protions of parts and mechanical mating surfaces or brackets, screws, and fasteners that were not previously coated are masked.

<step3>
<para>Dehumidify board at 150 to 170°F (66-77°C) for not less than 30 minutes in an air circulating oven.
<step3>
<para>Remove board from oven and cool to room temperature.

<step3>
<para>Prepare epoxy cememt
<xref xrefid="item04-01-00-21" xidtype="text"> per manufacturer's instructions.

<step3>
<para>Brush or spray coating on repaired area.

<step3>
<para>Air dry for 10 minutes at room temperature.

<step3>
<para>Place board in oven and cure at 150 to 170° (66 to 77°C) for approximately 90 minutes.

<step3>
<para>Remove board from oven. It has now cured to handling strength.

<step3>
<para>If any axially mounted parts require fillets of coating, repeat steps (4c) through (4h(8)).

<step3>
<para>Remove masking tape.

<step3>
<para>Clean board and remove masking tape residue using clean, unused isopropyl alcohol
<xref xrefid="item04-01-00-2" xidtype="text">.

<step3>
<para>Test circuit card using Test Program Set (TPS) 12293958.

<step3>
<para>Store in a transparent bag.

</proc>
</repair-rplc>

<assem>
<proc>
<title>Armament Control Unit
<step1 idref="fig0201">
<para>Install mounting block (54, fig. 4.1.2) and
bearing (53) into drive assembly (15).

<step1 idref="fig0201">
<para>Connect drive assembly (15) power plug to cable assembly (34)
J6.

<step1 idref="fig0201">
<para>Install switches (62 and 63) on drive assembly (15) by
installing screws (57), lockwashers (58), and flat washers (59).
Refer to electrical control switch adjustments. Torque screws (57)
to 6'2 in. - lbs. (.45 to .90 N·m).

<step1 idref="fig0201">
<para>Install switches (60 and 61) on link assemblies (14) by
installing screws (5), lockwashers (6), and flat washers (35).
Torque screws (5) to 6 ± 2 in.-lbs. (.45 to .90
N·m).

<step1 idref="fig0201">
<para>Install umbilical crank (23) by installing pins (19), washer
(4), and cotter pin (17).

<step1 idref="fig0201">
<para>Install link assemblies (14) on umbilical crank (23) by
installing pins (24), washers (4), and cotter pins (17).

<step1 idref="fig0201">
<para>Install pin assemblies (13) into link assemblies (14).

<step1 idref="fig0201">
<para>Install pin crank (25) by installing pin (19),
flat washers (4), and cotter pin (17).

<step1 idref="fig0201">
<para>Install pin crank (25) by installing pins (24), flat

washers (4), and cotter pins (17).

<step1 idref="fig0201">
<para>Install mounting spring blocks (12) on pin assemblies (13). Set spring blocks level, tighten screws (9) to clamp mounting spring blocks to pin assembly shafts. Refer to electrical control switch adjustments. Torque screws (9) to 26 ± 2 in.-lbs (2.71 to 3.16 N·m).

<step1 idref="fig0201">
<para>Install universal joint (52) by installing setscrews (46). Torque set screw (46) to 55 ± 5 in.-lbs (5.65 to 6.78 N·m).

<step1 idref="fig0201">
<para>Install lock rod arm (30) into actuator housing (36) by installing pin (31), washer (4), and cotter pin (17).

<step1 idref="fig0201">
<para>Install power cable assembly (38) into actuator housing (36) by installing jam nut (56). Torque jam nut (56) to 60 to 65 in.-lbs (6.78 to 7.36 N·m).

<step1 idref="fig0201">
<para>Install drive assembly (15) into actuator housing (36).

<step1 idref="fig0201">
<specpara>
<note>
<para>Shaft at rear of pointer override shaft must be alined with slot in lock rod arm.</note>

<para>Install bearing unit housings (18) by installing screws (22), lockwashers (21), and flat washers (20). Finger tighten.
</specpara>

<step1 idref="fig0201">
<para>Install setscrews (16) using sealer
<xref xrefid="item04-01-00-14" xidtype="text"> on cable assembly (37) and motor power cable on
actuator housing (36).

<step1 idref="fig0201">
<para>Install screws (29) using sealer
<xref xrefid="item04-01-00-14" xidtype="text">, lockwashers (21),

and flat washers (28) on drive
assembly (15). Finger tighten.

<step1 idref="fig0201">
<para>Install screws (26) using sealer
<xref xrefid="item04-01-00-14" xidtype="text">, lockwashers (10),
and flat washers (27) on link
assembly (14).

<step1 idref="fig0201">
<para>Install screws (55) on mounting block (54).

<step1 idref="fig0201">
<para>Torque screws (22 and 29) to 16 ±
2 in.-lbs (1.58 to 2.01 N·m).

<step1 idref="fig0201">
<para>Install pointer override shaft (48) by installing pointer
override (47), setscrews (46) using sealer
<xref xrefid="item04-01-00-14" xidtype="text">, and spring washer
(45) on pointer override (48).
Install pointer override (48) through arm-safe shaft hole on
actuator housing (36).

<step1 idref="fig0201">
<para>Install pointer override (48) on universal joint (52).
Torque setscrews (46) to 55 ± 5 in.-lbs (5.65 to 6.78
N·m).

<step1 idref="fig0201">
<para>Set override pointer to SAFE position. Torque setscrews (46)
to 55 &plusmn 5 in.-lbs (5.65 to 6.78 N·m).

<step1 idref="fig0201">
<para>Install actuator switch springs (8) by installing screws (5),
lockwashers (6) and flat washers (7) on mounting spring blocks
(12). Torque screws (5) to 6 ± 2 in.-lbs (.45 to .90
N·m).

<step1 idref="fig0201">
<para>Install circuit card assembly (51) by installing screws (39),
lockwashers (21), flat washers (28) and flat washers (40). Torque
screws (39) to 10 to 12 in.-lbs. (1.13 to 1.36 N·m).

<step1 idref="fig0201">
<para>Install cable assembly (37) electrical connectors to circuit

card (51).

<step1 idref="fig0201">
<para>Connect plug (4) to Armament Control Unit (ACU) power connector.
</proc>

<proc>
<title>Structure Assembly Launcher

<step1 idref="fig0201">
<para>Press pin spacer (30, fig. 4.1.2) into right center of launcher housing (1). Install right idler arm (39) on pin spacer (30). Install spacer sleeve (29) on pin spacer (30). Install left idler arm (39) on pin spacer (30).

<step1 idref="fig0201">
<para>Press pin spacer (30) into left center of launcher housing. Align holes in spacer sleeve (29) and pin spacer (30). Install pin (28), flat washer (14), and cotter pin (15).

<step1 idref="fig0201">
<para>Install lock rod (4) and spring (3) by installing retaining ring (2).

<step1 idref="fig0201">
<para>Install pin spacer (25) by installing screw (24), flat washer (26), and nut (27). Torque screw to 25 to 30 in.-lbs. (2.83 to 3.39 N·m). Safety wire screw (24) and nut (27) in accordance with MS33540 using lock wire MS20995-NC20.

<step1 idref="fig0201">
<para>Install adjusting pads (52) into housing (1). Install nuts (51).

<step1 idref="fig0201">
<para>Install setscrews (47) and nuts (45) on adjustment blocks (46).

<step1 idref="fig0201">
<para>Install adjustment block (46) by installing pins (50), screws (48) using sealer <xref xrefid="item04-01-00-14" xidtype="text">, lockwashers (49), and flat washers (14). Torque screws to 25 to 30 in.-lbs. (2.83 to 3.39 N·m).

<step1 idref="fig0201">
<para>Install idler arm pivots (44) by installing screws (42) and flat washers (43). Torque screws to 15 to 18 in.-lbs. (1.70 to 2.03 N·m) Safety wire screws in accordance with MS33540 using lockwire MS20995-NC20.

<step1 idref="fig0201">
<para>Install idler arms (40) by installing retaining rings (41).

