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## DETAIL SPECIFICATION

### MANUALS, TECHNICAL: ILLUSTRATED PARTS BREAKDOWN FIGURES; TECHNICAL CONTENT REQUIREMENTS (WORK PACKAGE CONCEPT)

This specification is approved for use by the Naval Air Warfare Center, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense, within the distribution limitations noted at the bottom of this page.

#### 1. SCOPE

1.1 Scope. This specification prescribes the technical content requirements for the preparation of illustrated parts breakdown (IPB) figures for use in a manual.

1.2 Classification (types of manuals). The types of manuals should be as prescribed in MIL-DTL-81927.

#### 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Air Warfare Center Aircraft Division, Code 414100B120-3, Highway 547, Lakehurst, NJ 08733-5100 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

## 2.2 Government documents.

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

## SPECIFICATIONS

### DEPARTMENT OF DEFENSE

MIL-DTL-81927 - Manuals, Technical: Work Package Style, Format, and Common Technical Content Requirements; General Specification for (Work Package Concept).

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

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

## PUBLICATIONS

### NAVAL AIR SYSTEMS COMMAND

NAVAIR 00-25-700 - Guide to General Style and Format of Work Package Technical Manuals.

(Copies of manuals are available by request to: Commanding Officer, Naval Air Technical Services Facility (NATSF), 700 Robbins Ave., Philadelphia, PA 19111-5097.)

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

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## 3. REQUIREMENTS

3.1 General.

- a. Copyrights and advertising. Copyright material shall not be included in any publication prepared in accordance with this specification without written permission of the copyright owner. Proprietary legends shall not be shown. The manual shall not contain advertising matter. All material prepared in accordance with this specification shall be Government property.
- b. Proprietary data. The Government shall have unlimited right to the data prepared under this specification. Proprietary legends are not acceptable in technical manuals. The preparing activity shall disclose, in narrative or pictorial display, that information necessary to fulfill the requirements of this specification without disclosing that portion of the manufacturing process that the preparing activity wishes to safeguard.
- c. Conflict between specifications. When conflict exists between MIL-DTL-81927 and the technical content requirements described herein, this specification shall take precedence. When conflict exists between the contract and this specification, the contract shall take precedence.
- d. General style and format. Manuals shall be prepared to work package (WP) concept. General style and format shall be as specified in MIL-DTL-81927.

3.2 Technical manual arrangement.

3.2.1 General arrangement. The general arrangement of a maintenance manual with IPB shall be in accordance with MIL-DTL-81927.

3.2.1.1 Arrangement of IPB figures. Each IPB figure shall consist of an illustration and the related Group Assembly Parts List (GAPL).

3.2.2 IPB figure format requirements. The format of IPB figures shall be compatible with all reproduction mediums. This should be accomplished through control of legibility of the GAPL, improved line art techniques in the preparation of supporting illustrations, and coordinated GAPL entries with illustrations (see NAVAIR 00-25-700). IPB figures shall be prepared using partial, full-page, or foldout illustration(s):

- a. IPB figures using partial and/or full-page illustrations.

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- (1) The first sheet of each IPB figure shall contain an illustration. The illustration(s) may be a full-page, partial-page, multiple-sheet, or multiple view illustration.
  - (2) The GAPL shall follow the required illustration(s).
    - (a) Partial page illustration. If a partial page illustration is prepared, the GAPL should begin on the same page.
    - (b) Full page illustration. If only one full-page illustration is required to adequately identify the part relationships, the GAPL shall immediately follow the illustration.
    - (c) Multiple-sheet or multiple view illustration. If multiple-sheet or multiple view illustration is required, the figure shall be planned so that each illustration (sheet) precedes the corresponding GAPL listings.
  - (3) The following column heads shall appear on each GAPL page, or below the illustration if a partial-page illustration is prepared;
    - (a) "INDEX NO."
    - (b) "PART NUMBER"
    - (c) "DESCRIPTION"
    - (d) "UNITS PER ASSY"
    - (e) "USABLE ON CODE"
    - (f) "SM&R CODE"
  - (4) The required column heads shall be boxed.
  - (5) The listings on the GAPL pages shall be as required herein.
  - (6) The figure title shall appear centered at the bottom of the image area of each illustration and GAPL page.
- b. IPB foldout figures. IPB figures using foldout illustrations (see 3.4.2.1.2) shall have a blank apron on each foldout illustration. When the IPB is required to provide coverage of complex installations or items with a high density of detailed parts with a single

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illustration, foldout illustrations may be used. When the IPB illustration supports more than one function (e.g., IPB, maintenance, component location, and test point identification), the requirement to read the text and view the supporting illustration, including detailed views, simultaneously is critical.

- (1) The GAPL shall precede the illustration(s). The GAPL shall be provided on single pages and shall be developed as required herein. The following column heads shall appear on each GAPL page:
  - (a) "INDEX NO."
  - (b) "PART NUMBER"
  - (c) "DESCRIPTION"
  - (d) "UNITS PER ASSY"
  - (e) "USABLE ON CODE"
  - (f) "SM&R CODE"
- (2) The required column heads shall be boxed.
- (3) The illustration shall follow the GAPL pages. The illustration(s) shall be developed as required herein.
- (4) The figure title shall appear at the bottom of the image area of each illustration and GAPL page. The figure number shall be placed before the figure title. The sheet number shall follow the figure title. The figure number, figure title, and sheet number shall be so placed that they will be visible when the page is folded.
- (5) The reverse side of foldout pages shall be blank.

3.2.3 IPB figure identification. All pages of an IPB figure (GAPL and illustration, see 3.2.1.1) shall contain a figure number, title, and sheet number, if applicable. Sheet numbers are not required for partial or full-page IPB figures.

3.2.3.1 Figure titles. Each IPB figure shall be assigned a figure title. The figure title shall be identical to the nomenclature assigned to the end item the figure covers. To aid in the identification of the item covered, all pages of the IPB figure title should include the end item part number(s) and the reference designation, if applicable. When the specific application of the

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figure is required to be identified, effectivity should be used to clarify the figure's application and/or restriction, e.g., "Before AFC 1234" or "After incorporation of AFC 1234".

