

NOT
MEASUREMENT
SENSITIVE

MIL-DTL-81218C(AS)
26 November 1997
SUPERSEDING
MIL-M-81218B(AS)
23 February 1989

DETAIL SPECIFICATION

MANUALS, TECHNICAL: AIRCRAFT ENGINE INTERMEDIATE AND DEPOT MAINTENANCE, PREPARATION OF (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 covers technical manual content requirements for preparation of aircraft engine intermediate and depot maintenance instructions in work package (WP) format for uninstalled reciprocating and gas turbine engines, including turboprop and turboshaft. This specification also covers requirements for an intermediate maintenance manual supplement for the installation, positioning, and identification of external tubing, cabling, clamping and attaching hardware and a Sequence Control Chart (SCC) that graphically depicts accomplishment of complete engine repair. When specified by the requiring activity, an Illustrated Parts Breakdown (IPB) shall be included.

1.2 Classification. The types of technical manuals covered by this specification are intermediate level, depot level, and combination intermediate and depot data as specified in the MIL-DTL-81927.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document shall be addressed to Commander, Naval Air Warfare Center Aircraft Division, Code 414100B120, 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.

AMSC N/A

AREA TMSS

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

MIL-DTL-81218C(AS)

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 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 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 specification to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

DEPARTMENT OF DEFENSE

MIL-DTL-15014	-	Manual, Technical: Separate Illustrated Parts Breakdown, Technical Content Requirements (Work Package Concept).
MIL-DTL-81927	-	Manuals, Technical: Work Package Style, Format, and Common Technical Content Requirements; General Specification for (Work Package Concept).
MIL-DTL-81929	-	Manuals, Technical: Illustrated Parts Breakdown Figures; Technical Content Requirements (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, publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

MIL-DTL-81218C(AS)

PUBLICATIONS

MARINE CORPS

MCO P1200.7 - Military Occupational Specialties Manual.

(Copies of the above manual are available from Commandant of Marine Corps, Code ARDC, Headquarter, U.S. Marine Corps, Washington, DC 20380-1775.)

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.

3. REQUIREMENTS

3.1 General.

3.1.1 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.

3.1.2 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.

3.1.3 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.

3.1.4 General style, format, and technical content. Manuals shall be prepared to WP concept. General style, format, and technical content shall be as specified in MIL-DTL-81927. MIL-DTL-81927 also provides the common requirements for WP concept manuals in the following areas:

- a. Technical manuals using WP concept.
- b. Style of writing.
- c. Referencing requirements.

MIL-DTL-81218C(AS)

- d. General format.
- e. Technical manual arrangement.
- f. Front matter (composite requirements).
- g. Indexes (composite requirements).
- h. Introduction (composite requirements).
- i. Technical content WP (composite requirements).
 - (1) Title page (composite requirements).
 - (a) Title block.
 - (b) Reference material list.
 - (c) Alphabetical index.
 - (d) Record of technical directives.
 - (2) Support equipment required lists.
 - (3) Material required lists.
- j. Artwork requirements.
- k. Changes/revisions.

3.1.5 IPB.

3.1.5.1 Relationship between the IPB and the WP concept. The IPB is an integral part of the technical data to be prepared in support of maintenance tasks. Therefore, it is essential that the intent of the WP concept is followed in the development of the supporting IPB. Emphasis shall be placed on the accessibility of data, comprehensibility of supporting illustrations, and the use of the information presented. The IPB data shall be prepared in accordance with MIL-DTL-81929 or MIL-DTL-15014, as applicable. The IPB figure(s) shall be an integral part of the maintenance element.

3.1.5.2 IPB figures. The format of IPB figures shall be compatible with all reproduction media. This shall be accomplished through control of legibility of the Group Assembly Parts List

MIL-DTL-81218C(AS)

(GAPL), proper line art techniques in the preparation of supporting illustrations, and coordinated GAPL entries with illustrations (see MIL-DTL-81927 and NAVAIR 00-25-700).

3.2 General requirements. Technical manuals prepared in accordance with this specification shall be in WP format meeting the general style and format requirements of MIL-DTL-81927 (see 3.1.4). The instructions shall consist of procedures for performing intermediate and/or depot level maintenance. Intermediate and depot maintenance will not normally be combined. Requirements of the gas turbine three-degree intermediate level maintenance program in accordance with OPNAVINST 4790.2 shall be reflected, as applicable, in intermediate level maintenance procedures.