<step1 idref="fig0201">
<para>Install mechanical post (11), jam nuts (10), and eye bolts (12) on actuator couplers (9).

<step1 idref="fig0201">
<para>Install actuator couplers (9) through rear opening of launcher housing.

<step1 idref="fig0201">
<para>Install bellcrank actuators (31 and 32) by installing pillow block bearings (33), flat washers (7), lock washers (35), and screws (34). Torque screws to 60 to 65 in.-lbs. (6.78 to 7.36 N·m). Connect bellcrank actuators (31 and 32) to actuator couplers (9) by installing pins (36), flat washers (14), and cotter pins (15).

<step1 idref="fig0201">
<para>Install handle (13) by installing pin (19), flat washer (14), and cotter pin (15). Install pin (20) and set screws (21). Torque set screws to 15 to 18 in.-lbs. (1.70 to 2.03 N·m).

<step1 idref="fig0201">
<para>Install latch (18) by installing pin (19), flat washer (14), and cotter pin (15). Install spring (16), flat washer (7), and screw (17).

<step1 idref="fig0201">
<para>Install latch bracket (6) by installing flat washers (7) and screws (8) using sealer
<xref xrefid="item04-01-00-14" xidtype="text">.
Torque screws to 60 to 65 in.-lbs. (6.78 to 7.36 N·m).

<step1 idref="fig0201">
<para>Adjust latch and handle as follows:

<step2>
<para>Place handle in locked position.

<step2>
<para>Loosen jam nut (10) tow places to free movement of mechanical post (11).

<step2>
<para>Finger tighten mechanical post (11) two places until latch is firmly seated against latch bracket (6).

<step2>
<para>Tighten mechanical post (11) two places, an additional half-turn counterclockwise while facing the front of the launcher.

<step2>
<para>Torque jam nuts (10) to 225 to 235 in.-lbs. (25.40 to 26.46 N·m).

<step2>
<para>Safety wire jam nuts (10), mechanical posts (11), and eye bolts (12) using safety wire MS20995-NC20.

<step2>
<para>Torque screw (17) to 15 to 18 in.-lbs. (1.780 to 2.03 N·m).

<step1 idref="fig0201">
<para>Install missile stops (23) by installing flat washers (7) and screws (22) using sealer
<xref xrefid="item04-01-00-14" xidtype="text">. Torque screws to 60 to 65 in.-lbs. (6.78 to 7.36 N·m).

<step1 idref="fig0200">
<para>Install input cable assembly (4, fig. 4.1.1)
by installing flat washers (11), lockwashers (12), and screws (13).

Install flat washers (3), lockwashers (2), and screws (1). Torque screws (1) to 2 to 2.5 in.-lbs. (.23 to .315 N·m). Torque screws (13) to 15 to 18 in.-lbs. (1.70 to 2.03 N·m).

<step1 idref="fig0200">
<para>Safety wire screws (13) in accordance with MS33540 using lockwire <partno>MS20995-NC20</partno>.

</proc>
</assem>
</maintsk>
</maintwp>
</mim>

APPENDIX B

DOCUMENT INSTANCE SAMPLES FOR AIR FORCE PRIMARY VENT VALVE, DMM PTO 6J15-8-136-3

This appendix provides two samples of the document instances for Air Force Depot Maintenance Manual (DMM) PTO 6J15-8-136-3, *Primary Vent Valve, P/N 5710110-101.* The first sample reflects a document instance tagged in accordance with the DTD requirements contained in MIL-M-28001B, *Markup Requirements and Generic Style Specification for Electronic Printed Output and Exchange of Text, Draft*, dated 13 December 1991.

The second sample reflects a document instance tagged in accordance with the maintenance modular DTD, and contains only the maintenance portions of PTO 6J15-8-136-3.

B.1 Sample of Document Instance in Accordance with MIL-M-28001B DTD Requirements.

Provided below is the document instance for Air Force Depot Maintenance Manual (DMM) PTO 6J15-8-136-3, *Primary Vent Valve, P/N 5710110-101* tagged in accordance with the DTD requirements contained in MIL-M-28001B. Comments about the development of the document instance or problems encountered in the tagging process are indicated in the body of the document instance by the symbol designation <!-- _____ -->.

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<front>
<idinfo>
<pubno>
<user>PTO</user>
<docno>6J15-8-136-3</docno>
</pubno>
<titleblk>
<!-- DGK:  no way to tag this text
SEQUENTIAL COPY
No. 1 of 4 Copies
in conforming or template-->

<doctype>Maintenance
<maintlvl>Depot
<prtitle>
<nomen>Overhaul Instructions<brk>
With Illustrated Parts Breakdown</nomen>
<eqpttype>PRIMARY VENT VALVE</eqpttype>
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<partno>5710110-101</partno>
</prtitle>
</titleblk>
<mfr>Parker Hannifin<brk>
Systems Division
<contractno>F33657-81-C-0210
<docmfr>Technology Applications, Inc.
<!-- no way to tag this contractno after the docmfr
F33657-86-D-0074
-->
<notice notctype="dist"><para>Distribution authorized to U.S. Government agencies only (Administrative or Operational Use) (15 November 1990). Other requests for this document shall be referred to ASD/B1LHT, Wright-Patterson AFT, Ohio 45433-6503.
<notice notctype="warning">
<para>This document contains technical data whose export is restricted by the Arms Export Control Act (Title 22, U.S.C., Sec 2451 et. seq.) of Executive Order 12470. Violations of these Export Laws are subject to severe criminal penalties.
<notice notctype="destr">
<para>For classified documents, follow the procedures in DoD 5200.22-M, Industrial Security Manual, Section II-19 or DoD 5200.1-R, Information Security Program Regulation, Chapter IX. For unclassified, limited documents, destroy by any method that will prevent disclosure of contents or reconstruction of the document.

<notice notctype="auth">
<para>Published under authority of the Secretary of the Air Force

<pubdate>15 NOVEMBER 1990
</idinfo>
<lep>
<!-- DGK: no way to tag these pages with conforming 28001b
or template
Technical Order Verification Planning Data
Technical Order Verification Status Page -->

<contents>
<illuslist>
<tablelist>
<!-- DGK: No element to tag the TCTO List in conforming or template dtd -->
<safesum>
<!-- DGK: no way to tag headings with model of safesum in conforming or template

DEFINITIONS
-->
<para>The following definitions apply to WARNINGS and CAUTIONS found throughout this publication.
<warning>
<para>
An operation or maintenance procedure, practice, condition statement, etc. which, if not strictly observed, could result in injury, death, or long term health hazards to personnel.
</warning>
<caution>
<para>An operating or maintenance procedure, practice, statement, etc. which, if not strictly observed, could result in damage destruction of equipment, or loss of mission effectiveness.
</caution>
<precaut>
<!-- DGK:no way to tag the heading
GENERAL PRECAUTIONS
-->
The following are general safety precautions that are not related to any specific procedure and therefore do not appear elsewhere in this publication. These are recommended precautions that personnel shall understand and apply during many phases of operation and maintenance.
<precaut>
<!-- DGK: no way to tag the heading
GIVE CLEANERS/CHEMICALS SPECIAL CARE
-->
Keep in approved containers and in minimum quantities. Some cleaners/chemicals may have an effect on skin, eyes, and respiratory tract. Observe manufactures WARNING labels and current safety directives. Deposit used cleaning cloths into safety cans. Unless otherwise indicated in the text, use as described in this TO should not result in any immediate health concerns. Consult the local Bioenvironmental Engineer for specific protective equipment and ventilation requirements.
<precaut>
<!-- DGK: no way to tag the heading
USE SAFETY APPROVED EQUIPMENT
-->
When cleaners and primers are being applied, approved explosion-proof lights, blowers, and other equipment shall be used. Ensure that firefighting equipment is readily available and in working order.
<warning>
<para>Cleaning solvent is toxic to skin, eyes, and respiratory

tract.
Skin and eye protection are required. Avoid repeated or prolonged contact. Good general ventilation is normally adequate.

<para>A spring-loaded mechanism can cause injury if released in an uncontrolled manner. Always take extra care when disassembling/assembling this type mechanism.