3.2.3.2 Figure number. Figure numbers shall be assigned in useage sequence and shall precede the figure title.

3.2.3.3 Sheet numbers.

- a. IPB figures. Each page of the figure shall be identified by a sequentially assigned sheet number following the figure title.
- b. Total sheet count. The first sheet of a multisheet IPB figure shall include the total number of sheets that make up the figure, e.g., "(Sheet 1 of 6)".
- c. IPB foldout figures. In order to prevent unnecessary changes to the references throughout the associated data, change suffixes may be applied to the GAPL page sheet numbers. In this manner, the sheet numbers for the illustration index numbers will not be changed unless the illustration is changed. The GAPL page sheet numbers are not required to be renumbered during a revision, unless the illustration was changed/revised.

3.3 Detailed technical content requirements.

3.3.1 Development of technical content. The general guidelines for the development of the technical content of a manual are discussed in MIL-DTL-81927. Strict compliance with the requirements of the specifications listed in the contract, approved maintenance rationale, parts provisioning, and approved support equipment data will ensure development of an IPB figure that is responsive to the requirements of the user.

- a. The IPB shall include all parts provisioned for the applicable maintenance level support of the article.
- b. An organizational level IPB should contain and illustrate items replaceable at the organizational level that do not affect the integrity of equipment provisioned for complete repair at a higher level of maintenance, e.g., knobs, lens covers, light bulbs, reflectors, and fuses. These items will also be listed and illustrated in the appropriate level of maintenance data in accordance with the complete repair code assigned.
- c. Source documentation shall determine the scope and depth of coverage required. SM&R codes will be assigned by the government and shall be listed in the IPB to identify the

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source of spares, repair parts, and support equipment and the levels of maintenance authorized to maintain, repair, overhaul, or condemn them.

3.3.1.1 Relationship between the IPB and the maintenance concept. The IPB is an integral part of the technical manual data to be prepared in support of maintenance tasks. Therefore, it is essential that the maintenance concept is followed in the development of the supporting IPB. Emphasis should be placed on the accessibility of data, comprehensibility of supporting illustrations, and the use of the information presented. The IPB should be prepared as an integral part of the maintenance coverage.

3.3.1.2 Preparation of the IPB. The source data used for maintenance task development shall also be used for development of the IPB. That is, if the maintenance tasks were developed through the LSA, the same set of documents shall be used in the development of the IPB. Consistency of information contained in the maintenance coverage and the IPB is essential.

3.3.1.3 Development of the IPB GAPL. The assembly of data should follow the same pattern established in the development of the maintenance task. Once the task analysis has been completed and the outline of the manual has been approved, the properly prepared GAPL will track the maintenance tasks it is intended to support. If a discrepancy between the maintenance task and the supporting GAPL is uncovered, the source data used shall again be reviewed and a determination made of the cause of the conflict. It should not be automatically assumed that the GAPL or the maintenance information is incorrect and adjust one to meet the other.

3.3.1.4 Top-down breakdown (engineering drawing sequence). Basic top-down breakdown sequence should not be used in the development of the IPB data, unless it matches the maintenance task to be supported.

3.3.2 Illustrations required. IPB figures may contain many different types of illustrations (see 3.4.2). The number and types of illustrations required will depend on the complexity of the item(s) covered.

3.3.2.1 Division of data. The technical content shall be divided into figures. Division shall be by representative main groups, assemblies, or systems with such additions, omissions, or change as may be required by the specific end item. The main groups or systems selected shall be compatible with the approved logistic support analysis (LSA), maintenance plan, or other approved forms of maintenance rationale. The first figure shall contain an assembled view of the end item. This view shall be keyed to permit reference to detailed views and figures as required. Systems and subsystems shall be separately illustrated and keyed to the assembly figures that list and illustrate the detailed parts of the system or subsystem. These illustrations shall be indexed so that the separate assembly sections can be readily located in the GAPL.

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3.3.3 Parts to be listed. All end items, repair parts and items of support equipment provisioned for the applicable maintenance level support of the article shall be listed. Support equipment shall be listed in accordance with 3.3.3s.

a. Items without part numbers;

- (1) Type and model numbers for equipment(s) that have not been assigned part numbers, but are identified by type and model numbers, shall have the type or model number placed in the "PART NUMBER" column. Either the type or model number shall be entered, e.g., the one that corresponds to a National Item Identification Number (NIIN) that has an assigned SM&R code.
- (2) If a vendor's number is entered, the type number shall be identified in the description column.
- (3) Parts which have neither a part number nor a type and model number assigned shall have a dash (-) placed in the "PART NUMBER" column.
- (4) Hardware procurable from normal commercial sources that does not have a part number assigned shall be identified by the abbreviation "COML" in the "PART NUMBER" column. Identifying information such as dimensions, material, and type shall be given after the description to enable replacement procurement from commercial sources.

b. Standard hardware provisioned for lowest level of maintenance usage:

- (1) Standard hardware (such as bolts, studs, packing, hose clips, fasteners, clamps, resistors, capacitors, diodes, transistors, gaskets) which are manufactured to conform to the requirements of NAS, JAN, USAF, NAVAIR, AN or MS drawings shall be listed.
- (2) However, when an item of standard hardware has been provisioned at the lowest level of support regardless of multilevel application, only the quantity of hardware required at the applicable level(s) of maintenance covered shall be listed and illustrated.

c. Oversize and undersize parts. When oversize or undersize parts are required and furnished and they are neither interchangeable with, nor within allowable production tolerances of the standard size part, they shall be listed by the part number specified in the contract drawing specification.