3.3 Arrangement. Except when noted for specific application or restricted from use in a specific application, arrangement shall be in accordance with MIL-DTL-81927 (see 3.1.4). Arrangement of technical content WPs shall normally be as follows:

- a. Description and principles of operation
- b. Standard practices (if applicable)
- c. Engine handling in shipping container/maintenance stand
- d. Preparation for service and storage
- e. Preinduction and mandatory inspection requirements
- f. Preparation for test (pre-test set up)
- g. Engine test
- h. Troubleshooting
- i. Removal and installation of major assemblies/subassemblies

MIL-DTL-81218C(AS)

- j. Major assembly/subassembly maintenance (disassembly, cleaning, inspection, repair and assembly of subassemblies)
- k. Engine maintenance (fuel systems, lubrication system, electrical system, bleed air system and other engine systems)
- 1. Support equipment maintenance

3.4 Technical content - general. Except where noted for specific application, or restricted from use in a specific application, the following guidelines apply to all maintenance manuals prepared to this specification.

3.4.1 Technical content requirements. Instructions prepared in accordance with this specification shall follow the approved maintenance plan/logistics support analysis and spare parts provisioning documentation applicable to the engine or equipment covered. Data shall be based on sound engineering principles and techniques, service experience, performance data, and available reliability data. Standard shop practices and techniques contained in general maintenance engineering series manuals shall not be duplicated. When applicable, appropriate reference shall be made to these manuals in accordance with MIL-DTL-81927 (see 3.1.4).

3.4.2 Maintenance level. Procedures shall be specifically tailored to the level of maintenance to which the manual applies. Intermediate maintenance manuals shall include coverage only to the extent of repair authorized at the intermediate level, and depot maintenance manuals shall contain complete rework instructions. When both intermediate and depot level engine maintenance coverage is specified, depot information normally shall not duplicate intermediate coverage but shall be limited to necessary supplementary depot maintenance information; appropriate reference from the depot manual to the intermediate manual and WP number shall be included.

3.4.2.1 Depot level. Depot level maintenance manuals shall include instructions and procedures that will permit repair of engine sections, modules, subassemblies, and accessories to the authorized depth contained in the maintenance plan. The extent of coverage required in depot level manuals will vary depending on the type of maintenance at the intermediate level. For example, if intermediate level maintenance is performed horizontally and the depot level maintenance is accomplished vertically, an extensive depot manual may be required.

3.4.2.2 Combined intermediate-depot maintenance. Where authorized by the requiring activity, a combined intermediate depot maintenance manual shall be prepared. If the differences between intermediate level procedures and depot level procedures for a particular section, module, subassembly, accessory, or function are minor, the procedures should be covered in the same WP(s). The WP title page(s) shall identify the combined coverage. The procedures applicable to depot level maintenance shall be appropriately identified; the manual introduction shall explain the method of identifying these procedures. If the differences between the

MIL-DTL-81218C(AS)

intermediate level and depot level are major, the depot level procedures shall be covered in separate WPs.

3.4.3 Special processes. Text shall include special processes or procedures required under extreme temperature and humidity conditions within the limits established by the design specification for the equipment covered. Text shall also include direction of rotation (CW/CCW) for torquing/turning with or without a torque adapter (multiplier). Left-hand thread bolts shall be noted for each usage. When applicable, provisions shall be included for the recoverability of precious metals.

3.4.4 Illustrations and diagrams. Illustrations shall be prepared in accordance with MIL-DTL-81927 (see 3.1.4). Complex systems shall be illustrated schematically or by block diagrams to the extent necessary for the technician to understand their operation. Cutaway illustrations shall not be prepared unless essential for illustrating the type of function described. Points of adjustment, including measurements, required tolerances, and methods for obtaining measurements, shall appear on illustrations of critical functioning systems requiring adjustment or rigging. Unusual operations such as those used in checking fit, shimming, clearances, and gearlash shall be illustrated when required for clarity.

3.4.4.1 Procedural illustrations. Procedural illustrations supplement the text by clarifying procedures which are complex, of a special nature, or are not obvious. These illustrations shall be included as necessary.

3.4.4.2 Exploded views. Exploded views shall be used if required to illustrate disassembly and assembly instructions. If exploded views are prepared, index numbers and a nomenclature list or legend keyed to the index numbers shall be included to identify each part. If the engine cannot be adequately illustrated by a single exploded view, separate subassembly exploded views may be included in sequence. In certain instances, exploded views prepared for the IPB can be used with minor modification. Index numbers shall be reassigned to coincide with the procedural text.

3.4.5 Support equipment required lists. The support equipment required lists shall be prepared in accordance with MIL-DTL-81927 (see 3.1.4).

3.4.6 Materials required lists. The materials requirements lists shall be prepared in accordance with MIL-DTL-81927 (see 3.1.4).