<para>Epoxy polyamide primer is highly toxic to eyes, skin, and respiratory tract. Eye and skin protection required. Good general ventilation is normally adequate.

<para>Use of compressed air can create an environment of propelled foreign particles that may enter the eyes. Eye protection required. Maximum pressure used shall not exceed 30 psi.
</warning>
<!-- DGK: introduction is out of order. precedes contents in conforming dtd
NOT A PROBLEM IN TEMPLATE-->
<intro>
<para0>
<title>PURPOSE AND SCOPE

<para>This manual contains overhaul maintenance instructions and an illustrated parts breakdown for the primary vent valve, 5710110.

<!-- DGK: only one para0 allowed in template dtd -->
<!--
<para0>
<title>ILLUSTRATED PARTS BREAKDOWN

<para>Introductory material for the illustrated parts breakdown for this
manual can be found in Chapter 10.

<para0>
<title>IMPROVEMENT REPORTS

<para>Recommendations for improvements to this Preliminary Technical
Order will be submitted on AFTO Form 27, Publication Change Request, in accordance with TO 00-5-1. Completed Forms will be forwarded to the B1-B Technical Order Control Unit (TOCU), 6510 MSUG/OL-AH, Dyess AFB, TX 79607-5000. Bases or sites not supported by the TOCU will forward action copies of the forms to the Central

Technical Order Control Unit (CTOCU), 6510 MSUG/MAV-9, Edwards AFB, CA 93523-5000.

<para0>
<title>LIST OF TECHNICAL MANUALS

<para>The following technical manuals are referenced in this manual:
<deflist>
<term>TO 33-D7-25-38-1
<def><para>Operation and Maintenance Instructions, Valve Test Console Assembly

<term>TO 1-1-2
<def><para>Corrosion Prevention and Control for Aerospace Equipment

<term>TO 1-1A-8
<def><para>Engineering Manual Series, Aircraft and Missile Repair, Structural Hardware

<term>TO 00-25-195
<def><para>Source, Maintenance, and Recoverability Coding of Air Force Weapons, Systems, and Equipment
</deflist>

<para0>
<title>ABBREVIATIONS/ACRONYMS/SYMBOLS

<para>For definitions of standard abbreviations and acronyms used throughout this manual, refer to MIL-STD-12(). Nonstandard abbreviations, acronyms, and symbols used in this manual are defined below:
<deflist>
<term>CCM
<def><para>Cubic centimeters/minute
<term>GN2
<def><para>Nitrogen gas
<term>>
<def><para> Greater than
<term><
<def><para>Less than
</deflist>

-->
</front>
<body>

<chapter>
<title>GENERAL INFORMATION

<para0>
<title>GENERAL
<para>This chapter provides general information about the primary vent valve, 5710110, including description, theory of operation, and leading particulars.
<para0>
<title>DESCRIPTION

<para>The primary vent valve <xref xrefid="fig1-1" xidtype="figure"> is a tubular housing containing a pressure sensitive diaphragm assembly. The tubular housing consists of an inlet duct, main housing assembly, cover assembly, and an actuation port. The primary vent valve, located in the aft fuel tank, acts to equalize fuel tank pressure with atmospheric pressure by admitting ambient air or exhausting fuel tank vapor. The primary vent valve is actuated by engine bleed air.

<para0>
<title>THEORY OF OPERATION
<para>Figure 1-2 shows the primary vent valve operation

<para>The primary vent valve is a device that equalizes internal fuel
tank pressure with external atmospheric pressure. The primary vent valve admits ambient air to, or exhausts fuel vapor from the fuel tanks to maintain pressure equalization. In the normally closed portion the primary vent valve retains the vapor in the liquid fuel storage tanks. When the pressure differential is within limits, engine bleed air is supplied to close the primary vent valve. When the pressure differential limits are exceeded pilot valves, sensing tank and atmospheric pressure differential, remove bleed air flow the primary vent valve. Removing bleed air pressure enables the primary vent valve to open,. This allows tank pressure to return to the pressure differential limits by exhausting fuel vapor or by taking in air. When the pressure differential returns to the prescribed limits, bleed air is again applied through pilot valves to close the primary vent valve.

<para0>
<title>LEADING PARTICULARS

<para>Table 1-1 provides the maintenance technician with a quick reference to significant general data relating to the primary vent

valve. Specific information required for maintenance or repair actions are provided in their respective chapter, test, or table.

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<colspec colnum="2" colwidth="12pi">
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<entry>DATA
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<row><entry>Weight<!-- DGK:  charfill handled in FOSI -->
<entry>8.5 pounds

<row><entry>Length
<entry>22.5 inches

<row><entry>Diameter
<entry>10.75 inches
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<figure id="fig1-1">
<title>Primary Vent Valve
<graphic boardno="xyz">
</figure>
<figure id="fig1-2">
<title>Primary Vent Valve Operation
<graphic boardno="abc">
</figure>
</chapter>
<chapter>
<title>SUPPORT EQUIPMENT AND LIST OF CONSUMABLES
<para0>
<title>GENERAL
<para>This chapter lists all the support equipment and consumables
required for testing and maintaining the primary vent valve.