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- d. Matched parts. When two or more parts that would normally be procured as separate items have been machined to fit as a matched set or lapped assembly, or have been matched electronically to meet circuit requirements, the set of items shall be assigned a separate part number.
- e. Contractor standard parts. Contractor standard parts should only be listed when the NIIN is assigned to the contractor standard part.
- f. Government standard parts. Government standard part numbers shall be listed in the "PART NUMBER" column. The part number shall be complete including prefixes and suffixes to the basic number. If more than one Government standard part number is listed on the contractor drawing specification for a single application, the preferred part number shall be listed.
- g. Government standard items containing nonstandard detailed parts. Items covered by Government standard drawings, that contain repair parts that are not designated by government detailed designed drawing numbers, shall be listed in organizational level manuals by the Government standard part number when the NSN is assigned to the Government standard item.
- h. Altered or source-controlled items. If any Government standard or commercial item is altered, selected, or source controlled because of special fit, tolerance, weight, or reliability of performance, the part number of the activity responsible for the alteration, selection, or source control shall appear in the "PART NUMBER" column. Repainting, reidentifying, or other insignificant operations shall not be considered alterations, selections, or source controls.
- i. Similar assemblies. If right and left, top and bottom, front and rear, or other similar assemblies contain a majority of identical parts, the IPB for the similar assemblies shall be combined and identified in the GAPL.
- j. Symmetrically opposite parts. Symmetrically opposite parts shall be listed separately and identified in accordance with the contract drawing specification.
- k. Subcontractor or vendor items. Subcontractor or vendor items are defined as items that are used by the manufacturer of the item covered by the IPB exactly as produced by a subcontractor or vendor. Repainting, reidentifying, or other insignificant operations shall not be considered alterations, selections, or source controls. When subcontractor or vendor items are assigned an NIIN, the item part number shall be listed in the "PART NUMBER" column.

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- l. Redesigned parts. If the design or material of a part is changed to the extent that interchangeability or physical or functional performance is affected, the new part number assigned in accordance with the contract drawing specification shall be listed. The original part shall be omitted if not authorized for continued use. If the original part has continued application, the application shall be indicated in the GAPL.
- m. Selected electronic components. If a component board contains detail part(s) which can be replaced from a selection of components of different values, the illustration shall show one part. The GAPL shall list the basic part number without the specific value, e.g., "RCO7GF---J." If the selection is to be made after test, a note shall appear after the description of the part, e.g., "/Value determined at test/."
- n. Alternate parts. An alternate part is defined as a part that is used when a preferable part is not available. Alternate parts shall be listed below the preferred part when assigned an NIIN. The specific relationship shall be identified using the GAPL "DESCRIPTION" and "USABLE ON CODE" columns.
- o. Equivalent parts. An equivalent part is defined as a part that is used interchangeably with one or more parts, none of which are preferable over the other. Equivalent parts shall be listed below the preferred part when assigned an NIIN. The specific interchangeability shall be identified using the GAPL "USABLE ON CODE" column.
- p. Quick Engine Change Assembly (QECA). Following the breakdown of the QECA, the part number and description of the Quick Engine Change Kit (QECK) shall be listed. All QECK parts shall be illustrated, indexed, and identified in the GAPL description column with the acronym "QEC".
- q. Parts kits. When repair parts for the end item or for repairable units within the end item are to be supplied in the form of kits, a part number shall be assigned to each kit in accordance with contract drawing specification requirements.
  - (1) The kit(s) part numbers shall be placed last in the list of parts of the unit to which it applies and at the same indentation as the unit to which it applies. The kit components listed shall carry the appropriate kit SM&R code.
  - (2) Contents of the kit shall be listed at one indent below the kit description and shall not be assigned index numbers. Part number, description, quantity per kit, and SM&R code shall be included for each item in the kit.
  - (3) Lists of supplemental kits shall follow the list of original kits in the same manner as prescribed herein.

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(4) Separate illustrations for kits shall not be prepared.

r. Markings.

- (1) Decals, metalcalcs, and vinyl film markings, such as those that provide instructions, which require replacement or must be requisitioned separately, are considered to be parts. The identifying drawing number for each marking shall appear in the "PART NUMBER" column.
- (2) Locations of markings shall be illustrated; however, legible copy of the marking on the illustration is not required.
- (3) A marking need not be listed or illustrated (and should not be requisitioned separately) if:
  - (a) it is attached to a part or a non-repairable assembly merely to identify it;
  - (b) the parts or non-repairable assemblies are stocked, stored, and issued with the marking attached;
  - (c) or the parts, not the marking, are replaced.
- (4) When the illustration of a part or non-repairable assembly seems to be incomplete with the marking omitted, it is proper to show, but not list, the marking.

s. Support equipment.

- (1) Support equipment - when required. Support equipment approved for use and provisioned for the maintenance level support of the article shall be listed and illustrated as the last WP(s) of the manual.
- (2) Support equipment items requiring breakdown. Breakdown of support equipment listed in support of an end item shall be included when:
  - (a) The support equipment is peculiar to support the end item.
  - (b) Provisioning documentation dictates repair of the support equipment at the maintenance level coverage of the end item.
  - (c) A separate publication is not available or has not been authorized.

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- (3) Logistically non-repairable support equipment. An illustration, part number, description of the item and units per assembly shall be listed for these types of end items.

3.3.4 Parts not to be listed. The following shall not be listed:

- a. Assembly detail parts that are permanently joined together. Parts that lose their identity by being welded or joined to other pieces as a permanent unit. This does not include riveted items provisioned for the applicable maintenance level of the manual.
- b. Items made from bulk stock. Items made from (raw) bulk stock such as lockwire, bonding braid, upholstery cloth, and friction tape.
- c. Structural items. Except in structural repair IPBs, structural items such as stringers, stiffeners, skin, doublers, and gussets, which serve no purpose in description of parts relationship or specification of significant procured parts, except when required to maintain next higher assembly identity or to identify items having maintenance significance.
- d. Detail parts for consumable items. Details of items SM&R coded for throwaway.
- e. Substitute item. A substitute item is an item which possesses such functional and physical characteristics as to be capable of being exchanged for another under specific conditions or for particular applications and without alteration of the item itself or those adjoining it. Degradation of equipment performance will result when substitute items are used. Substitute items shall not be listed, unless authorized by the requiring activity.