3.5 Technical content - detailed.

3.5.1 Alphabetical index. In addition to the requirements of MIL-DTL-81927 (see 3.1.4), the alphabetical index for intermediate maintenance manuals shall include identification of tasks applicable to each degree of intermediate maintenance. A subheading "Maintenance Allocation" and three columns identified "1st", "2nd", and "3rd" for each degree of intermediate maintenance

MIL-DTL-81218C(AS)

shall be included under the "Work Package Number" heading. The alphabetical index for depot maintenance manuals shall be in accordance with MIL-DTL-81927 (see 3.1.4).

3.5.2 Introduction. In addition to the requirements of MIL-DTL-81927 (see 3.1.4), the introduction shall include the significant differences between models and the method of indicating those differences, if more than one engine model is covered. Only information covering uninstalled aircraft engines shall be included. The introduction shall indicate, when applicable, that the external piping, cabling, and clamping information for the engine is contained in a separate intermediate maintenance manual or supplement. When a separate IPB manual is approved, the introduction shall make reference to the IPB. A historical record of applicable technical directives is required and a complete list of reference material is also required. A support equipment and materials required list is not required in the introduction, but shall be provided in separate WPs as applicable.

3.5.2.1 Maintenance allocation. The introduction for an intermediate maintenance manual shall include an explanation of the maintenance allocation heading contained in the alphabetical index. It shall contain a statement that allowable maintenance shall be consistent with spare parts provisioning, support equipment, and maintenance site capability and that if these conditions are not met, the engine shall be declared beyond capability of maintenance (BCM) and shall be transferred to a maintenance activity having repair capability in accordance with OPNAVINST 4790.2.

3.5.2.2 Reference material listing. The reference material list shall be prepared in accordance with MIL-DTL-81927 (see 3.1.4).

3.5.2.3 Historical record of applicable technical directives. The historical record of applicable technical directives shall be prepared in accordance with MIL-DTL-81927 (see 3.1.4).

3.5.3 Support equipment required WP. The consolidated list of support equipment required by MIL-DTL-81927 (see 3.1.4) shall be a separate WP. The listing shall be tabular with nomenclature identified first in alphabetical sequence and shall include the part number or type designation, maintenance level and degree, and reference to WPs in which the support equipment is required. Illustrations of support equipment shall be included for the support equipment that is not adequately illustrated for identification in WP procedures.

3.5.4 Materials required WP. The consolidated listings of materials required by MIL-DTL-81927 (see 3.1.4) shall be a separate WP. The consolidated list of materials shall be a tabular listing in two parts.

- a. Consumable materials. The consumable materials shall be listed alphabetically by nomenclature, specification or part number, and shall reference those WPs in which used.

MIL-DTL-81218C(AS)

- b. Expendable materials. The expendable materials shall be listed alphabetically by nomenclature, specification or part number, quantity, and shall reference those WPs in which used.

3.5.5 Description and principles of operation. This coverage, which is used by maintenance personnel to further understanding of the engine, shall include but not be limited to basic engine description, and description of each related system. This information on the engine and its systems shall include purpose, type, series, main features, and a table of leading particulars including dimensions, weight, and other basic engine data. If more than one model is covered, the significant differences shall be explained.

3.5.5.1 Principles of operation. A complete explanation of the operation of the engine and its systems shall be included. Basic theory found in textbooks shall not be included. Information such as cylinder numbering, compressor stages, combustion chamber arrangement, location of major sections, modules, components, and accessories shall be presented. The principles of operation shall consist of functional narrative written to facilitate understanding of the engine systems to the extent necessary to support fault detection and isolation and maintenance of the systems. This text shall describe system operation and the relationship of other systems/components during system integration. Functional block diagrams and schematics shall be used to support the text.

3.5.6 Standard practices. This coverage may be separate WP and shall contain standard cleaning processes, inspection, and repair procedures, plating, welding, and other general information not contained in a separate manual. Practices and procedures that are peculiar to assemblies, subassemblies, components and accessories shall not be included in this coverage. Reference shall be made to the standard practice WP from maintenance WPs where applicable.

3.5.7 Engine handling. The coverage shall include handling instructions for engine removal from and installation in the shipping container and maintenance stand. The coverage shall also include instructions for transferring an engine to and from a transport trailer and use of a standard Navy rail system.

3.5.8 Preparation for use, storage, and shipment. These instructions shall include unpacking the engine, depreservation, preoiling, preparation for initial run, preservation, packing, and storage. In addition, this WP shall include the overall dimensions and weight of shipping and storage containers with the engine, engine sections, modules, or components packed in them. Information shall be included for corrosion control in the form of prevention, recognition, and elimination procedures. Instructions shall also be included for short-time storage at the intermediate level. Specific instructions shall be included for the engine and equipment concerned and shall not duplicate information provided in general series manuals, which shall be referenced as applicable.