<para0>
<title>SUPPORT EQUIPMENT

<para>Table 2-1 lists the support equipment with their part numbers
and type designation required for testing and maintaining the primary
vent valve.  Common tools, such as screwdrivers, pliers, and
wirecutters are not listed.
```

<para>These items are authorized support equipment required to perform
the prescribed maintenance procedures. Use of authorized alternate parts is approved unless the restriction "NO SUBSTITUTIONS AUTHORIZED" appears in the "PART NUMBER" column. When "NO SUBSTITUTIONS AUTHORIZED" is specified, only the specified item shall be used. <xref xrefid="tab2-1" xidtype="table">
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<colspec colnum="3" colname="three" colwidth="9pi">
<colspec colnum="4" colname="four" align="center" colwidth="6pi">
<colspec colnum="5" colname="five" colwidth="9pi">
<thead>
<row rowsep="1">
<entry align="left">PART NUMBER
<entry>NOMENCLATURE
<entry>TYPE DESIGNATION
<entry>FSCM
<entry align="center">APPLICATION
<tbody>
<row>
<entry>PB6-1000
<entry>Spring Tester
<entry colname="four">36403
<entry>Test Spring

<row>
<entry>291500-1
<entry>Valve Test Stand
<entry colname="four">99193
<entry>Used for testing primary vent valve pressure limits
</table>
<para0>
<title>CONSUMABLES

<para>Table 2-2 provides a list of consumables for cleaning, repairing, and assembling the primary vent valve.

<para>Consumable materials are expendable items and supplies consumed during component maintenance. All consumables not identified in the illustrated parts breakdown (IPB) chapter are listed in the list of consumables, Table 2-2. Use of authorized

alternate parts is approved unless the restriction "NO
SUBSTITUTIONS AUTHORIZED"
appears in the "PART NUMBER" column. When "NO SUBSTITUTIONS
AUTHORIZED" is specified, only the specified item shall be used.
<xref xrefid="tab2-2" xidtype="table">

<para>In the text of this manual, consumables will be referenced by
their index number.

<para0>
<title>LOCAL MANUFACTURED ITEMS

<para>There are no local manufactured items required.

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<colspec colnum="2" colname="two" colwidth="11pi">
<colspec colnum="3" colname="three" colwidth="10pi">
<colspec colnum="4" colname="four" colwidth="8pi">
<colspec colnum="5" colname="five" align="center" colwidth="7pi">
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<row rowsep="1">
<entry align="left">INDEX NO.
<entry>NOMENCLATURE
<entry align="center">PART NUMBER
<entry>SPECIFICATION
<entry>FSCM
<tbody>
<row>
<entry>1
<entry>Cloth, Crocus
<entry>A-A-1200
<entry>P-C-451
<entry>58536

<row>
<entry>2
<entry>Epoxy Primer
<entry colname="four">MIL-P-23377C
<entry>81348

<row>
<entry>3

<entry>Polyethylene, 4-mil
<entry colname="four">PPP-C-795, Class I
<entry>81348

<row>
<entry>4
<entry>Solvent
<entry>P-D-680, Type II
<entry>MIL-C-38736
<entry>81348

<row><entry>5
<entry>Nitrogen
<entry colname="four">BB-N-411
<entry>81348
</table>
</chapter>
<chapter>
<title>DISASSEMBLY
<para0>
<title>GENERAL
<para>This chapter provides information on any special procedure that
must be performed prior to inspection, repair, or replacement of parts. This chapter covers the following subject matter:
<randlist>
<item><para>Removal from shipping container
<item><para>External Inspection
<item><para>Disassembly
</randlist>
<para0>
<title>REMOVAL FROM SHIPPING CONTAINER

<para>No special unpacking procedures are required other than retention
of the shipping container and all reusable packing, bagging, shipping material, and undamaged caps and plugs following general shop procedures. The equipment is shipped and stored fully assembled. No loose components should be apparent.

<para>Visually inspect the equipment after it is removed from its shipping
container. Document any obvious damage. Repair as necessary per Chapter 5.

<para0>

<title>EXTERNAL INSPECTION

<para>The external inspection will be performed per Table 3-1 and Figure
3-1. The particular area of the assembly under inspection is identified in the "COMPONENT" column. The "INSPECTION CRITERIA" are identified in the second column. "CORRECTIVE ACTION" directions are provided in the third column.
<!-- DGK: did not enter table 3-1 -->

<para0>
<title>DISASSEMBLY

<para>Disassemble the primary vent valve as follows (Figure 3-1):

<step1>
<para>Remove screws <!-- DGK: cannot crossreference callouts in conforming or template-->
(1), washers (2), and angle bracket (3) from inlet duct (4). Remove inlet duct and old packing (5) from main housing assembly (6).

<step1>
<para>Remove screws (7), washers (8), and cover plate (9) and remove
old packing (10).

<step1>
<para>Remove dowel pin (11) from tube (20).

<step1>
<para>Remove screws (12) and washers (13), and carefully remove cover
assembly (14).

<step1>
<para>Remove diaphragm assembly (15) and old packing (16) from main housing assembly (6).

<step1>
<specpara>
<warning>
<para>A spring-loaded mechanism can cause injury if released in an uncontrolled manner. Always take extra care when disassembling/assembling this type mechanism.
</warning>

<para>Remove screws (17) and washers (18), and separate retainer
and
bearing assembly (19) form diaphragm assembly (15).
</specpara>
<step1>
<para>Pull tube (20), spring (21) and associated hardware from
diaphragm
assembly (15).

<step1>
<para>Remove spring (21).

<step1>
<para>Remove spring retainer (22).

<step1>
<para>Remove straight-head pin (23).

<step1>
<para>Remove sleeve (24).
<figure id="fig3-1">
<title>Primary Vent Valve Disassembly
<graphic boardno="bcd">
<legend>
<callout>1 </callout>
<Def><para>Screw (24)

<callout>2</callout>
<Def><para>Washer (24)

<Callout>3</callout>
<Def><para>Angle bracket

<callout>4 </callout>
<Def><para>Inlet duct

<callout>5</callout>
<Def><para>Packing

<callout>6</callout>
<def><para>Main housing assembly

<callout>7</callout>
<Def><para>Screw (2)
<!-- DGK: skipped callouts
8

Washer (2)

9
Cover plate

10
Packing

11
Dowel pin

12
Screw (24)

13
Washer (24)

14
Cover assembly

15
Diaphragm assembly

16
Packing

17
Screw (4)

18
Washer (4)

19
Retainer and bearing assembly

20
Tube

21
Spring

22
Spring retainer

23
Straight-head pin

```
-->
<callout>24</callout>
<def><para>Sleeve
</figure>
</chapter>
<chapter>
<title>CLEANING

<para0>
<title>GENERAL

<para>Cleaning instructions for the primary vent valve are as
follows:
<step1>
<specpara>
<warning>

<para>Cleaning solvent is toxic to skin, eyes, and respiratory
tract.
Skin and eye protection are required. Avoid repeated or prolonged
contact. Good general ventilation is normally adequate.
</warning>
<para>Clean all parts using cleaning solvent (No. 4, Table 2-2)
applied
with clean cloth.
</specpara>
<step1>
<specpara>
<warning>
<para>Use of compressed air can create an environment of propelled
foreign particles that may enter the eyes. Eye protection
required. Maximum pressure used shall not exceed 30 psi.
</warning>
<para>Blow dry parts with dry air at 30 psi maximum.
</specpara>
<para0>
<title>SURFACE TOUCH-UP

<para>Touch up minor scratches on external surfaces by polishing
lightly with crocus cloth <!-- DGK:  cannot crossreference rows or
entries in a table in conforming or template-->(No. 1, Table 2-2).

<para0>
<title>PAINT TOUCH-UP
<specpara>
<warning>
```

<para>Epoxy polyamide primer is highly toxic to eyes , skin, and respiratory tract. Eye and skin protection re required. Good general ventilation is normally adequate.
</warning>
<para>Touch up minor scratches on painted surfaces by painting with epoxy primer (No. 2, Table 2-2).
<note>
<para>Touch up areas should blend evenly with the original coating.
</note>
</specpara>
<para0>
<title>CORROSION PREVENTION

<para>Refer to 1-1-2 for corrosion control and treatment.

</chapter>
<chapter>
<title>INSPECTION, REPAIR, AND REPLACEMENT
<para0>
<title>GENERAL
<para>This chapter includes instructions for the primary vent valve inspection, and repair and replacement of worn, damaged, or defective parts.

<para>Disassembly instructions are provided in Chapter 3. Chapter 8
provides testing and troubleshooting instructions for the equipment. The assembly of the vent valve is presented in Chapter 6.

<para0>
<title>INSPECTION
<para>Inspect all parts thoroughly as detailed in Table 5-1.

<para0>
<title>REPAIR AND REPLACEMENT

<para>The following paragraphs explain repair and replacement. No repair
procedures are given for those parts which cannot be economically repaired or overhauled and which are normally replaced.

<subpara1>
<title>REPAIR

<para>General surface and paint touch-up are provided in Chapter 4.

```
<subpara1>
<title>REPLACEMENT

<para>All parts with cracks, breaks, scoring, and distortions shall
be
replaced.

<table id="tab5-1" tocentry="0" frame="all" colsep="1" rowsep="0"
pgwide="1">
<title>Inspection Chart
<tgroup cols="3">
<colspec colnum="1" colname="one" colwidth="12pi">
<colspec colnum="2" colname="two" colwidth="13pi">
<colspec colnum="3" colname="three" colwidth="16pi">
<thead>
<row rowsep="1">
<entry align="center">COMPONENT
<entry align="center">INSPECT FOR
<entry align="center">REMEDY
<tbody>
<row>
<entry>Main housing assembly
<entry>Cracks
<entry>Replace

<row>
<entry>Cover assembly
<entry>Cracks
<entry>Replace


<row>
<entry>Diaphragm assembly
<entry>Cracks/tears
<entry>Replace

<row>
<entry>Retainer and bearing assembly
<entry>Cracks
<entry>Replace retainer

<row>
<entry>Sleeve
<entry>Cracked/bent
<entry>Replace
```

```
<row>
<entry>Spring retainer
<entry>Cracked/worn
<entry>Replace

<row>
<entry>Spring
<entry>Broken/distorted
<entry>Replace

<row>
<entry>Tube
<entry>Cracked/bent, scored
<entry>Replace

<row>
<entry>Inlet duct
<entry>Cracks
<entry>Replace

<row>
<entry>Cover plate
<entry>Cracks
<entry>Replace

<row>
<entry>Angle bracket
<entry>Cracked/loose
<entry>Replace

<row><entry>Straight-head pin
<entry>Bent
<entry>Replace
</table>
</chapter>


<!-- skipped chapter 6-->

<chapter>
<title>ASSESSORIES
<!-- DGK:  unable to produce this text in conforming or template