3.3.5 Additional coverage requirements.

- a. Nuclear hardness critical items (HCI), (CSI) or (OCI). When survivability considerations are specified and Hardness Critical Items (HCIs) are identified on drawings and parts lists, the items shall be marked and identified in the description column of the GAPL. All changes to or proposed substitutions of HCIs shall be evaluated for hardness impacts by the engineering activity responsible for survivability. The introduction shall include an explanation of the HCI symbol's usage and method of highlighting and other pertinent information as necessary to emphasize uniqueness of HCIs.
- b. Electrostatic discharge (ESD) sensitive parts. If electronic equipment to be handled, inspected, repaired or assembled is ESD sensitive, the items shall be marked and identified in the description column of the GAPL. The introduction shall include an

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explanation of the ESD symbol's usage and method of highlighting and other pertinent information as necessary to emphasize uniqueness of ESD sensitive components.

### 3.4 Illustrations.

3.4.1 General artwork requirements. Artwork (illustrations) shall be prepared in accordance with MIL-DTL-81927 and the detailed requirements specified herein.

3.4.1.1 Assembly and subassembly illustrations. Each assembly and subassembly included in the GAPL shall be illustrated to locate and identify detail parts, including attaching parts. When a number of identical parts, including attaching parts, are used in the same location, only one need be illustrated if the locations of the parts are obvious. Detail parts and the relationship to the assembly or subassembly shall be clearly identified. The method of presentation is dependent on the complexity of the required coverage, non-complex or complex.

- a. Detail view method. Detail views (see 3.4.1.4) shall be used for complex requirements.
- b. Bracket detail part identification method. The bracket method of identification may be used for non-complex requirements. When the bracket method is used, the detail parts shall have their index numbers placed within the bracket. A leader line shall be used from the bracket to the index number of assembly or subassembly. If all detailed parts can be clearly shown in an assembled view, the detailed parts should not be exploded merely to make attaching parts visible.

3.4.1.2 Exploded views. Illustrations shall be exploded to identify detailed parts that cannot be shown clearly with an assembled illustration. If all detailed parts can be clearly shown in an assembled view, the detailed parts should not be exploded merely to make attaching parts visible.

3.4.1.3 Items SM&R-coded as repairable. Items or assemblies SM&R-coded as repairable items at the manual's applicable maintenance level shall be shown assembled on the next higher assembly (NHA) main view with an index number assigned to the assembly (see 3.4.1.8.1). The breakdown of the assembly may be provided as a detail view of the NHA main view or as a separate figure, dependent on the task analysis/coverage breakdown. Parts of the assembly shall also be assigned index numbers and illustrated as required.

3.4.1.4 Detail views. A detail view of an assembly or subassembly shall be prepared when the subject matter cannot be clearly illustrated in the main view of the figure.

- a. The assembly or subassembly and attaching parts shall be indexed on the main view.

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- b. The assembly or subassembly shall be identified with a sequentially assigned capital letter adjacent to the applicable index number on the main view.
- c. The capital letter(s) assigned to a detail view(s) should be approximately 14-point bold type and placed within the image area so that it is highly visible. If required for clarity, a leader line shall be used from the subject part or assembly to the bold type letter identifying the detail view.
- d. The detail illustration shall be identified by the same capital letter as placed in the main view.
- e. The detail view shall be boxed.
- f. The detail parts shall have their index numbers placed on the detail view.
- g. The detail view may be placed with the main view or on a separate page. Placement shall be dependent on the complexity of the required detail and the open space available on the main view. In either method, the prime consideration shall be clarity of presentation.

3.4.1.5 Parts shown only to indicate relationship. In order to properly illustrate the relationship of parts to assemblies shown on the illustration, it will often be necessary to include parts not listed in the applicable GAPL. Since these parts are not indexed, they shall be subdued to give proper emphasis to the listed assemblies or parts. Shading shall not be used to subdue non-indexed parts. The line-weight used (for the subdued areas) shall be lighter (than the indexed items), yet strong enough to reproduce clearly.

3.4.1.6 New assemblies and parts. If an assembly or part provided on a later model differs from the basic model, and the change is such that the existing illustration will not adequately portray the new assembly or part, the latter may be shown on the illustration for the basic model in a detail view. If space does not permit, a separate illustration shall be prepared.

3.4.1.7 Symmetrically opposite parts and similar assemblies. If it is unnecessary for a clear presentation to illustrate both right and left, top and bottom, front and rear views of similar parts and assemblies, and if both parts have the same general appearance and purpose but different part numbers, such parts and assemblies shall be illustrated once. An index number shall be assigned in the listing to the first of the similar parts or assemblies listed. The difference (such as left-hand or right hand) in the parts shall be identified in the description of the item.

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3.4.1.8 Index numbers. Index numbers, with leader lines to the parts to which they pertain, shall be used on all illustrations. Index numbers shall be assigned in accordance with 3.6.1.8.1. The index numbers on each illustration shall agree with those in the parts listing.

3.4.1.8.1 Assignment of index numbers. Index numbers shall be assigned to all parts listed in the GAPL that have maintenance or supply significance, except as otherwise noted herein. Index numbers shall be first assigned to the parts list and then applied to the illustration to maintain the proper sequence in the breakdown. If the same part number is listed more than once in the breakdown, it may be assigned a different index number for each listing. No index number shall be assigned to an assembly when all detail parts are indexed, unless such assembly is also illustrated completely assembled on the illustration. Illustrations shall be reindexed, as required, when parts are added or deleted from the parts list, except as follows:

- a. Added parts may be assigned letter-suffixed index numbers, e.g., 2A, 2B, 2C, when additional information or corrections must be inserted late in preparation and renumbering of index numbers would delay submittal.
- b. During a revision to the manual, if an IPB figure has not otherwise been affected, e.g., no technical content change is required, the illustration and tabular data shall not be reindexed to eliminate previously added suffixed index numbers. In a revision that affects 80 percent or more of the total accumulated changed pages, the data shall be reindexed.
- c. When the technical content change is a minor correction to either the illustration or tabular data, the figure shall not be reindexed.