MIL-DTL-81218C(AS)

3.5.9 Preinduction and mandatory inspection requirements. Preinduction and mandatory inspection requirements covering any engine inducted at intermediate or depot maintenance level are required as a separate WP. The WP shall detail inspection/investigation procedures. The depth of inspection/investigation shall depend upon remaining engine life, operational requirements and economic feasibility. Applicable WPs shall be referenced for details of removal, cleaning, inspection, repair, assembly, installation, and testing. Probable cause/corrective action, and mandatory/recommended maintenance tasks to be taken for correction of engine defects shall be detailed. Major inspection requirements for complete engine repair shall be identified.

3.5.10 Preparation for test. Setup procedures required to prepare the engine for test shall be included. Reference shall be made to assembly and disassembly procedures in applicable maintenance WPs, when necessary. Instrumentation and fluid, air, and electrical supply requirements shall be included. The applicable test system and engine adapter stand or cell shall be listed as support equipment. Procedures for operation of the test system, description, and location of instrumentation, controls or indicators shall be covered in the test system manual only. This information is not to be duplicated in the engine maintenance manual. Other support equipment required for test setup, such as special adapter assemblies peculiar to the engine being tested and special fittings to be installed in sensing lines for monitoring and test instrumentation, shall also be listed if not covered in the engine test system manual. When a special adapter manual or supplement for adaptation of the engine to the stand or cell is available or being prepared, the adapter manual or supplement shall be referenced and only those procedures necessary to insure complete installation and removal instructions shall be included. Operation, installation, description, and location of items such as indicator lights, switches, fuses, and digital meters, shall be included in the adapter assembly maintenance manual and shall not be duplicated in the engine maintenance manual.

3.5.11 Engine test. Complete instructions shall be included covering test requirements at the maintenance level covered in the manual. Test data pertaining to specific testing conditions and instructions required for use of support equipment, if applicable, shall be included. If an engine malfunction should occur, reference shall be made to the troubleshooting WP. Coverage shall include:

- a. Safety precautions
- b. Static test and motoring procedures
- c. Start-up information, operation and shutdown procedures, and emergency shutdown procedures.
- d. Operating and test parameters
- e. Level of testing following specific repairs

MIL-DTL-81218C(AS)

- f. Functional test
- g. Performance evaluation worksheet
- h. Test schedule
- i. Penalty schedule
- j. Hot preservation requirements

3.5.11.1 Environmental conditions. Allowable engine performance data corrected to standard day atmospheric conditions shall be included.

3.5.11.2 Charts or curves. Performance evaluation charts or curves depicting engine operating parameters shall be included. Correction charts shall be included to show correction factors for performance evaluation.

3.5.11.3 Engine operating limits. A table of operating limits shall be included with the following column headings:

Table (number) Engine Operating Limits

Items	Limits	Remarks
-------	--------	---------

3.5.11.4 Test schedules and procedures. A description of the sequence and manner of accomplishing a functional or performance evaluation of the engine shall be included. All checks and adjustments shall be described in detail with appropriate references to charts or curves. For performance evaluation, a test schedule shall be presented in tabular form.

3.5.11.5 Test requirements. A table shall be included listing the specific test requirements for engines repaired within the scope of the manual. The table shall be prepared with the following column headings:

Table (number) Test Requirements

Parts/Modules Replaced or Repaired	Functional Test	Performance Test	Comments
---------------------------------------	--------------------	---------------------	----------

3.5.11.6 Penalty applications. A table of penalty applications shall be included outlining the additional testing required for parts reinstalled or replaced following successful completion of a performance run and shall contain the following column headings:

MIL-DTL-81218C(AS)

Table (number) Penalty Applications

Nomenclature	Reinstallation Test	Replacement Test	Comments
--------------	------------------------	---------------------	----------

NOTE: A paragraph shall be inserted immediately following the table of penalty applications to read as follows:

"Parts removed to gain access to other parts or areas shall invoke the same penalties, in accordance with the table of penalty applications, as parts replaced to correct deficiencies and malfunctions. In the event that more than one penalty is invoked, the most severe shall apply."

3.5.12 Troubleshooting. Detailed procedures to determine, isolate and remedy performance difficulties on the engine and engine systems shall be included. Specific instructions shall contain special techniques, methods, limits, and instrumentation requirements, as necessary, for effective troubleshooting. Instructions shall also be included for locating and identifying malfunctions caused through interaction of integrated systems. Instructions for setup and use of support equipment including instructions for its operation during troubleshooting shall be included, if applicable. Procedures shall cover not only troubles most likely to occur, but also those of a less frequent and more complex nature. Information shall be arranged in the order of probable occurrence and shall guide the technician, in as practical a manner as possible, to the cause of equipment failure or malfunction and its repair. The sequence of steps required to remove or repair a component or unit shall be referenced by WP number when such removal or repair is required. Troubleshooting diagrams shall be prepared in accordance with MIL-DTL-81927. Troubleshooting data shall be supported by functional flow diagrams, schematics and wiring diagrams, as required.