(This chapter intentionally left blank.)
-->
</chapter>
```

<chapter>
<title>TESTING

<para0>
<title>GENERAL
<para>This chapter describes primary vent valve test procedures and preparation for shipment/storage.

<para>All tests shall be performed in a clean, filtered air environment.

<para0>
<title>BENCH TEST SETUP

<para>The primary vent valve shall be tested for proper performance.
Test setup for steps 8 through 20 is illustrated in Figure 8-1.
Refer to 33-D7-25-38-1 for test stand setup and operation.

<para0>
<title>TEST PROCEDURES

<para>The following steps provide procedures for testing the primary vent
valve. If a malfunction occurs during testing, refer to Table 8-1.

<step1>
<para>Connect regulated source of nitrogen (No. 5, Table 2-2) to actuation port (3, Figure 9-1) with 0-25 standard cubic centimeter (CCM) flowmeter and 0-200 pos gage attached in line.
<step1>
<specpara>
<warning>
<para>Cleaning solvent is toxic to skin, eyes, and respiratory tract.
Skin and eye protection are required. Avoid repeated or prolonged contact. Good general ventilation is normally adequate.
</warning>
<para>Submerge vent valve assembly in a suitable container of solvent
(No. 4, Table 2-2).
</specpara>
<step1>
<para>Apply 15-25 psig to actuation port (3, Figure 8-1) for one minute.

<randlist>
<item><para>There shall be no evidence of leakage at main housing assembly
flange.
</randlist>
<step1>
<para>Reduce pressure to 8-12 psig.

<randlist>
<item><para>Maximum leakage shall not exceed 25 CCM.
</randlist>
<step1>
<para>Increase pressure to 95-105 psig.

<randlist>
<item><para>Maximum leakage shall not exceed 25 CCM.
</randlist>
<Step1>
<para>Reduce pressure to 0 psig and remove vent valve assembly from container and disconnect nitrogen (No. 5, Table 2-2) source.

<step1>
<para>Dry vent valve assembly with clean cloth.

<step1>
<specpara>
<note>
<para>The valve test stand (4, Figure 8-1) shall be off and configured
for component testing in accordance with TO 33-D7-25-38-1.
</note>
<para>Place vent valve into valve test holder (1, Figure 8-1).
</specpara>
<step1>
<para>Connect a regulated source nitrogen (No. 5, Table 2-2) capable of
generating 0-105 psi to actuation port (3, Figure 8-1) on vent valve assembly.

<step1>
<para>Install air line with 10-1000 CCM flowmeter to lower main housing
assembly side of valve test holder.

<step1>
<para>Install 0-100 inch differential pressure gage to the test

setup
switch low pressure line attached to lower side of main housing assembly and high pressure line attached to upper side of main housing assembly of vent valve.
<step1>
<specpara>
<note>
<deflist>
<term>P1
<Def><para>gage pressure at actuation port
<term>P2
<def><para>differential pressure between upper and lower sides of vent
valve assembly
<term>P3
<def><para>Flowmeter
</deflist>
</note>
<para>Apply 25-35 psig at valve actuation port (P1) (3, Figure 8-1).
</specpara>
<figure>
<title>Valve Test Console Assembly

<graphic boardno="cde">
<legend>
<callout>1</callout>
<Def><para>VALVE TEST HOLDER

<callout>2</callout>
<Def><para>MIN HOUSING ASSEMBLY

<callout>3</callout>
<Def><para>ACTUATION PORT

<callout>4 </callout>
<Def><para>VALVE TEST CONSOLE ASSEMBLY
</figure>

<step1>
<para>Establish 52-64 inches water differential (P2) vacuum across valve.

<step1>
<para>Slowly reduce pressure at P1 until differential pressure at P2

drops off.

<step1>
<para>Note cracking pressure at P1 gage.

<randlist>
<item><para>Cracking pressure shall be 0.1 psig minimum corrected as noted on
P1 gage.
</randlist>
<step1>
<para>Increase P1 gage pressure until valve reseats. This shall be noticed by increase in differential pressure at P2 gage.

<randlist>
<item><para>Reseat pressure at P1 gage shall be 4.2 psig maximum.
</randlist>
<step1>
<para>Reduce all pressure and vacuum to 0.

<step1>
<para>Apply 8-12 psig pressure at P1 gage and 36-48 inches differential
pressure at P2 gage.
<randlist>
<item><para>Seat leakage shall be 500 CCM maximum.
</randlist>
<step1>
<para>Slowly increase head pressure at P1 gage to 95-105 psig.
<randlist>
<item><para>Seat leakage shall be 500 CCM maximum.
</randlist>
<step1>
<para>Reduce all pressure and vacuum to 0 and remove vent valve assembly
(2, Figure 8-1) from valve test holder (1, Figure 8-1).

<step1>
<para>Install packing (5, Figure 3-1) inlet duct (4) and anglebracket (3)
on main housing assembly (6) with washers (2) and screws (1).
Torque screws 17-19 inch-pounds.

<para0>
<title>SPRING COMPRESSION TEST
<specpara>

<warning>
<para>A spring-loaded mechanism can cause injury if released in an uncontrolled manner.
</warning>
<para>The primary vent valve spring (21, Figure 3-1) shall be subjected
to a separate load test by a suitable spring tester prior to valve assembly.
</specpara>
<para>Connect the spring tester by adjusting the spring tester platform
to accept a 4.32 inch spring. Refer to chapter 9 for desired loads and expected spring performance. Replace spring if load requirements are not met.

<para0>
<title>ANALYSIS
<para>When a malfunction occurs during operational or functional testing
of
the primary vent valve, refer to Table 8-1 to locate and correct the malfunction.

<para0>
<title>PREPARATION FOR SHIPMENT/STORAGE
<para>Perform preparation for shipment/storage as follows:

<step1>
<para>Install protective caps and plugs

<step1>
<para>Wrap valve assembly to 4-mil polyethylene (No. 3, Table 2-2)

<step1>
<para>Place valve assembly in approved shipping container.
Tag container with applicable shop practices.

<table id="tab8-1" tocentry="0" frame="all" colsep="1" rowsep="0" pgwide="1">
<title>Malfunction Isolation Guide
<tgroup cols="3">
<colspec colnum="1" colname="one" colwidth="12pi">
<colspec colnum="2" colname="two" colwidth="13pi">
<colspec colnum="3" colname="three" colwidth="16pi">
<thead>
<row rowsep="1">

```
<entry align="center">TROUBLE
<entry align="center">PROBABLE CAUSE
<entry align="center">REMEDY
<tbody>
<row>
<entry>Main housing pressure flange leakage
<entry>Faulty packing, worn or torn diaphragm assembly
<entry>Replace packing/diaphragm assembly
<row>
<entry>Main housing assembly leakage &gt; 25 CCM
<entry>Packing at cover plate or main housing assembly not seated
properly
<entry>Replace packings

<row>
<entry>Cracking pressure &lt;0.1 PSIG
<entry>Wear/broken spring
<entry>Replace

<row>
<entry>Reseat pressure &gt;4.2 psig
<entry>Diaphragm assembly not seated properly
<entry>Realign diaphragm assembly

<row>
<entry colname="two">Incorrect spring tension
<entry>Replace


<row>
<entry>Diaphragm assembly does not seat
<entry>Ruptured diaphragm assembly
<entry>Replace

<row>
<entry>Seat leakage &gt; 500 CCM with differential pressure across
valve
<entry>Ruptured diaphragm, packing not seated properly
<entry>Replace diaphragm assembly and/or packing
</table>
</chapter>
<!--SKIP CHAPTER 9-->