3.4.1.8.2 Attaching parts. Each part in a set of attaching parts (such as bolt, washer, nut) shall be assigned an index number. However, also see 3.4.1.8.3. Sets of attaching parts shall be exploded when the assembly is hidden and sufficiently complex to merit explosion. If the attaching parts are not visible on the illustration, and their location is obvious, multiple index numbers that identify the principle item and its attaching parts may be assigned and an exploded view is not required.

3.4.1.8.3 Indexing of duplicate items. The total quantity of each item listed in the GAPL shall be identified with index numbers in the illustration. To avoid cluttering an illustration with unnecessary index numbers, large quantity items need not be indexed more than once on the illustration or on each sheet of a multisheet illustration that the part is shown. However, the location of the items must be obvious in the illustration. For example, multiple size rivets that are shown in various locations on the illustration need only be indexed once for each part number listed in the parts list.

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3.4.1.8.4 Indexing assemblies. Each assembly and subassembly of the end item shall be shown assembled and assigned an index number (see 3.4.1.8.1). Assemblies and subassemblies coded for assembly, manufacture, or repair at the applicable maintenance level shall also be shown exploded in a detail view on the main illustration or in a separate illustration, and index numbers shall be assigned to all detailed parts.

3.4.1.8.5 Items not having a logical maintenance sequence. For items not having a logical maintenance sequence (e.g., circuit card assembly), the assignment of index numbers shall begin at the top left-hand corner and continue clockwise.

3.4.1.9 Component boards. When a component board or bracket assembly that holds electrical components is presented orthographically, the reference designation may be placed within the view of the part, if space permits. Leader lines may be used to identify reference designations that cannot be placed within the view of the part. When the number of leader lines to indexed parts causes the illustration to become cluttered, the figure may contain a legend adjacent to the artwork or on a separate sheet. The listing shall contain an alphanumerical listing of the reference designations and their associated index numbers. Index numbers for items with reference designations shall be identified using the legend and not on the artwork. Index numbers shall be used only to identify items that do not have reference designations.

3.4.1.10 Polarity identification. When applicable, the polarity of electronic components shall be identified on the component in all maintenance and IPB illustrations.

3.4.2 Detailed artwork requirements.

3.4.2.1 End item illustration. The view of the end item shall be prepared to permit reference to detailed views, figures, or manuals. Reference shall be made by use of index numbers. The location of subassembly detailed figures shall be identified by text reference in the GAPL.

3.4.2.1.1 Multiple view illustrations. When it is necessary to identify significant features of the end item, a multiple view illustration shall be developed in accordance with MIL-DTL-81927. The multiple view illustration shall be prepared to improve the identification of the parts or to clarify the relationship or the location of the parts, e.g., effectivity differences or top, bottom, front and/or back views of an end item or assembly.

3.4.2.1.2 Foldout illustrations. When it is necessary to provide coverage of complex installations with a single IPB figure, a foldout illustration may be used, e.g., aircraft equipment rack, or operator's station, with maintenance interaction (i.e., removal or relocation of one assembly to access another assembly or repair part). A foldout illustration may also be used



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when a component board or single item contains a high number of detail parts and cannot be adequately covered with multiple sheet or multiple view illustrations. The format of an IPB foldout illustration shall be as follows:

- a. Complex foldout illustration. A complex foldout illustration should be developed as an end item illustration with reference to following detailed views of various lengths prepared as combined maintenance/IPB illustration(s). Detail views may also reference additional detail views. Callouts may be assigned to maintenance significant items as required to support the maintenance actions in accordance with MIL-DTL-81927. Maintenance related text and short tabular data may also be used. The primary consideration should be clarity of presentation.
- b. Single item foldout illustration. Foldout illustrations prepared in support of component boards shall be developed in the same manner as partial/full page illustrations prepared for component boards (see 3.4.1.9), except for the additional length. The legend shall be placed adjacent to the artwork as part of the foldout illustration.

3.4.3 Reference to detailed views of subassemblies. If it is impractical to illustrate the detailed parts of a subassembly in the illustration, the subassembly shall be shown in the illustration and reference to a separate detail view(s) shall be included. Detail view(s) shall be prepared in accordance with 3.4.1.4. If it is impractical to illustrate the detailed parts of a subassembly in a detail view because of the complexity of the item in question, a reference to a separate subassembly figure (IPB WP) or WP (IPB part of a WP) shall be placed in the "DESCRIPTION" column of the GAPL, following the item nomenclature. A separate exploded view of the subassembly shall be prepared in accordance with 3.4.1.2.

3.4.4 Reference designations. Illustrations that depict electrical components shall include reference designation after the index number. If an orthographic view is prepared, the reference designation may be placed within the view of the part, if space permits.

3.5 Group assembly parts list. All parts provisioned for the applicable maintenance level support of the article shall be listed on GAPL pages. The columns of tabular data shall appear from the left margin to the right margin as follows:

3.5.1 "INDEX NO." column. The index numbers that appear in the associated illustration shall appear in this column in numerical sequence beginning with the number 1 (see 3.4.1.8).

3.5.2 "PART NUMBER" column. Part numbers assigned to the parts listed or other specific requirements detailed herein shall appear in this column.

- a. Items without part numbers (see 3.3.3a).

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- b. Parts to be listed (see 3.3.3).
- c. Parts not to be listed (see 3.3.4).

3.5.3 "DESCRIPTION" column. The description as obtained from engineering drawings of the part listed shall appear in this column. The description shall be prepared as follows:

3.5.3.1 Nomenclature consistency. Nomenclature of identical systems, subsystems, equipment, support equipment, components, and parts of the end item should be consistent throughout a manual, volumes of a manual, and manuals that are a part of a set of manuals covering an end item. The preparing activity should develop nomenclature lists for associate preparing activities and sub-preparing activities to ensure such consistency. The correct nomenclature should be derived from one of the following sources (listed in the order of precedence):

- a. "AN" nomenclature,
- b. Nameplate nomenclature,
- c. H-6 assigned nomenclature, or
- d. Nomenclature on the drawing from which the item was manufactured.