3.5.13 Removal and installation.

3.5.13.1 Removal of major assemblies/subassemblies. These instructions shall include procedures for sequential dismantling of the engine in sections, modules or major assemblies. Instructions shall indicate that care must be exercised to prevent the entrance of dirt and other foreign materials into the engine, and whenever practical, temporary covers should be used to seal all openings in the dismantled engine.

3.5.13.2 Installation of major assemblies/subassemblies. Instructions shall cover the final assembly of sections, modules, and major assemblies to form a complete engine prior to performance test. Step by step assembly procedures to check, align and adjust each section, module, assembly or subassembly shall be included. Precautions to be observed and quality assurance requirements shall be included. These instructions shall contain a statement that the assembled engine is to receive a checkout in accordance with applicable test instructions. When

MIL-DTL-81218C(AS)

a procedure (step) states "if outside of limits, go to step x," the procedure shall also direct "go to step y" if within limits.

3.5.14 Major assembly/subassembly maintenance. Maintenance of sections or modules (such as front frame, compressor, and turbine) and major subassemblies (such as gearboxes) shall be covered in separate WPs for each section, module, or subassembly. These WPs shall include procedures and illustrations for disassembly, cleaning, inspection, repair, and assembly. Application and operation of support equipment shall be described as they are required during maintenance and illustrated when necessary. Instructions shall specify use of approved corrosion preventive compounds, neutralization, or other protection on parts and components.

3.5.14.1 Disassembly. Instructions shall include sequential procedures for disassembly of sections, modules and subassemblies into component parts. Disassembly of component parts shall be covered only to the extent required for the authorized level of maintenance. Precautions to be observed and critical dimensions to be recorded shall be included.

3.5.14.2 Cleaning. Specific instructions for parts and subassemblies and cleaning methods such as special agents, ultrasonic, and compressed air not covered in general manuals or the standard practices WP shall be included. References to these documents shall be made, as necessary. Precautions to be observed during cleaning shall be specified. Instructions relating to preservation of metal parts and surface treatment after cleaning shall be included.

3.5.14.3 Inspection. Procedures shall include the required inspection methods, support equipment, and instructions for inspection of engine parts within the scope of the applicable level of maintenance. Inspection instructions shall encompass failure, wear, damage, corrosion, leakage, aging, burning, malfunctioning, deformation, and deterioration that can be expected to occur during service of the engine. Allowable service limits and adequate standards for determining when parts should be repaired or replaced shall be included. Illustrations shall be prepared whenever necessary to augment inspection tables and shall be (index) numbered to correlate table(s) to figure(s). Procedures shall be included for performing special inspections required when the engine has operated beyond permissible limits, such as overspeed, overtemperature, or sudden stop. Requirements for special inspection by nondestructive methods shall be specified.

3.5.14.4 Repair. Comprehensive instructions shall be included for necessary repair to restore the engine section, module, or major subassembly to a completely satisfactory condition. Repair methods shall be specified for the correction of all deficiencies and conditions considered repairable within the scope of the level of maintenance to which the manual applies. Specific data shall be included to adequately describe repairs, including material specifications for metals when pertinent to making repairs.

MIL-DTL-81218C(AS)

3.5.14.5 Assembly. These instructions shall cover assembly of component parts into subassemblies, sections, and modules. The use of required corrosion preventive methods, special lubricants, gasket pastes, and other such applications shall be specified. Location of piping and cabling shall be provided. Peculiar lockwiring methods and locking devices shall be emphasized. Testing requirements and methods shall be included for in-work progress testing of subassemblies during repair and assembly. Precautions to be observed and quality assurance requirements shall be included. As required, a calculation worksheet shall be provided identifying critical dimensions to be recorded. For Service Life Limited Items, the location of part number and serial number, by specific life limited part, shall be indicated. When a procedure (step) states "if outside of limits, go to step x," the procedure shall also direct "go to step y" if within limits.

3.5.14.5.1 Dimensional limits and torque values. Coverage shall include limits to be used for determining and maintaining proper relationship between mating parts in any particular assembly. These limits shall include all such data as clearances, gearlash, and endplay. Illustrations shall be prepared when necessary. When such illustrations are used, they shall include reference numbers and tabulation of the limits instead of the data appearing in the text. Reference numbers on the illustrations shall have leaders to the points of clearance, gearlash, or endplay and shall be listed in numerical order. Torque values shall be called out in the text where utilized and shall be noted as a quality assurance procedure/step.