<chapter>
<title>ILLUSTRATED PARTS BREAKDOWN
```

<para0>
<title>GENERAL

<para>This illustrated parts breakdown (IPB) lists, illustrates,
and
describes assemblies, subassemblies, and detail parts for the
primary vent valve 5710110.

<para>The IPB provides information for identifying, requisitioning,
and
issuing parts. It also illustrates assembly and disassembly
relationships of parts. Listed part numbers meet critical
equipment design specification requirements. Only the specified
part numbers (or alternates) should be used for replacement of
parts.

<para0>
<title>CONTENTS

<para>The IPB is divided into four areas: Introduction,
Maintenance
Parts List (MPL), Numerical Index (NI), and Reference Designation
Index (RDI). An understanding of the following subparagraphs is
essential for full utilization of the MPL.

<para0>
<title>MAINTENANCE PARTS LIST

<para>The MPL contains a breakdown of the equipment into its major
assemblies, subassemblies, detail parts, and attaching parts which
are considered to have maintenance significance. Paragraphs that
follow provide criteria used in determining parts to be listed and
describe the contents of each column of the MPL.
<subpara1>
<title>PARTS LISTED
<para>In general, the assemblies ....<!--skip to next subpara-->
<subpara1>
<title>FIGURE, INDEX, AND SHEET NUMBER
<para>This column provides the figure....<!--skip to next subpara--
>
<subpara1>
<title>PART NUMBER
<para>This column provides the part number for each...
<!-- SKIP TO 10-14 -->

<subpara1>

<title>FEDERAL SUPPLY CODE FOR MANUFACTURERS (FSCM)

<para>This column provides the FSCM on the same line as the applicable
part number. Codes, names, and addresses of vendors with assigned FSCM are listed in Cataloging Handbooks H4-1, H4-2, and H4-3, as applicable. Vendors that have not yet been assigned FSCM codes by the Government are identified herein by a temporary FSCM identifier. Temporary FSCM identifiers are five-digit codes comprised of Arabic numbers preceded by a series of dashes. The identifier----1 is representative of the first used in a publication. Temporary FSCM identifiers and applicable manufacturer names and addresses are listed as follows:
<!-- DGK: no way to tag this text in conforming or template
REFERENCE NO.
NAME AND ADDRESS

NONE
-->

<subpara1>
<title>DESCRIPTION

<para>The description is assigned according to the nomenclature placed in
the title block by the design activity, along with modifiers and descriptive information to completely identify the part. The noun name is listed first, followed by modifiers and descriptive information to completely identify the part. Attaching parts are identified by (AP) immediately following the noun name and modifier(s) in this column. Specification control, source control, and altered item drawing numbers are listed where applicable.

<subpara2>
<title>INDENTATION

<para>Parts listed in the MPL are indented to show higher assembly/installation (NHA) relationship. To determine the NHA of a part or assembly, note the column in which the first word of the description appears. The first item directly above, which appears one column to the left (except for attaching parts), is the NHA. The following example shows an installation or assembly starting in the extreme left position (first indentation) and continue down into succeeding columns until the last detail is reached.
<para>
<emphasis emph="underline">1 2 3 4 5 6 7

DESCRIPTION</emphasis><brk>
<para>Installation, major assembly detail parts for above assembly.
<para>.Assembly
<para>.Attaching parts for assembly (AP)
<para>..Detail parts for assembly
<para>..Subassemblies
<para>..Attaching parts for subassemblies (AP)
<para>...Detail Parts for subassemblies
<subpara2><title>TITLE
<para>A figure title is assigned to every figure in the MPL. This
title
is identical to that shown on the illustration.

<subpara2><title>ALTERED PARTS

<para>When one part has been altered to become another part number,
the
altered part appears in the part number field. The part number
used for alteration appears in the description.
<verbatim>
EX: (ALTERED FROM ____)
If the part number used for the alteration is that of
a supplier, the supplier's FSCM is also included.
EX:(ALTERED FROM____)(FSCM)
</verbatim>
<subpara2>
<title>CROSS REFERENCE NOTES
<para>Various figures cross reference notes appear throughout the
MPLs.
They show NHA figure/detail relationship and provide configuration
continuity. For example:
<verbatim>
(FOR NHA SEE____)-Indicates where the installa-
tion or assembly is listed under its NHA.

(FOR DETAILS SEE____)-Indicates where the in-
stallation or assembly is broken down to its com-
ponent parts.
</verbatim>
<!-- SKIP TO HARDNESS-CRITICAL ITEMS 10-42 -->

<para0>
<title>HARDNESS-CRITICAL ITEMS

<specpara>
<caution>

<para>The symbol <emphasis emph="bold">**HCI**</emphasis>
establishes special requirements limiting
changes and substitutions of parts. For these items, the specific
parts listed shall be used to ensure hardness is not degraded.
</caution>
<para>There may be some parts in the IPB identified as
hardness-critical.
Any such items will be identified by the symbol **HCI** preceding
the keyword in the description column. A hardness-critical item is
a component that is mission critical and sensitive to one or more
nuclear effects or has design characteristics that are driven by
one or more nuclear weapon effects. Identification of hardness-
critical items is necessary so that maintenance of the components
does not degrade nuclear hardness.
</specpara>
<!-- DGK: no way to tag this text in conforming or template
RELATED MANUALS
NONE
-->
<!-- DGK: only way to tag mpl is as a table...no meaning to data
NOTE:
it is not numbered as a table and it does not
have the required table title in conforming or template
therefore it is not tagged as a table

Figure/Index/ Sht. No.
Part Number
FSCM
Description 1 2 3 4 5 6 7
Units Per Assy
Usable On Code
SMR

10-1
VALVE PRIMARY VENT

- 1
5710110-101
92003
VALVE, PRIMARY VENT
1
PAOLD

- 2
5711110-101

92003
. VALVE ASSEMBLY PRIMARY VENT
1
XB-

3
5723234-1
92003
. . DUCT, INLET
1
PADZZ
-->
<!-- skip to figure 10-1 -->
<figure>
<title>Primary Vent
<graphic boardno="def">
</figure>
</chapter>
<chapter>
<title>DIFFERENCE DATA SHEETS
<!-- DGK: no way to indicate this
(This chapter intentionally left blank.)
-->
</chapter>
</body>
</doc>

B.2 Sample of Document Instance using the Maintenance Module DTD.

The document instance for Air Force Depot Maintenance Manual (DMM) PTO 6J15-8-136-3, *Primary Vent Valve, P/N 5710110-101* tagged in accordance with the maintenance module DTD is provided below. Comments about the development of the document instance or problems encountered in the tagging process are indicated in the body of the document instance by the symbol designation <!-- _____ -->.

<mim tmno="PTO 6J 15-8-136-3" revno="0" chngno="0">
<maintwp wpno="04-00-00" level="depot">
<title>PRIMARY VENT VALVE MAINTENANCE
<wpsum>This task covers Disassembly, cleaning, inspection, repair,
replacement, assembly and testing.
<wpinfo>
<maintlvl level="depot">
<testeqp>

<name id="item04-00-00-6">Spring Tester

<partno idref="item04-00-00-6">PB 6-1000 (36403)</partno>

<name id="item04-00-00-7">Valve Test Stand
<partno idref="item04-00-00-7">291500-1 (99193)</partno>

</testeqp>

<mtrlpart>
<name id="item04-00-00-1">Crocus cloth
<partno idref="item04-00-00-1">A-A-1200, P-C-451</partno>
<cageno idref="item04-00-00-1">58536</cageno>
<extref docno="Appendix D" pretext="Item 1">

<name id="item04-00-00-2">Epoxy Primer
<partno idref="item04-00-00-2">MIL-P-23377C</partno>
<cageno idref="item04-00-00-2">(81348)</cageno>
<extref docno="Appendix D" pretext="Item 2">

<name id="item04-00-00-3">Polyethylene, 4-mil
<partno idref="item04-00-00-3"> PPP-C-795, Class I</partno>
<cageno idref="item04-00-00-3">(81348)</cageno>
<extref docno="Appendix D" pretext="Item 3">

<name id="item04-00-00-4">Solvent
<partno idref="item04-00-00-4">P-D-680, Type II,
MIL-C-38736</partno>
<cageno idref="item04-00-00-4">(81348)</cageno>
<extref docno="Appendix D" pretext="Item 4">

<name id="item04-00-00-5">Nitrogen
<partno idref="item04-00-00-5">BB-N-411</partno>
<cageno idref="item04-00-00-5">(81348)</cageno>
<extref docno="Appendix D" pretext="Item 5">
</mtrlpart>

<ref>
<extref docno="TO 33-D7-25-38-1" posttext="Operation and
Maintenance Instructions, Valve Test Console Assembly">
<extref docno="TO 1-1-2" posttext="Corrosion Prevention and Control
for Aerospace Equipment">

</wpinfo>

<maintsk>