3.5.3.1.1 Identifying noun modifiers. Modifiers should be arranged in the sequence as necessary to indicate specifics such as function and location, and to maintain consistency of nomenclature. Modifiers shall be added to the description of parts as required to assure positive identification, e.g., washer, flat and washer, lock. These modifiers need not appear on the preparing activity drawing. For additional information, refer to "Noun modifiers" in MIL-DTL-81927.

3.5.3.2 Arrangement of wording;

- a. Hardness critical items. When the part is identified as an HCI, the symbol [HCI] shall precede the first word in the description column. It is preferred that the symbol be placed within brackets, that is [HCI] ; however, other methods of highlighting the symbol to call attention to its importance are acceptable.

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- b. Electrostatic discharge sensitive parts. When a part is identified as an item subject to ESD, the symbol shall precede the first word in the description column. It is preferred that the symbol be placed within brackets, that is [ESD]; however, other methods of highlighting the symbol to call attention to its importance are acceptable.
- c. Identifying noun. The identifying noun shall be the first word of the description.
- d. Abbreviation "ASSY or INSTL". If the item is an assembly or installation, the abbreviation "ASSY or INSTL", as applicable, shall follow the noun.
- e. Drawing modifiers. The identifying noun or "ASSY or INSTL" shall be followed by the modifiers included in the drawing title description.
- f. Identifying modifiers. Modifiers, such as "upper," "lower," "inner," "outer," "front," and "rear," shall be placed next.
- g. Commercial and Government Entity Codes (CAGE). Manufacturers' codes (or complete name if no code has been assigned) and references to other manuals or figures shall follow the description. Manufacturer's codes shall not be listed for Government standard parts.
- h. Amplifying information. Amplifying information, notations, and references, as applicable.

3.5.3.3 Dimensions. Where units of measurement are the same, they shall not be repeated with each dimension, e.g., "1/8 by 21/32 inch." A zero shall precede the decimal point of decimal values less than one, e.g., "0.002 inch."

3.5.3.4 Capitalization. The entire description may be in upper case letters. As a minimum, the item name shall be in upper case letters and the first letter of the first word immediately following the item name, and the first letter of proper nouns shall be in upper case letter.

3.5.3.5 Abbreviations. Abbreviations should be held to a minimum and should be in accordance with MIL-DTL-81927. Abbreviations shall be consistent throughout the manual, volume, and WPs.

3.5.3.6 Leaders. Leaders (a series of periods or dots) shall be used to join the description and the "UNITS PER ASSY" column. When the description requires more than one line, leaders shall only be used on the first line.

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3.5.3.7 Tolerances for electrical/electronic parts. Percentages or actual values or allowable tolerances for such items as non-military standard resistors and capacitors shall be given as part of the description, expressed as plus and minus values.

3.5.3.8 Undrilled or untrimmed parts. Parts that require drilling or trimming on installation shall be identified by a notation to that effect in the "DESCRIPTION" column.

3.5.3.9 Make from instructions. Most parts source coded MO, MF, MH, or MG require manufacturing instructions in the maintenance WP/manual (see MIL-DTL-81927). These parts shall not have "Make From" information in the description column but shall reference the maintenance WP/manual. M-Series parts requiring only length, width or thickness not requiring special manufacturing instructions shall include the raw bulk stock and final dimensions in the description column. The list of raw (bulk) stock shall not be included for parts to be fabricated at depot level (SM&R coded MD).

3.5.3.10 Conditional acronym or abbreviation.

- a. Items using liquid oxygen (LOX). Following the nomenclature of parts in the "DESCRIPTION" column, items using LOX shall be identified by the acronym LOX at the far right of the "DESCRIPTION" column if hazardous conditions could result from lack of this information.
- b. Quick engine change assembly (QECA).
  - (1) Repair parts, government furnished equipment and approved contractor furnished accessories of an aircraft engine that also are included in the QECA, shall be identified by the acronym "QEC" following the description of each repair part. The acronym shall appear at the far right of the "DESCRIPTION" column.
  - (2) Following the breakdown of the QECA, the part number and description of the Quick Engine Change Kit (QECK) shall be listed. All QECK parts shall be illustrated and indexed.
  - (3) Basic aircraft engine parts shall not be identified with the acronym "QEC".
- c. Magnetic control items (MAG). Parts requiring test for magnetic inclusion shall be identified by the abbreviation "MAG" to assist in the identification of such parts when malfunctions could result because of the lack of this information. The abbreviation shall be placed at the far right of the "DESCRIPTION" column, following the nomenclature of the part.

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3.5.3.11 Part kits. A statement indicating parts kit(s) availability shall be included after the description of the article or unit for which the kit is supplied.

3.5.3.12 Oversize and undersize parts. When oversize or undersize parts are required and furnished and they are neither interchangeable with, nor within allowable production tolerances of the standard size part, they shall be listed by the part number specified in the contract drawing specification. All dimensional differences shall be included in the "DESCRIPTION" column.

3.5.3.13 Similar assemblies. See 3.3.3i.

- a. Peculiar parts notation. Parts peculiar to only one assembly shall be identified by a note in the "DESCRIPTION" column.
- b. Different quantity notation. Identical parts that are used in different quantities on the assemblies shall be listed separately and identified by a note in the "DESCRIPTION" column.

3.5.3.14 Matched parts. When two or more parts that would normally be procured as separate items have been machined to fit as a matched set or lapped assembly, or have been matched electronically to meet circuit requirements, the set of items shall be assigned a separate part number. A notation in the "DESCRIPTION" column shall indicate that the item consists of a matched set or matched pair. The part numbers and nomenclature of the items that make up the set shall be listed in the "DESCRIPTION" column.

3.5.3.15 Subcontractor or vendor items. The descriptions of such items shall include the type, model, or applicable Government specification and the applicable manufacturer's code. If the manufacturer's code is not available, the name and address of the manufacturer shall be given. If such items are illustrated on preparing activity specification control or envelope drawings, the specification control or envelope drawing number shall also be listed in the "DESCRIPTION" column.