3.5.14.6 Local manufacture items. Information required for the fabrication of items source coded "local manufacture" (MF, MG, MH) shall be included unless the manufacture of the item is obvious. Only those items listed in the applicable IPB shall be considered. The data shall include identification of material required.

3.5.15 Engine maintenance. WPs shall be prepared for each engine system (such as fuel, lubrication, and electrical) accessory. Procedures for removing and installing the accessories from/to an assembled basic engine shall be included. The coverage shall include instructions for inspection, lubrication, adjustment, testing, troubleshooting, and minor repair. For accessories having separate maintenance manuals, reference shall be made to applicable manual numbers and titles.

3.5.16 Support equipment maintenance. When separate support equipment maintenance manuals or maintenance requirements cards (MRC) are not procured for peculiar support equipment furnished by the preparing activity, maintenance instructions for such equipment shall be included in a separate WP. Instructions for required fabrication of peculiar tools, when such fabrication is approved by the requiring activity, shall be included. Concise step by step procedures shall be included for proper care and fabrication of support equipment while in and out of service. These procedures shall cover instructions for storage, preventive maintenance, lubrication, operating checks and adjustments. End items of support equipment coded as technically non-repairable shall be included but shall be supported by an illustration and parts list only.

MIL-DTL-81218C(AS)

3.5.17 IPB. Unless otherwise specified, the IPB data shall normally be integrated with the maintenance data within the maintenance manual. Unless otherwise specified, the IPB data shall be developed in accordance with MIL-DTL-81929 or MIL-DTL-15014, as applicable.

3.6 External tubing, cabling and clamping. When specified in the contract, an intermediate maintenance manual supplement shall be prepared. When a separate manual supplement is not prescribed in the contract and the coverage is applicable, the coverage shall be provided in separate WPs within the manual. This coverage shall contain necessary information for the proper installation, positioning and identification of external tubing, cables, clamping and attaching hardware. The alphabetical index of each technical content WP shall include, in addition to paragraph headings, all figures contained in the WP. The technical content WPs shall be arranged as follows:

- a. Bracket installation
- b. External components
- c. Tubing, cabling and clamping installation
- d. Critical clearances

3.6.1 Numerical index. A numerical index of external parts by part number, cross referenced to their installation sequence number, shall be prepared. This index, identified as WP001 01, shall follow the alphabetical index.

3.6.2 Bracket installation. Illustrations shall be prepared identifying the engine flanges and views of each flange that brackets are secured to. Flange identification and view direction, spacer size and location, bracket part numbers, angle location and direction, bolt head direction, and torque values shall be provided.

3.6.3 External components. This coverage shall indicate what external components, such as gearboxes, pumps, valves, and controls, must be installed prior to installation of tubing and cables. Reference shall be made to the applicable maintenance WPs.

3.6.4 External tubing, cabling and clamping installation. Illustrations of the sides, top, and bottom views of the engine showing all tubing, cabling, clamping and attaching hardware as it would appear when properly and completely installed shall be prepared. These illustrations should be drawn as foldouts and shall be done in a scale that assures the external configuration is legible. All foldout illustrations shall be prepared as right hand pages in accordance with MIL-DTL-81927. Circled numbers shall reflect installation sequence of each external part. The sequence number, part number, nomenclature, and zone figure for detailed installation data shall be prepared in tabular form. Critical clearance items shall be identified .

MIL-DTL-81218C(AS)

3.6.4.1 Zone references. An illustration depicting the engine zones shall be prepared.

3.6.4.2 Zone detail views. A detailed view of each engine zone shall be prepared. These zone detail figures shall contain complete information necessary to install all external parts and attaching hardware. A key shall be prepared for each detail view.

3.6.5 Critical clearances. This coverage shall illustrate the specific critical clearance areas and identify the minimum allowable measurement that is required to ensure sufficient clearance exists in those areas.

3.7 Sequence control chart. When specified in the contract (see 6.2.1), a sequence control chart (SCC) shall be prepared. The SCC shall be a graphic presentation that will program the accomplishment of complete engine repair (CER) in a logical order. The presentation shall contain the major CER tasks and their required sequence, oriented to actual work time and manpower utilization.

3.7.1 Format.

3.7.1.1 Image area. The image area of the SCC shall be 17 inches high by 50 inches long.

3.7.1.2 Upper portion. The upper portion of the SCC shall contain the following:

- a. Table including identification of crew members, their rating (RTG), Military Occupational Specialty (MOS), and applicable WPs.
 - (1) Crew member no. - Number assigned to each specialist (no. 1 is normally the crew leader).
 - (2) RTG/MOS - The type of rating and MOS shall be determined in accordance with NAVPERS 18068 and MCO P1200.7.
 - (3) Applicable WPs - The WP numbers of tasks assigned to each specialist. The WPs are in the engine intermediate maintenance manual.
- b. Work Area Chart - An illustration of the engine with a breakdown of work areas numbered and identified in a legend.
- c. Title block (centered) with notation that chart is to be used with applicable WPs in engine intermediate maintenance manual and other applicable technical manuals (corresponding MRCs and tubing, piping and clamping manual supplement).
- d. Table with blocks for job numbers, times and dates for four engines.