```
<inspinstitm>
<proc>
<step1 id="step104-00-00-2" idref="table04-00-00-1">
<para>Inspect all parts thoroughly as detailed in Table 4.1.1.
<table id="table04-00-00-1" idref="step104-00-00-2" colsep="1"
rowsep="0" frame="all">
<title>Inspection Chart</title>
<tgroup cols="3">
<colspec colnum="1" colname="one" colwidth="12pi" align="left">
<colspec colnum="2" colname="two" colwidth="12pi" align="left">
<colspec colnum="3" colname="three"  colwidth="16pi" align="left">
<thead>
<row rowsep="1">
<entry align="center">COMPONENT</entry>
<entry align="center">INSPECT FOR</entry>
<entry align = "center">REMEDY</entry>
</row>
</thead>
<tbody>
<row>
<entry>Main housing assembly</entry>
<entry>Cracks</entry>
<entry>Replace</entry>
</row>
<row>
<entry>Cover assembly</entry>
<entry>Cracks</entry>
<entry>Replace</entry>
</row>
<row>
<entry>Diaphragm assembly</entry>
<entry>Cracks/tears</entry>
<entry>Replace</entry>
</row>
<row>
<entry>Retainer and bearing assembly</entry>
<entry>Cracks</entry>
<entry>Replace retainer</entry>
</row>
<row>
<entry>Sleeve</entry>
<entry>Cracked/bent</entry>
<entry>Replace</entry>
</row>
<row>
<entry>Spring retainer</entry>
```

<entry>Cracked/worn</entry>
<entry>Replace</entry>
</row>
<row>
<entry>Spring</entry>
<entry>Broken/distorted</entry>
<entry>Replace</entry>
</row>
<row>
<entry>Tube</entry>
<entry>Cracked/bent, scored</entry>
<entry>Replace</entry>
</row>
<row>
<entry>Inlet duct</entry>
<entry>Cracks</entry>
<entry>Replace</entry>
</row>
<row>
<entry>Cover plate</entry>
<entry>Cracks</entry>
<entry>Replace</entry>
</row>
<row>
<entry>Angle bracket</entry>
<entry>Cracked/loose</entry>
<entry>Replace</entry>
</row>
<row>
<entry>Straight-head pin</entry>
<entry>Bent</entry>
<entry>Replace</entry>
</row>
</tbody>
</tgroup>
</table>
</proc>
</inspinstitm>

<disassem>
<proc>
<step1 id="step104-00-00-1" idref="fig0100" assocfig="fig0100">
<para>Remove screws (1, Figure 4.1.1),
washers (2), and angle bracket (3) from inlet duct (4). Remove
inlet duct and old
packing (3) from main housing assembly (6).

<figure id="fig0100" idref="step104-00-00-1">
<title>Primary Vent Valve Disassembly
<subfig>
<graphic boardno="MM000001.1A" graphsty="1">
</subfig>
<subfig>
<graphic boardno="MM000001.1B" graphsty="1">
</subfig>
</figure>

<step1 idref="fig0100">
<para>Remove screws (7), washers (8), and cover plate
(9) and remove old packing (10).

<step1 idref="fig0100">
<para>Remove dowel pin (11) from tube (20).

<step1 idref="fig0100">
<para>Remove screws (12) and washers (13), and carefully
remove cover assembly (14).

<step1 idref="fig0100">
<para>Remove diaphragm assembly (15) and old packing
(16) from main housing assembly (6).

<step1 idref="fig0100">
<specpara>
<warning>
<para>A spring-loaded mechanism can cause injury if released in an
uncontrolled manner. Always take extra care when
disassembling/assembling this type mechanism.
</warning>
<para>Remove screws (17) and washers (18), and separate
retainer and bearing assembly (19) from diaphragm assembly (15).
</specpara>
<step1 idref="fig0100">
<para>Pull tube (20), spring (21), and associated hardware
from diaphragm assembly (15).

<step1 idref="fig0100">
<para>Remove spring (21).

<step1 idref="fig0100">
<para>Remove spring retainer (22).

<step1 idref="fig0100">
<para>Remove straight-head pin (23).

<step1 idref="fig0100">
<para>Remove sleeve (24).

</proc>
</disassem>

<clean>
<proc>
<title>General
<para>Cleaning instructions for the primary vent valve are as follows:
<step1>
<specpara>
<warning>
<para>Cleaning solvent is toxic to skin, eyes, and respiratory tract. Skin and eye protection are required. Avoid repeated or prolonged contact. Good general ventilation is normally adequate.
</warning>
<para>Clean all parts using cleaning solvent <xref xrefid="item04-00-00-4" xidtype="text"> applied with clean cloth.
</specpara>
<step1>
<specpara>
<warning>
<para>Use of compressed air can create an environment of propelled foreign particles that may enter the eyes. Eye protection required. Maximum pressure used shall not exceed 30 psi.
</warning>
<para>Blow dry parts with dry air at 30 psi maximum.
</specpara>
</proc>
<proc>
<title>Surface Touch-Up.

<step1>
<para>Touch up minor scratches on external surfaces by polishing lightly with crocus cloth (No. 1).
</proc>
<proc>

<title>Paint Touch-Up.
<step1>
<specpara>
<warning>
<para>Epoxy polyamide primer is highly toxic to eyes, skin, and respiratory tract. Eye and skin protection are required. Good general ventilation is normally adequate.
</warning>
<para>Touch up minor scratches on painted surfaces by painting with epoxy primer <xref xrefid="item04-00-00-2" xidtype="text">.
<note>
<para>Touch up areas should blend evenly with the original coating.
</note>
</specpara>
</proc>
<proc>
<title>Corrosion Prevention
<step1>
<para>Refer to TO 1-1-2 for corrosion control and treatment.
</proc>
</clean>

<repair-rplc>
<proc>
<step1>
<specpara>
<note>
<para>No repair procedures are given for those parts which cannot be economically repaired or overhauled and which are normally replaced.
</note>
<para>General surface and paint touch-up are provided under cleaning of this work package.
</specpara>
<step1>
<para>All parts with cracks, breaks, scoring, and distortions shall be replaced.
</proc>
</repair-rplc>
<assem>
<proc>
<step1 idref="fig0100">

<para>Insert sleeve (24, Figure 4.1.1) over tube
(20).

<step1 idref="fig0100">
<para>Install straight-head pin (23) through sleeve (24) and tube
(20).

<step1 idref="fig0100">
<para>Insert spring retainer (22) over tube (20) so that spring
retainer sits flush against sleeve (24).

<step1 idref="fig0100">
<specpara>
<note>
<para>
Prior to installing spring (21) perform spring compression test.
</note>
<para>Insert spring (21) over tube (20) so that spring sits
flush against spring retainer (22).
</specpara>
<step1 idref="fig0100">
<specpara>
<note>
<para>Ensure that spring retainer moves smoothly along tube
surface.
</note>
<para>Insert tube (20) through retainer and bearing assembly (19).
</specpara>

<step1 idref="fig0100">
<para>Install retainer and bearing assembly (19) with tube (20),
spring (21), and associated hardware on diaphragm assembly (15)
with washers (18) and screws (17). Torque screws (17) to 17-19
inch-pounds.

<step1 idref="fig0100">
<para>Place new packing (16) and diaphragm assembly (15)
on main housing assembly (6).

<step1 idref="fig0100">
<para>Position cover assembly (14) on diaphragm assembly (15) and
install in main housing assembly (6) with washers (13) and screws
(12). Torque screws to 29-31 inch-pounds.

<step1 idref="fig0100">
<specpara>
<warning>
<para>A spring-loaded mechanism can cause injury if release din an uncontrolled manner. Always take extra care when disassembling/assembling this type mechanism.
</warning>
<para>Push tube (20) towards cover assembly (14) and install dowel pin (11).
</specpara>
<step1 idref="fig0100">
<para>Install packing (10) and cover plate (9) with washers (8) and screws (7). Torque screws 17-19 inch-pounds.
<step1 idref="fig0100">
<specpara>
<note>
<para>Prior to installing inlet duct (4), perform test procedures.
</note>
<para>Install new packing (5, Figure 4.1.1), inlet duct (4), and angle bracket (3) on main housing assembly (6) with washers (2) and screws (1). Torque screws to 17-19 inch-pounds.
</specpara>
</proc>
</assem>

<test>
<proc>
<step1 id="step104-00-00-3" idref="table04-00-00-2 fig0101" assocfig="fig0101">
<specpara>
<note>
<para>All tests shall be performed in a clean, filtered air environment.
</note>
<note>
<para>If a malfunction occurs during testing, refer to Table 4.1.2.
</note>

<para>Test setup for steps 9 through 21 is illustrated in Figure 4.1.2. Refer to TO 33-D7-25-38-1 for test stand setup and operation.
<figure id="fig0101" idref="step104-00-00-3">
<title>Valve Test Console Assembly</title>
<graphic boardno="MM000002.1" graphsty="1">
</figure>