3.5.3.16 Redesigned parts. See 3.3.3l. If the original part has continued application, the applicable model, block numbers, and serial numbers of the items on which the part is usable shall be indicated by usable on codes. "Alternate for" or "Use until exhausted" as applicable, shall follow the description.

3.5.3.17 Selected items. See 3.3.3m. If a component board contains a detail part which can be replaced from a selection of components of different values, the illustration shall show one part. The GAPL shall list the basic part number without the specific value, e.g., "RCO7GF---J." If the selection is to be made after test, a note shall appear after the description of the part, e.g., "/Value determined at test/."

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3.5.3.18 Items without part numbers. See 3.3.3a.

- a. If a vendor's number is entered, the type number shall be identified in the description column.
- b. Hardware procurable from normal commercial sources that does not have a part number assigned shall be identified by the abbreviation "COML" in the "PART NUMBER" column. Identifying information such as dimensions, material, and type shall be given after the description to enable replacement procurement from commercial sources.

3.5.3.19 References to other manuals. If coverage of the end item is contained in another manual, the applicable end item shall be listed and reference made to the manual. The reference shall appear after the item description, in diagonals or parenthesis, e.g., "/Breakdown, NAVAIR 01-85ADA-4-6/" or "(Breakdown NAVAIR 01-85ADA-4-6)."

3.5.3.20 References to other figures in the same manual or volumes of the manual. If coverage is contained in another figure or WP, the applicable end item shall be listed and reference made to the figure number. The reference shall appear after the item description, in diagonals or parenthesis, e.g., "/Breakdown, F0011 00/" or "(Breakdown, F0026 00)."

3.5.3.21 Next higher assembly references. Necessary reference shall be made to other figures for next higher assemblies. The reference shall appear after the item description, in diagonals or parenthesis, e.g., "/NHA, F0079 00/" or "(NHA, A1-F18AA-XXX-XXX F0081 00)."

3.5.3.22 Indention to show relationship;

- a. The end item nomenclature shall not be indented, and shall be flush with the left margin of the "DESCRIPTION" column. When provisioning documentation dictates that repair of the article or main assembly is authorized at the applicable maintenance level, the GAPL will include the repair parts data. This data shall be included in the parts breakdown with indentions to show relationship in accordance with the example below. Runover lines of nomenclature shall be indented an additional indention (two spaces of proportional type) from the first line of nomenclature. Indention shall be indicated by leaders (a series of periods or dots), one leader equal to one indention. Indention to show relationship shall be presented as shown in the following example:

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## END ITEM (FIGURE COVERAGE)

Runover line of nomenclature for end item (figure coverage)

. Detailed parts for end item (figure coverage)

. ASSEMBLY

(ATTACHING PARTS)

. Attaching parts for ASSEMBLY

---\*---

. . Detailed parts for ASSEMBLY

. . SUBASSEMBLY

(ATTACHING PARTS)

. . Attaching parts for SUBASSEMBLY

---\*---

. . . Detailed parts for SUBASSEMBLY

. . . SUB-SUBASSEMBLY

(ATTACHING PARTS)

. . . Attaching parts for SUB-SUBASSEMBLY

---\*---

. . . . Detailed parts for SUB-SUBASSEMBLY

b. Parts kits.

- (1) The kit(s) part numbers shall be placed last in the list of parts of the unit to which it applies and at the same indentation as the unit to which it applies.
- (2) Part kits shall be at the same indentation as to the unit to which it applies.
- (3) Kit contents shall be at one indent below the kit description.
- (4) Lists of supplemental kits shall follow the list of original kits in the same manner as prescribed herein.

3.5.3.23 Listing of attaching parts.

- a. Placement. Attaching parts shall be listed beneath the item to be attached. They shall be listed, preceding any detailed parts of the item, at the same indentation as the part they attach.
- b. Caption. The caption "(ATTACHING PARTS)" shall be placed one indentation to the right of the nomenclature of the part to be attached, on the line immediately above the list of attaching parts.

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- c. Separation symbol. The symbol "---\*---" shall follow the attaching parts, to separate the list from subsequent listings of parts. The separation symbol shall have the same indentation as "(ATTACHING PARTS)".

3.5.3.24 Index numbers for attaching parts.

- a. Normally, index numbers shall be assigned to all attaching parts.
- b. Fastening groups used at the same location (e.g., a relay attached by multiple nuts, bolts, and washers) need not be individually illustrated or identified by index number, unless maintenance significant. When group callouts are used, they shall contain only one particular size, combination, or group of parts.
- (1) Each size, combination, or group of parts shall be listed separately.
  - (2) If an identical part, appearing at several locations, is attached with different attaching parts, the part shall be indexed separately.
  - (3) If more than one size or type of attaching part is used at different points on the part being attached, each size (with the pertinent attaching parts such as washer and nut) shall be given a separate index number so that the location of the different sizes and types may be readily identified in the illustration.

3.5.3.25 Quantities of attaching parts.

- a. Quantities of attaching parts shall be listed per unit (piece) only. For example, if two fittings are required for each preceding assembly and one bolt is required to attach both fittings, the correct listing is as follows:

DESCRIPTION	UNITS PER ASSY
FITTING ASSY, HINGE (ATTACHING PARTS)	2
BOLT	1
---*---	

- b. If common attaching parts are used for more than one item and each item is assigned a separate index number, the attaching parts heading shall be expanded to so indicate. For



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example, if two clamps (one indexed 3; the other, 4) are attached by one bolt, the correct attaching parts heading is "(ATTACHING PARTS FOR INDEX NUMBERS 3 AND 4)."

- c. If the attaching parts are the same for a number of items and these items are indexed and listed separately one after the other, the attaching parts shall be listed following the last item, and the attaching parts heading should be expanded to indicate this. For example, if six connectors, each having a different part number with the same attaching parts, are indexed 1 through 6, the correct attaching parts heading is "(ATTACHING PARTS FOR EACH OF INDEX NUMBERS 1 THRU 6)."