MIL-DTL-81218C(AS)

e. Publication number, date and supersedure notice, when applicable.

3.7.1.3 Middle portion. Blocks in the middle portion of the SCC shall be arranged to identify specific tasks in the logical sequence of accomplishment. The block width shall be lined up with the time brackets in the lower portion. The task title and number shall be the same as the intermediate maintenance manual. The WP number shall be placed in the upper right hand corner of each block. The work area number(s) shall be located in the lower right hand corner. WPs which contain major engine inspection requirements shall be identified by placing an asterisk before the WP number. Task assignments to specific crew members shall be shown at the left. Identification of the major engine inspection asterisk shall be shown.

3.7.1.4 Lower portion. A graph coordinate for TIME shall be divided into equal vertical increments of one hour, and each hourly increment shall be subdivided in six equal parts rated at ten minutes each. The graph shall display the total clock hours required to process the engine and individual tasks. In addition, the time allowed each crew member to accomplish specific tasks will permit a computation of manhours per task. If task time is excessive and could cause the length of the SCC to exceed 52 inches, a reduction of areas used to reflect time shall be made by grouping large individual time lapses of more than two hours into smaller increments. The tasks shall be listed by WP number in parentheses with the left parenthesis located at the time the task will begin and the right parenthesis at the time the task will be completed. Blocks for engine identification number and supervisor and crew member number shall be included at the left of the lower portion. The lower portion shall include provisions that will permit tracking and recording of four engines.

3.7.2 Type size. Type size shall be at least 8-point type.

3.7.3 Paper stock. The SCC shall be printed on white 50 pound paper.

3.7.4 Folded dimension. The SCC shall be folded accordion style to approximately 7 1/2 x 12 inches, and so folded that the publication number will be visible.

4. VERIFICATION

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

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

MIL-DTL-81218C(AS)

Department's System Command. Packaging data retrieval is available from the managing Military Department 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. Technical manuals prepared in accordance with this specification are intended for use by maintenance personnel in performing intermediate and depot level maintenance of uninstalled aircraft engines.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification,
- b. Whether a combined maintenance manual with IPB is required (see 3.5.17).
- c. Whether an external tubing, cabling and clamping manual supplement is required (see 3.6).
- d. Whether a sequence control chart is required (see 3.7).
- e. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2).
- f. Packaging requirements (see 5.1).

6.3 Guidance document. The following document is cited in section 3 of this specification and is provided for guidance and information only. Unless otherwise specified, the issue is that cited in the solicitation.

OPNAVINST 4790.2	-	Naval Aviation Maintenance Program
NAVPERS 18068	-	Navy Enlisted Manpower and Personnel Classifications and Occupational Standards.

(Copies are available by request to Commander, Naval Inventory Control Point Philadelphia, Publications/Forms Branch, Code 03334, 700 Robbins Ave., Philadelphia, PA 19111-5098.)

MIL-DTL-81218C(AS)

6.4 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.

6.5 Subject term (key word) listing.

Aircraft engine maintenance
External tubing, cabling and clamping
Illustrated parts breakdown
Sequence control chart
Work package concept

6.6 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.

CONCLUDING MATERIAL

Preparing activity:
Navy-AS

(Project TMSS-N270)

MIL-DTL-81218C (AS)

INDEX

	<u>PARAGRAPH</u>	<u>PAGE</u>
Acquisition requirements	6.2	18
Alphabetical index	3.5.1	7
APPLICABLE DOCUMENTS	2.	2
Arrangement	3.3	5
Assembly	3.5.14.5	14
Bracket installation.....	3.6.2	15
Changes from previous issue	6.6	19
Charts or curves	3.5.11.2	11
Classification.....	1.2	1
Cleaning	3.5.14.2	13
Combined intermediate-depot maintenance.....	3.4.2.2	6
Conflict between specifications.....	3.1.3	3
Copyrights and advertising	3.1.1	3
Critical clearances	3.6.5	16
Depot level.....	3.4.2.1	6
Description and principles of operation.....	3.5.5	9
Dimensional limits and torque values	3.5.14.5.1	14
Disassembly	3.5.14.1	13
Engine handling.....	3.5.7	9
Engine maintenance.....	3.5.15	14
Engine operating limits.....	3.5.11.3	11
Engine test	3.5.11	10
Environmental conditions	3.5.11.1	11
Exploded views	3.4.4.2	7
External components	3.6.3	15
External tubing, cabling and clamping.....	3.6	15
External tubing, cabling and clamping installation	3.6.4	15
Folded dimension	3.7.4	17
Format	3.7.1	16