```
<table id="table04-00-00-2" idref="step104-00-00-2" frame="all"
colsep="1" rowsep="0">
<title>Malfunction Isolation Guide
<tgroup cols="3">
<colspec colnum="1" colname="one" align="left" colwidth="12pi">
<colspec colnum="2" colname="two" align="left" colwidth="12pi">
<colspec colnum="3" colname="three" align="left" colwidth="12pi">
<thead>
<row rowsep="1">
<entry align="center">TROUBLE</entry>
<entry align="center">PROBABLE CAUSE</entry>
<entry align="center">REMEDY</entry>
</row>
</thead>
<tbody>
<row>
<entry>Main housing assembly flange leakage</entry>
<entry>Faulty packing, worn or torn diaphragm assembly</entry>
<entry>Replace packing/diaphragm assembly</entry>
</row>

<row>
<entry>Main housing assembly leakage &gt;25 CCM</entry>
<entry>Packing at cover plate or main housing assembly not seated
properly</entry>
<entry>Replace packings</entry>
</row>
<row>
<entry>Cracking pressure &lt; 0.1 PSIG</entry>
<entry>Weak/broken spring</entry>
<entry>Replace</entry>
</row>
<row>
<entry>Reseat pressure &gt; 4.2 psig</entry>
<entry>Diaphragm assembly not seated properly</entry>
<entry>Realign diaphragm assembly</entry>
</row>
<row>
<entry colname="two">Incorrect spring tension</entry>
<entry>Replace</entry>
</row>
<row>
<entry>Diaphragm assembly does not seat</entry>
<entry>Ruptured diaphragm assembly</entry>
<entry>Replace</entry>
</row>
```

<row>
<entry>Seat leakage > 500 CCM with differential pressure across valve</entry>
<entry>Ruptured diaphragm, packing not seated properly</entry>
<entry>Replace diaphragm assembly and/or packing</entry>
</row>
</tbody>
</tgroup>
</table>

</specpara>

<step1 idref="fig0101">
<para>Connect regulated source of nitrogen <xref xrefid="item04-00-00-5" xidtype="text"> to actuation port (3, Figure 4.1.2), with 0-25 standard cubic centimeter (CCM) flowmeter and 0-200 psi gage attached in line.

<step1>
<specpara>
<warning>
<para>Cleaning solvent is toxic to skin, eyes, and respiratory tract. Skin and eye protection are required. Avoid repeated or prolonged contact. Good general ventilation is normally adequate.
</warning>
<para>Submerge vent valve assembly in a suitable container of solvent <xref xrefid="item04-00-00-4" xidtype="text">.
</specpara>

<step1 idref="fig0101">
<para>Apply 15-25 psig to actuation port (3, Figure 4.1.2) for one minute.

<randlist>
<item>
There shall be no evidence of leakage at main housing assembly flange.
</randlist>

<step1>
<para>Reduce pressure to 8-12 psig.

<randlist>
<item>Maximum leakage shall not exceed 25 CCM.
</randlist>

<step1>
<para>Increase pressure to 95-105 psig.

<randlist>
<item>Maximum leakage shall not exceed 25 CCM.
</randlist>

<step1>
<para>Reduce pressure to 0 psig and remove vent valve assembly from container and disconnect nitrogen <xref xrefid="item04-00-00-5" xidtype="text"> source.

<step1>
<para>Dry vent valve assembly with clean cloth.

<step1 idref="fig0101">
<specpara>
<note>
<para>The valve test stand (1, Figure 4.1.2) shall be off and configured for component testing in accordance with TO 33-D7-25-38-1.
</note>
<para>Place vent valve into valve test holder (1, Figure 4.1.2).
</specpara>

<step1 idref="fig0101">
<para>Connect a regulated source nitrogen <xref xrefid="item04-00-00-5" xidtype="text"> capable of generating 0-105 psi to actuation port (3, Figure 4.1.2) on vent valve assembly.

<step1>
<para>Install air line with 10-1000 CCM flowmeter to lower main housing assembly side of valve test holder.

<step1>
<para>Install 0-100 inch differential pressure gage to the test setup with low pressure line attached to lower side of main housing assembly and high pressure line attached to upper side of main housing assembly of vent valve.
<step1 idref="fig0101">
<specpara>
<note>
<deflist>
<term>P1</term>

<def>gage pressure at actuation port</def>
<term>P2</term>
<def>differential pressure between upper and lower sides of vent valve assembly</def>
<term>P3</term>
<def>Flowmeter</def>
</deflist>
</note>
<para>Apply 25-35 psig at valve actuation port (P1) (3, Figure 4.1.2).
</specpara>
<step1>
<para>Establish 52-64 inches water differential (P2) vacuum across valve.

<step1>
<para>Slowly reduce pressure at P1 until differential pressure at P2 drops off.

<step1>
<para>Note cracking pressure at P1 gage.
<randlist>
<item>Cracking pressure shall be 0.1 psig minimum corrected as noted on P1 gage.
</randlist>
<step1>
<para>Increase P1 gage pressure until valve reseats. This shall be noticed by increase in differential pressure at P2 gage.

<randlist>
<item>Reseat pressure at P1 gage shall be 4.2 psig maximum.
</randlist>
<step1>
<para>Reduce all pressure and vacuum to 0.

<step1>
<para>Apply 8-12 psig pressure pt P1 gage and 36-48 inches differential pressure at P2 gage.

<randlist>
<item>Seat leakage shall be 500 CCM maximum.
</randlist>

<step1>
<para>Slowly increase head pressure at P1 gage to 95-105 psig.

<randlist>
<item>Seat leakage shall be 500 CCM maximum.
</randlist>

<step1 idref="fig0101">
<para>Reduce all pressure and vacuum to 0 and
remove vent valve assembly (2, Figure 4.1.2) from valve test holder
(1).

<step1 idref="fig0100">
<para>Install packing (5, Figure 4.1.1), inlet duct
(4), and anglebracket (3) on main housing assembly (6) with
washers (2) and screws (1). Torque screws 17-19
inch-pounds.
</proc>
<proc>
<title>Spring Compression Test
<step1 idref="fig0100">
<specpara>
<warning>
<para>A spring loaded mechanism can cause injury if released in an
uncontrolled manner. Always take extra care when
disassembling/assembling this type mechanism.
</warning>
<para>The primary vent valve spring (21, Figure
4.1.1) shall be subjected to a separate load test by a suitable
spring tester prior to valve assembly.
</specpara>

<step1>
<para>Connect the spring to the spring tester by adjusting the
spring tester platform to accept a 4.32 inch spring.

</proc>
</test>
</maintsk>
</maintwp>
</mim>