3.5.4 "UNITS PER ASSY" column. This column shall indicate the number of units required per assembly, per subassembly, and per subassembly, as applicable.

- a. The entry in the "UNITS PER ASSY" column shall be aligned with the first line of multiple-line descriptions. The quantities of attaching parts shall be as specified in 3.5.3.25.
- b. If more than one assembly is required, the total of such assemblies shall be indicated.
- c. For detailed or subassembly parts of a major assembly, the quantity required for one major assembly shall be indicated.
- d. For oversize or undersize parts, the letters "AR" shall be placed in this column to indicate "as required."
- e. For items that are listed for reference, the letters "REF" (item found elsewhere in the IPB) shall be placed in the column.

3.5.5 "USABLE ON CODE" column. This column shall contain codes for assemblies and parts to indicate their specific usability with the end item to which the IPB figure applies. Capital letters shall be used to identify the application of the items. If single letters of the alphabet are not sufficient to complete coding, double letters may be used, e.g., AA, AB, etc. The letters O and I shall not be used singularly or in pairs.

- a. Blank column. The "USABLE ON CODE" column is left blank to indicate the item is applicable to all items.

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- b. Simple application. When different end item part numbers are identified, each end item shall be assigned a code in sequence and that code shall be listed for each peculiar item in the parts list. More than one code may be assigned to the same item. e.g., A, B or A, C.
- c. Figure specific codes. When multiple application of items is required, a master "usable on" code list shall be developed for the figure and provided at the bottom of the last tabular page of the figure, e.g., effectivity, used to indicate that the item is applicable only after, or before, incorporation of a technical directive and/or specific serial number application.

3.5.5.1 Redesigned parts. If the original part has continued application, the applicable model, block numbers, and serial numbers of the items on which the part is usable shall be indicated by "usable on" codes. "Alternate for" or "Use until exhausted" as applicable, shall follow the description.

3.5.5.2 Alternate parts. An alternate part is defined as a part that is used when a preferable part is not available. When an item is completely interchangeable but one part is preferable for use, the number of the preferred part shall be listed without a notation in the "USABLE ON CODE" column and all alternate part numbers shall be listed with an asterisk (\*) in the "USABLE IN CODE" column. When an item is completely interchangeable on certain end items but one part number is preferable for use, the "USABLE ON CODE" column shall carry the end item identification, with or without an asterisk (\*), as applicable.

3.5.5.3 Equivalent parts. An equivalent part is defined as a part that is used interchangeably with one or more parts, none of which are preferable over the other. All equivalent part numbers shall be listed with an asterisk (\*) in the "USABLE ON CODE" column. When a part is interchangeable only on certain end items the "USABLE ON CODE" column shall carry the end item identification in addition to the required asterisk (\*).

3.5.6 "SM&R CODE" column. This column shall list the source, maintenance and recoverability (SM&R) code for every part for which one has been approved by the government.

#### 4. VERIFICATION

4.1 Verification. Verification shall be conducted as prescribed in the contract.

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## 5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of material is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

## 6. NOTES

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

6.1 Intended Use. The IPBs prepared in accordance with this specification are intended for use in technical manuals covering the repair of aircraft structure and structural components at organizational, intermediate, and depot maintenance levels.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Type(s) of manuals to be prepared (see 1.2).
- c. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2).
- d. Packaging requirements (see 5.1).

6.3 Definitions.

6.3.1 Article (equipment or end item). An article consists of components, assemblies, subassemblies, and parts connected or associated with each other to perform an operation function.

6.3.2 Commercial item. A commercial item is a supply or service that normally is, or has been, sold or offered to the public commercially by any supplier.

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6.3.3 Vendor. A vendor is a design activity, manufacturer, wholesaler, or agent from whom are acquired items used in, or attached to, the end item produced by the preparing activity.

6.4 Technical manuals. The requirements for technical manuals should be considered when this specification is applied on a contract. If technical manuals are required, specifications and standards that have been cleared and listed in DoD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL) must be listed on a separate Contract Data Requirements List (DD Form 1423), which is included as an exhibit to the contract. The technical manuals must be acquired under separate contract line item in the contract.

6.5 Specification figures. The figures previously included in this specification were intended to illustrate methods of presentation of technical data. They are being revised for incorporation into NAVAIR 00-25-700. Sample illustrations can be provided by the requiring activity, if requested. The sample figures shall not be interpreted as limiting the technical content requirements that are established by the text. The text must take precedence over all examples shown in the sample figures.

6.6 Subject term (key word) listing.

- Exploded views
- Foldouts
- Format manuals
- Illustrations
- IPB
- Work package concept

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

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Preparing activity:  
Navy - AS

(Project TMSS-N261)



# STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

## INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

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### I RECOMMEND A CHANGE:

1. DOCUMENT NUMBER  
MIL-DTL-91829C

2. DOCUMENT DATE (YYMMDD)  
971126

3. DOCUMENT TITLE MANUALS, TECHNICAL; ILLUSTRATED PARTS BREAKDOWN FIGURES; TECH CONTENT REQUIREMENTS

4. NATURE OF CHANGE Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

### 5. REASON FOR RECOMMENDATION

### 6. SUBMITTER

a. NAME (Last, First, Middle Initial)

b. ORGANIZATION

c. ADDRESS (Include Zip Code)

d. TELEPHONE (Include Area Code)  
(1) Commercial  
(2) AUTOVON  
(if applicable)

7. DATE SUBMITTED  
(YYMMDD)

### 8. PREPARING ACTIVITY

a. NAME COMMANDER

NAVAL AIR WARFARE CENTER, AIRCRAFT  
DIV.

b. TELEPHONE Include Area Code)

(1) Commercial (2) AUTOVON  
(908)323-2628 624-2628

c. ADDRESS (Include Zip Code)

CODE 414100B120-3  
HIGHWAY 547  
LAKEHURST, NJ 08733-5100

IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:

DEFENSE QUALITY AND STANDARDIZATION OFFICE  
5203 Leesburg Pike, Suite 1403, Falls Church, VA 22401-3466  
Telephone (703) 756-2340 AUTOVON 289-2340