MIL-DTL-81218C (AS)

INDEX

	<u>PARAGRAPH</u>	<u>PAGE</u>
General	2.1	2
General	3.1	3
General requirements.....	3.2	5
General style, format, and technical content.....	3.1.4	3
Government documents.....	2.2	2
Guidance document.....	6.3	18
Historical record of applicable technical directives	3.5.2.3	8
IPB	3.1.5	4
IPB.....	3.5.17	15
IPB figures.....	3.1.5.2	4
Illustrations and diagrams.....	3.4.4	7
Image area	3.7.1.1	16
Inspection	3.5.14.3	13
Installation of major assemblies/subassemblies	3.5.13.2	12
Intended use.....	6.1	18
Introduction	3.5.2	8
Local manufacture items.....	3.5.14.6	14
Lower portion	3.7.1.4	17
Maintenance allocation.....	3.5.2.1	8
Maintenance level.....	3.4.2	6
Major assembly/subassembly maintenance	3.5.14	13
Materials required lists	3.4.6	7
Materials required WP.....	3.5.4	8
Middle portion	3.7.1.3	17
NOTES	6.	18
Numerical index	3.6.1	15
Order of precedence.....	2.3	3
Other government documents, drawings, and publications	2.2.2	2
PACKAGING.....	5.	17
Packaging	5.1	17

MIL-DTL-81218C (AS)

INDEX

	<u>PARAGRAPH</u>	<u>PAGE</u>
Paper stock	3.7.3	17
Penalty applications.....	3.5.11.6	11
Preinduction and mandatory inspection requirements	3.5.9	10
Preparation for test.....	3.5.10	10
Preparation for use, storage, and shipment.....	3.5.8	9
Principles of operation.....	3.5.5.1	9
Procedural illustrations	3.4.4.1	7
Proprietary data.....	3.1.2	3
Reference material listing.....	3.5.2.2	8
Relationship between the IPB and the WP concept	3.1.5.1	4
Removal and installation.....	3.5.13	12
Removal of major assemblies/subassemblies	3.5.13.1	12
Repair	3.5.14.4	13
REQUIREMENTS	3.	3
SCOPE	1.	1
Scope	1.1	1
Sequence control chart.....	3.7	16
Special processes.....	3.4.3	7
Specification figures	6.4	19
Specifications, standards and handbooks.....	2.2.1	2
Standard practices	3.5.6	9
Subject term (key word) listing.....	6.5	19
Support equipment maintenance	3.5.16	14
Support equipment required lists	3.4.5	7
Support equipment required WP.....	3.5.3	8
Technical content - detailed.....	3.5	7
Technical content - general.....	3.4	6
Technical content requirements	3.4.1	6
Test requirements.....	3.5.11.5	11
Test schedules and procedures.....	3.5.11.4	11
Troubleshooting	3.5.12	12
Type size	3.7.2	17
Upper portion	3.7.1.2	16

MIL-DTL-81218C (AS)

INDEX

	<u>PARAGRAPH</u>	<u>PAGE</u>
VERIFICATION	4.	17
Verification	4.1	17
Zone detail views	3.6.4.2	16
Zone references	3.6.4.1	16

CONCLUDING MATERIAL

Preparing activity:
Navy-AS

(Project TMSS-N270)

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.
NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:

1. DOCUMENT NUMBER

MIL-DTL-81218C

2. DOCUMENT DATE (YYMMDD)

971126

3. DOCUMENT TITLE

MANUAL, TECHNICAL; AIRCRAFT ENGINE IMD AND DEPOT MAINTENANCE, PREPARATION OF

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

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle Initial)

b. ORGANIZATION

c. ADDRESS (Include Zip Code)

d. TELEPHONE
(Include Area Code)
(1) Commercial:7. DATE SUBMITTED
(YYMMDD)(2) DSN:
(If Applicable)

8. PREPARING ACTIVITY

a. NAME
COMMANDER
NAVAL AIR WARFARE CENTER
AIRCRAFT DIVISIONb. TELEPHONE NUMBER (Include Area Code)
(1) Commercial (908) 323-2628
(2) DSN 624-2628c. ADDRESS (Include Zip Code)
CODE 414100B120-3
HIGHWAY 547
LAKEHURST, NJ 08733-5100IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:
Defense Quality and Standardization Office, 5203 Leesburg Pike,
Suite 1403, Falls Church, VA 22041-3466
Telephone (703) 756-2340 DSN 289-2340